Chapter: 16

State(s): Idaho

Recovery Unit Name: Clearwater River

Region 1
U.S. Fish and Wildlife Service
Portland, Oregon

DISCLAIMER

Recovery plans delineate reasonable actions that are believed necessary to recover and/or protect the species. Recovery plans are prepared by the U.S. Fish and Wildlife Service and, in this case, with the assistance of recovery unit teams, State and Tribal agencies, and others. Objectives will be attained and any necessary funds made available subject to budgetary and other constraints affecting the parties involved, as well as the need to address other priorities. Recovery plans do not necessarily represent the views or the official positions or indicate the approval of any individuals or agencies involved in the plan formulation, other than the U.S. Fish and Wildlife Service. Recovery plans represent the official position of the U.S. Fish and Wildlife Service *only* after they have been signed by the Director or Regional Director as *approved*. Approved recovery plans are subject to modification as dictated by new findings, changes in species status, and the completion of recovery tasks.

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Four problem assessments prepared under the Idaho Bull Trout Conservation Plan by the Clearwater Basin Bull Trout Technical Advisory Team (CBBTTAT) contributed to this chapter. The four problem assessments include the North Fork Clearwater River basin (CBBTTAT 1998a); the Lochsa River and Selway River basins, including the Middle Fork Clearwater River upstream of the confluence with the South Fork Clearwater River (CBBTTAT 1998b); the lower Clearwater River, downstream of the confluence with the South Fork Clearwater River (CBBTTAT 1998c); and the South Fork Clearwater River (CBBTTAT 1998d). The Service acknowledges the technical groups for the Clearwater River basin and numerous individuals who participated in various meetings and discussions in developing the problem assessments, who are acknowledged in each assessment.

CLEARWATER RIVER RECOVERY UNIT CHAPTER OF THE BULL TROUT RECOVERY PLAN

EXECUTIVE SUMMARY

CURRENT SPECIES STATUS

The U.S. Fish and Wildlife Service issued a final rule listing the Columbia River and Klamath River populations of bull trout as threatened species on June 10, 1998 (63 FR 31647). The Clearwater River Recovery Unit forms part of the range of the Columbia River distinct population segment. The Clearwater River Recovery Unit includes the entire Clearwater River basin upstream from the confluence with the Snake River. Bull trout are distributed throughout most of the large rivers and associated tributary systems within the Clearwater River Recovery Unit, and they exhibit adfluvial, fluvial and resident life history patterns (CSS 2001). The Clearwater River Recovery Unit consists of 7 core areas, with a total of 45 local populations and 27 potential local populations distributed among the core areas (Table 2).

HABITAT REQUIREMENTS AND LIMITING FACTORS

A detailed discussion of bull trout biology and habitat requirements is provided in Chapter 1 of this recovery plan. The limiting factors discussed here are specific to the Clearwater River Recovery Unit chapter. Land and water management activities that depress bull trout populations and degrade habitat in this recovery unit include operation and maintenance of dams and other diversion structures, forest management practices, livestock grazing, agriculture, agricultural diversions, road construction and maintenance, mining, and introduction of nonnative species. Impassable dams and diversion structures isolate and fragment bull trout local populations. Forestry activities impact bull trout through decreased recruitable large woody debris, increased water temperatures from reduced shading, and lack of pools and habitat complexity. Livestock grazing degrades aquatic habitat by removing riparian vegetation, destabilizing streambanks, widening stream channels, promoting incised channels and lowering water tables, reducing pool frequency, increasing soil erosion, and altering water quality. Agriculture practices impact bull trout through added inputs of nutrients, pesticides, herbicides, and sediment, and reduced riparian vegetation. Introduced brook trout threaten bull trout through hybridization, competition, and possible predation.

RECOVERY GOAL AND OBJECTIVES

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed across the species native range, so that the species can be delisted**. To accomplish this goal, the following recovery objectives addressing distribution, abundance, habitat and genetics were identified.

- Maintain the current distribution of bull trout and restore their distribution in previously occupied areas within the Clearwater River Recovery Unit.

- Maintain stable or increasing trends in abundance of bull trout in the Clearwater River Recovery Unit.

- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.

- Conserve genetic diversity and provide opportunity for genetic exchange.

RECOVERY CRITERIA

Recovery criteria for the Coeur d'Alene Recovery Unit were established to assess whether recovery actions result in the recovery of bull trout in the basin. The criteria developed for bull trout recovery address quantitative measurements of bull trout distribution and population characteristics on a recovery unit basis.

1. **Maintain the current distribution of bull trout in the 45 currently identified local populations, restore or confirm distribution in the 18 potential local populations that are essential to recovery, and determine the feasibility of establishing 8 additional potential local**

populations. Eighteen potential local populations were assigned a higher priority and determined to be essential to bull trout recovery because they will assist with attainment of the recovery objectives and criteria for distribution and abundance and will improve connectivity within and between core areas. These potential local populations include Rock, Cold Springs, Post Office, Weir, Hungery, Fish, Indian Grave, Lake, Boulder, Old Man, Split, Marten, Mink, Gedney, O'Hara, Clear, and Mill Creeks, and American River. Eight potential local populations, although still important to recovery, were assigned a lower priority because they currently either have degraded habitat or threats present such that support of bull trout may not be currently possible. The second priority potential local populations include Beaver, Orogrande, Deadman, Canyon, Coolwater, Fire, Pete King, Meadow, and Three Links creeks (Clearwater Recovery Unit Team, *in litt.* 2000; Clearwater Recovery Unit Team, *in litt.* 2002).

2. **Achieve estimated abundance of adult bull trout of at least 21,500 individuals in the Clearwater River Recovery Unit including at least 500 individuals in each of the Fish Lake (North Fork Clearwater River), the Fish Lake (Lochsa River), and the Lower/Middle Fork Clearwater River core areas; and at least 5,000 individuals in each of the North Fork Clearwater River, the Lochsa River, the Selway River, and the South Fork Clearwater River core areas**. Abundance of adult bull trout for the recovery unit was estimated based on professional judgement using surveyed fish densities, consideration of current habitat conditions and potential conditions after threats have been addressed (Clearwater Recovery Unit Team, *in litt*. 2000).

3. **Restore adult bull trout local populations to exhibit stable or increasing trends in abundance in the Clearwater River Recovery Unit, based on at least 15 years of monitoring data.** The intent of this criterion is that adult bull trout in core areas presently below their recovered abundance exhibit increasing trends, whereas bull trout in core areas that may be at their recovered abundance exhibit stable trends.

4. **Address specific known barriers to bull trout migration in the Clearwater River Recovery Unit, and identify and address additional barriers. Known passage barriers that must be addressed include: culvert on Forest Service Road 222 (T26N, R8E, S3) in South Fork Red River; private road culvert at confluence of East Fork American River with American River; culvert on county road crossing in Big Elk Creek approximately 0.65 miles upstream from Little Elk Creek confluence; culvert on Forest Service Road 108 in the West Fork Fishing (Squaw) Creek; culverts on Highway 12 at Badger, Cold Storage, and Noseeum creeks; culvert on Forest Service Road 223 at the mouth of Boyd Creek. Other passage barriers that must be addressed are those that have been identified within a general location and need further investigation on the specific location, including: Little North Fork Clearwater River (two culverts between Butte and Culdesac creeks); Beaver Creek below Sheep Mountain sub-watershed (two culverts); North Fork Clearwater River above Isabella Creek sub-watershed (three culverts); Death/Fisher/Trail sub-watershed (two culverts); Cold Springs sub-watershed (one culvert), Long/Short/Slate sub-watershed (two culverts); Moose Creek sub-watershed (one culvert); Cayuse Creek watershed (culvert barrier in Mae Creek).** Substantial gains in reconnecting fragmented habitat may be achieved in all core areas by restoring passage over or around many of the barriers that are typically located on smaller streams, including road crossings, culverts, and water diversions. The priority for addressing passage barriers and re-establishing of connectivity by core area is the South Fork Clearwater, Lochsa, North Fork Clearwater, Lower/Middle Fork Clearwater, and Selway River core areas. Within the core areas, priority should be placed on watersheds currently occupied by bull trout.

Known barriers are listed above and in the Recovery Measures Narrative (section 1.2) portion of this plan, but many others have not yet been identified. However, they are collectively very important to recovery. Tasks to identify and assess barriers to bull trout passage are recommended in this recovery plan. A list of all such artificial barriers should be prepared in the first five years of implementation. Surveys to identify passage barriers should be prioritized by core area as follows: South Fork Clearwater, Lochsa, North Fork Clearwater, Lower/Middle Fork Clearwater, and Selway River core areas. Substantial progress must be made in providing passage over the majority of these sites, consistent with the protection of upstream populations of westslope cutthroat trout (*Oncorhynchus clarki*) and other native fishes, to meet the bull trout recovery criteria for connectivity.

ACTIONS NEEDED

Recovery for bull trout will entail reducing threats to the long-term persistence of populations and their habitats, ensuring the security of multiple interacting groups of bull trout, and providing access and habitat conditions that allow for the expression of various life history forms. Specific tasks falling within seven categories are discussed in Chapter 1. Tasks specific to this recovery unit are provided in this chapter.

ESTIMATED COST OF RECOVERY

Total estimated cost of bull trout recovery in this recovery unit is $10.9 million spread over a 25-year recovery timeframe, or an average of $434,000 per year. If the timeframe for recovery can be reduced, lower estimated costs would occur. Total cost includes estimates of expenditures by local, Tribal, State, and Federal governments and by private business and individuals. These costs are attributed to bull trout conservation but other aquatic species will also benefit. Cost estimates are not provided for tasks which are normal agency responsibilities under existing authorities Successful recovery of bull trout in the Clearwater River Recovery Unit is contingent on improving habitat conditions, removing barriers, and removal of nonnative species.

ESTIMATED DATE OF RECOVERY

Time required to achieve recovery depends on bull trout status, factors affecting bull trout, implementation and effectiveness of recovery tasks, and responses to recovery tasks. A tremendous amount of work will be required to restore impaired habitat, reconnect habitat, and eliminate threats from nonnative species. Three to five bull trout generations (15 to 25 years), or possibly longer, may be necessary before identified threats to the species can be significantly reduced and bull trout can be considered eligible for delisting.

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INTRODUCTION

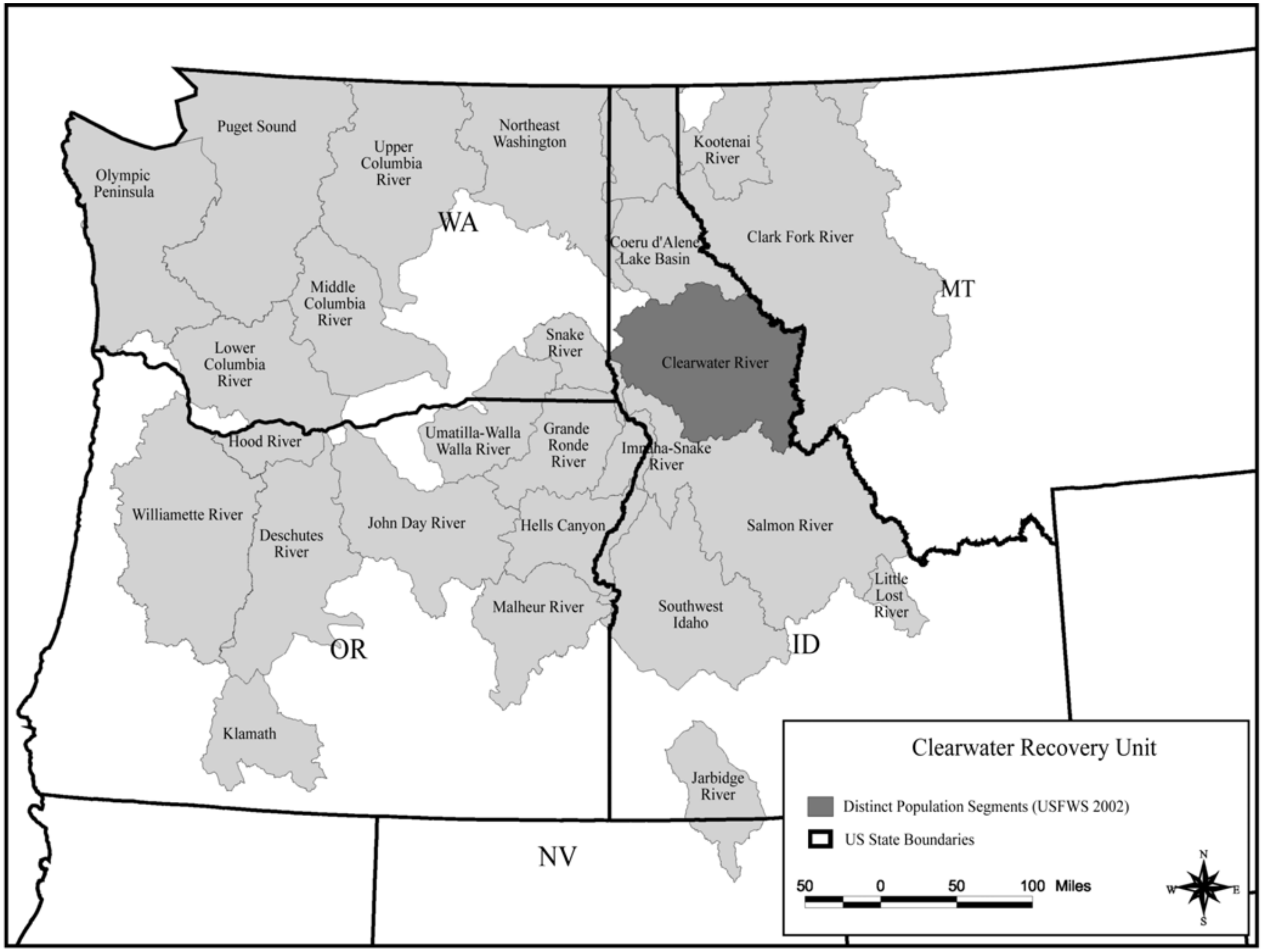
Recovery Unit Designation

The Clearwater River Recovery Unit is one of 22 recovery units designated for bull trout in the Columbia River basin (Figure 1). The Clearwater River Recovery Unit includes the entire Clearwater River basin upstream from the confluence with the Snake River. Except for some high elevation lakes and streams with natural barriers, bull trout were historically likely able to move among most areas within the recovery unit. However, Dworshak Dam now isolates bull trout in the North Fork Clearwater River from fish in the remainder of the basin. The Clearwater River basin is included in a single recovery unit because it likely functioned as a unit historically. Another factor in the designation of the basin as a recovery unit is an administrative decision; the basin is identified in the Idaho Bull Trout Conservation Plan (Batt 1996) as encompassing 10 key watersheds where protection and/or restoration activities are likely to produce measurable results.

Geographic Description of Recovery Unit

The Clearwater River Recovery Unit lies in northcentral Idaho, and extends from the Idaho/Montana border near Missoula, Montana to the Idaho/Washington border at Lewiston, Idaho. Major tributaries in the recovery unit include the Clearwater, North Fork Clearwater, Middle Fork Clearwater, South Fork Clearwater, Lochsa, and Selway Rivers. The Clearwater River drains approximately 2,423,761 hectares (5,989,052 acres). Elevations range from 216 meters (710 feet) at the confluence of the Clearwater and Snake Rivers to over 2,743 meters (9,000 feet) in the Bitterroot Mountains.

Figure 1. Bull Trout Recovery Units in the United States, highlighting the Clearwater River Recovery Unit.



The Clearwater River Recovery Unit experiences a wide variety of climates (Clearwater Subbasin Summary (CSS) 2001). Warm, moist maritime air masses from the Pacific strongly influence the climate across the recovery unit, except for the eastern higher elevations and southern-most portions of the recovery unit. These areas are more similar to the northern Rocky Mountain climatic conditions with drier and cooler climates. Annual precipitation in the area is 762 to 2,540 millimeters (30 to 100 inches), with over 90 percent occurring during the fall, winter, and spring. A seasonal snowpack generally covers the area during October to June, depending on elevation. Periodic, high intensity electrical storms are common during the summer months and may ignite wildfires. Mean annual temperatures throughout the recovery unit range from 10 to 13 degrees Celsius (C) (50 to 55 degrees Fahrenheit (F)) at lower elevations to -3 to 0 degrees C (25 to 32 degrees F) in the upper elevations (CSS 2001). Temperatures are generally below freezing in higher elevations of the drainage during the winter and can be in excess of 32 degrees C (90 degrees F) in the lower elevation canyons during the summer (Bugosh 1999; Maughan 1972).

The main geologic parent material for soils and sediment in the recovery unit is metamorphic, granitic, and basalt rock types (CSS 2001). The Idaho granite batholith makes up much of the bedrock found in the Clearwater and Bitterroot mountains in the central and eastern portions of the recovery unit. Batholithic rock erodes to sand contributing to fine sediments in streams, and Belt Series rock often exhibits heavy stream bedload movement when associated with recent glaciation. Contact between the two rock formations produces an unstable layer that is often associated with frequent mass failures resulting in landslides.

The many ridges and mountains of the Clearwater and Bitterroot ranges in the central and eastern part of the recovery unit have convex slopes ranging from 20 to 25 percent (McClelland *et al*. 1997). Steeper slopes exist in the glacial cut valleys in the upper elevations around the recovery unit at the head of many tributary valleys (CSS 2001). These glaciated areas are prevalent in the upper portions of the recovery unit.

The breaklands of the recovery unit refer mainly to the larger river valleys such as those found in the mainstem Clearwater River canyon. The lower

Clearwater River separates the Camas and Palouse prairies through the formation of these steep river breaks (CBBTTAT 1998c). The upland prairies may rise over 914 meters (3,000 feet) above the lower Clearwater River.

The mainstem Clearwater River originates in the Bitterroot Mountains at elevations ranging from 2,562 to 2,745 meters (8,400 to 9,000 feet) (CSS 2001). The Clearwater River contributes approximately one-third of the Snake River flow and 10 percent of the flow of the Columbia River system annually, with a mean annual discharge of approximately 434 cubic meters per second (15,300 cubic feet per second) near the mouth (Lipscomb 1998). The Selway and Lochsa Rivers originate at the Idaho/Montana border and flow in a westerly to northwesterly direction through the breaklands and forested canyons to their junction at Lowell, Idaho. The confluence of the Selway and Lochsa form the Middle Fork of the Clearwater River, which flows in a westerly direction until it joins the South Fork of the Clearwater River. At this point the river is locally known as the mainstem Clearwater River (CSS 2001) and continues its westerly and northwesterly flow to the town of Ahsahka, where it is joined by the North Fork of the Clearwater River. The Clearwater River then joins the Snake River at Lewiston, Idaho.

Records for monthly flows indicate that peak flows generally occur in the months of May and June (CSS 2001). Low flows most often occur in August and September which corresponds with high instream temperatures and low precipitation in most of the recovery unit. The timing, duration, and volume of peak flows are driven by snowmelt and/or by seasonal rainstorms at elevations less than 1,220 meters (4,000 feet) (CSS 2001). Rain-on-snow events can occur from November through March (Thomas *et al*. 1963), and may result in hydrograph peaks through this period (CSS 2001).

Vegetation within the Clearwater River Recovery Unit consists of canyon grasslands with steep, complex topography dominated by perennial bunchgrass and shrub communities; and forested canyons and uplands dominated by cedar-hemlock-white pine forests (CBBTTAT 1998c). Over 70 percent of the recovery unit consists of forested communities and 12 percent is made up of shrubland and grassland communities (CSS 2001). Cedar-hemlock-white pine communities are generally productive and support a variety of tree species (*e.g.*, western red cedar (*Thuja plicata*), white pine (*Pinus monticola*), grand fir (*Abies grandis*), western larch (*Larix occidentalis*), and Douglas fir (*Pseudotsuga menziesii*)). Lodgepole pine (*Pinus contorta*), subalpine fir (*Abies lasiocarpa*), ponderosa pine (*Pinus ponderosa*), and Engelmann spruce (*Picea engelmannii*) are also present at middle and high elevations within the recovery unit. The majority of the grasslands occur in the foothills and breaklands as canyon bunch grass communities (CSS 2001).

There are currently more than 30 species of fish inhabiting the recovery unit, including 19 native species, two of which have been reintroduced (Table 1) (CSS 2001). Several anadromous salmonid propagation facilities produce and release spring/summer chinook salmon, fall chinook salmon, coho salmon and steelhead in the recovery unit. Three nonnative species have been introduced into Dworshak Reservoir and may be found downstream of the dam in the lower Clearwater River (CBBTTAT 1998c). Distribution of the majority of nonnative fish species (Table 1) does not overlap with bull trout distribution in the Clearwater River Recovery Unit.

Table 1. Fish species inhabiting the Clearwater River Recovery Unit (CSS 2001).

Common Name	Scientific Name	Origin
Arctic grayling	*Thymallus arcticus*	Nonnative
Black bullhead	*Ictalurus melas*	Nonnative
Black crappie	*Pomoxus nigromaculatus*	Nonnative
Bluegill	*Lepomis macrochirus*	Nonnative
Bridgelip sucker	*Catostomus columbianus*	Native
Brook trout	*Salvelinus fontinalis*	Nonnative
Brown bullhead	*Ameiurus nebulosus*	Nonnative
Bull trout	*Salvelinus confluentus*	Native
Carp	*Cyprinus carpio*	Nonnative
Channel catfish	*Ictalurus natalis*	Nonnative
Chinook salmon (fall)	*Oncorhynchus tshawytscha*	Native and Reintroduced
Chinook salmon (spring)	*Oncorhynchus tshawytscha*	Reintroduced

Common Name	Scientific Name	Origin
Chiselmouth	*Acrocheilus alutaceus*	Native
Coho salmon	*Oncorhynchus kisutch*	Reintroduced
Golden trout	*Oncorhynchus mykiss aquabonita*	Nonnative
Kokanee salmon	*Oncorhynchus nerka*	Nonnative
Largemouth bass	*Micropterus salmoides*	Nonnative
Largescale sucker	*Catostomus macrocheilus*	Native
Longnose dace	*Rhinichthys cataractae*	Native
Mottled sculpin	*Cottus bairdi*	Native
Mountain whitefish	*Prosopium williamsoni*	Native
Northern pike minnow	*Ptychocheilus oregonensis*	Native
Pacific lamprey	*Lampetra tridentata*	Native
Paiute sculpin	*Cottus beldingi*	Native
Peamouth	*Mylocheilus caurinus*	Native
Pumpkinseed	*Lepomis gibbosus*	Nonnative
Redside shiner	*Richardsonius balteatus*	Native
Sandroller	*Percopsis transmontana*	Native
Shorthead sculpin	*Cottus confusus*	Native
Smallmouth bass	*Micropterus dolomieui*	Nonnative
Speckled dace	*Rhinichthys osculus*	Native
Steelhead/rainbow/redband trout	*Oncorhynchus mykiss*	Native and Nonnative[1]
Tiger muskie	*Esox masquinongy x.E. lucius*	Nonnative
Torrent sculpin	*Cottus rhotheus*	Native
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	Native
Yellow perch	*Perca flavescens*	Nonnative

Description of Core Areas

[1] Includes nonnative resident rainbow trout.

The Clearwater River Recovery Unit has been divided into seven core areas for purposes of recovery planning. These core areas include the North Fork Clearwater River, Fish Lake (an isolated basin in the North Fork Clearwater River watershed), Lochsa River, Fish Lake (an isolated basin in the Lochsa River watershed), Selway River, South Fork Clearwater River, and the Lower and Middle Fork Clearwater River (Figure 2).

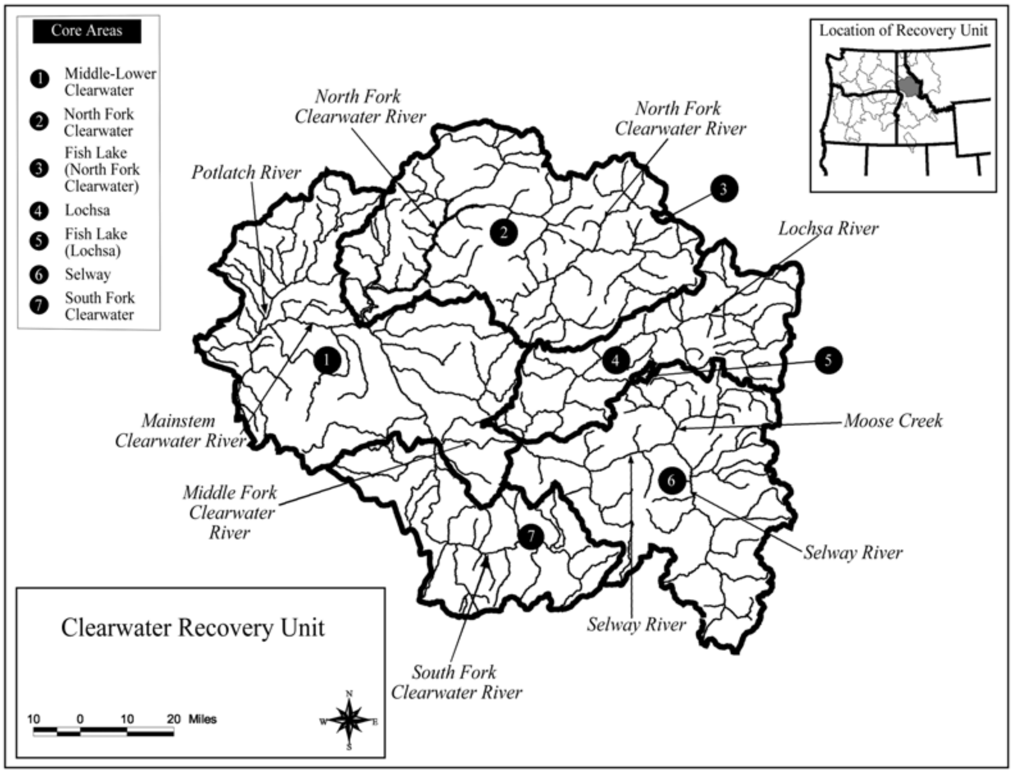
North Fork Clearwater River core area. The North Fork Clearwater River core area is located in Clearwater, Idaho, and Shoshone Counties. It includes the North Fork Clearwater River and all its tributaries upstream of Dworshak Dam. The core area is approximately 632,360 hectares (1,562,561 acres). Elevations range from 441 meters (1,445 feet) near the reservoir to 2,440 meters (8,000 feet) at the headwaters (CBBTTAT 1998a). Major tributaries within the core area include; Elk Creek, Little North Fork Clearwater River, Beaver Creek, Quartz Creek, Skull Creek, Orogrande Creek, Weitas Creek, and Kelly Creek (U.S. Forest Service (USFS) 2000).

Land managers within the core area include the Clearwater National Forest, Idaho Panhandle National Forest, Bureau of Land Management, U.S. Army Corps of Engineers, State of Idaho, Plum Creek Timber Company, and Potlatch Corporation. The Clearwater National Forest manages 64 percent of the watershed (USFS 2000). Idaho Department of Fish and Game and the Nez Perce Tribe manage fisheries resources within this core area (CBBTTAT 1998a).

The North Fork Clearwater River flows 46 kilometers (29 miles) from its headwaters to the reservoir with an average annual discharge of 100 cubic meters per second (3,520 cubic feet per second) from Dworshak Dam (CBBTTAT 1998a). Long-term discharge and temperature data have been recorded by the U.S. Geological Survey at Canyon Creek, just upstream of Dworshak Reservoir.

Stream flows follow a pattern of low flows during the late summer and fall

Figure 2. Clearwater River Recovery Unit with Core Areas for Bull Trout.



months and high flows in the spring and early summer months. Peak discharge generally occurs in late May or early June, typically ranging from 396 to 850 cubic meters per second (14,000 to 30,000 cubic feet per second) (CBBTTAT 1998a). Rain-on-snow events are more common at elevations below 1,220 meters (4,000 feet) (USFS 2000).

The North Fork Clearwater River has been identified by the State of Idaho as a Special Resource Water. This State designation recognizes the North Fork Clearwater River as having at least one, if not all, of the following characteristics: (1) the water is of outstanding high quality, exceeding cold water biota standards; (2) the water is of unique ecological significance; (3) the water possesses outstanding recreational or aesthetic qualities; and (4) intensive protection of the quality of the water is in the paramount interest of the people of Idaho (CBBTTAT 1998a).

The State of Idaho classified five tributaries of the North Fork Clearwater River as Stream Segments of Concern: Weitas, Skull, Quartz, Meadow creeks and Little North Fork Clearwater River (CBBTTAT 1998a). These watersheds have site-specific Best Management Practices to address the unique hazards and resources in these areas (USFS 2000). Thirty-eight stream segments and one reservoir in the North Fork Clearwater River core area are listed as Water Quality Limited under section 303(d) of the Clean Water Act (CBBTTAT 1998a) (See Appendix A). Most of these streams are in the Moose, Orogrande, Quartz, Beaver, and Floodwood Creek watersheds, and Dworshak Reservoir tributaries.

Fish Lake (North Fork Clearwater River) core area. The Fish Lake (North Fork Clearwater River) core area is located in Clearwater County on Federal lands managed by the Clearwater National Forest. The core area is approximately 1,433 hectares (3,541 acres). Fish Lake is the largest mountain lake in northcentral Idaho with a surface area of approximately 47 hectares (116 acres) at an elevation of 1,812 meters (5,943 feet) (Murphy and Cochnauer 1998).

Fish Lake is a large, oligotrophic mountain lake located in the Long Creek watershed of the upper North Fork Clearwater River drainage. The lake basin is on the crest of the Bitterroot Divide which forms the Idaho-Montana border. It is situated in a glacial trough with glacial ridges on the north and east, a strongly scoured cirque basin and headwall to the south, and the continuation of the glacial trough bottom to the west. The lake has a maximum depth of 42 meters (138 feet) with 90 percent of the surface area greater than 3 meters (10 feet) deep (Murphy and Cochnauer 1998). There are five small inlets and one outlet. Four inlets enter on the eastern end of the lake; the largest is a spring origin inlet that is 1 meter (3 feet) wide. This larger spring-fed inlet has spawning-size gravels, but no bull trout spawning activity has been observed. The fifth inlet on the north side of the lake is small and originates in a large seep area. There is one outlet, Lake Creek, exiting on the west side of the lake flowing 19 kilometers (12 miles) to the

North Fork Clearwater River. The surrounding area is dominated by Engelmann spruce, Douglas fir, and associated sub-alpine understory.

South Fork Clearwater River core area. The South Fork Clearwater River core area is located in Idaho County and encompasses an area of approximately 304,522 hectares (752,474 acres). The core area extends from the headwaters above Elk City and Red River to the confluence with the Middle Fork of the Clearwater River at Kooskia. Included in the area are 13 major watersheds, plus numerous face drainages (streams that are very small and steep, and generally provide very little habitat for fish, except possible seasonal habitat near their mouths) that flow into the mainstem South Fork Clearwater River (USFS 1999c). Major tributaries within the core area include: American River, Mill Creek, Red River, Newsome Creek, Crooked River, Johns Creek, Tenmile Creek, Meadow Creek, Leggett Creek, Cougar-Peasley creeks, Silver Creek, Wing Creek, and Twentymile Creek.

The core area includes a mixture of private and public lands. The Camas Prairie contains approximately 80,595 hectares (199,000 acres) and is mostly private land, with lesser amounts of Bureau Land Management, State of Idaho and Nez Perce Tribal lands (CBBTTAT 1998d). Of the remaining 223,959 hectares (552,987 acres), 69 percent is in Federal ownership, primarily in the Nez Perce National Forest (USFS 1999c). Approximately 10,125 hectares (25,000 acres) that occur within the National Forest boundary are owned by private interests and 5,265 hectares (13,000 acres) are in Bureau of Land Management ownership (USFS 1999c).

Average annual stream flow is 30 cubic meters per second (1,060 cubic feet per second) as measured at the U.S. Geological Survey stream gauge at Stites, Idaho (CBBTTAT 1998d). Stream flows follow a pattern of low flows during the late summer and fall months and high flows in the spring and early summer months. Peak discharge generally occurs in late May with an average of 95 cubic meters per second (3,370 cubic feet per second) (USFS 1999c).

September is generally the lowest flow month, with an average of 7 cubic meters per second (258 cubic feet per second) discharge (USFS 1999c).

The State of Idaho has classified eleven tributaries of the South Fork Clearwater as Stream Segments of Concern: American River, Red River, South Fork Red River, Big Elk Creek, Little Elk Creek, Crooked River, Newsome Creek, Tenmile Creek, Johns Creek, Meadow Creek, and Mill Creek (CBBTTAT 1998d). Within the entire core area, there are 18 stream segments and one lake listed as Water Quality Limited under section 303(d) of the Clean Water Act (CBBTTAT 1998d) (See Appendix A).

Lochsa River core area. The Lochsa River core area is located in Idaho County and encompasses an area of approximately 303,024 hectares (748,773 acres). Elevations range from 2,743 meters (9,000 feet) at the crest of the Bitterroots to 396 meters (1,300 feet) at Lowell, Idaho (USFS 1999a). The core area extends from the headwaters of Colt Killed Creek and Crooked Fork Creek which combine to form the Lochsa River, to the confluence of the Lochsa and Selway Rivers. Major drainages in the Lochsa River core area include: Brushy Fork, Colt Killed (White Sands), Crooked Fork, Walton, Shotgun, Fishing (Squaw), Legendary Bear (Papoose), Post Office, Warm Springs, Lake, Split, Stanley, Boulder, Old Man, Fish, Hungery, Deadman, and Pete King creeks.

The primary land managers within the core area are the Clearwater National Forest and Plum Creek Timber Company, whose ownership includes 16,592 hectares (41,000 acres) in the upper Lochsa River watershed (USFS 1999a). Approximately 60 percent of the core area is within designated Wilderness and Roadless areas. The main stem Lochsa River is designated as a Wild and Scenic River, and as such is protected from alterations to maintain its free-flowing and scenic characteristics. The area influenced by the wild and scenic river designation is the water body itself and generally 0.4 kilometer (one-quarter mile) on either side of the river.

Stream flows follow a pattern of low flows during the late summer and fall months and high flows in the spring and early summer months (USFS 1999a).

Peak discharge generally occurs in late May, averaging approximately 297 cubic meters per second (10,500 cubic feet per second) in the lower Lochsa River.

Twelve stream segments within the core area are listed as Water Quality Limited under section 303(d) of the Clean Water Act (CBBTTAT 1998b) (See Appendix A).

Fish Lake (Lochsa River) core area. The Fish Lake (Lochsa River) core area is located in Idaho County on Federal lands managed by the Clearwater National Forest. The core area encompasses the lake basin and upper outlet stream and is approximately 2,132 hectares (5,267 acres). The lake has a surface area of approximately 22 hectares (54 acres), and is located at an elevation of 1,716 meters (5,628 feet) (Bahls 1992).

Fish Lake is a large, oligotrophic mountain lake that is located within the Selway-Bitterroot Wilderness of the Clearwater National Forest. The lake is located in the Lake Creek watershed, which drains from the south side of the middle reaches of the Lochsa River. This large, glacial valley lake is situated in a glacial trough with prominent ridges on the south and west. The lake has a maximum depth of 12 meters (39 feet). The lake has two inlets and one outlet. Both inlets enter the lake on the western shoreline, with the outlet draining the eastern end of the lake. The outlet is the headwaters of Fish Lake Creek, which becomes Lake Creek at its confluence with Sponge Creek. Lake Creek meets the Lochsa River approximately 21 kilometers (13 miles) downstream. There is a back-country airstrip in the meadow on the west end of the lake. The surrounding lakeshore canopy is dominated by subalpine fir.

Selway River core area. The Selway River core area is located in Idaho and Clearwater counties and includes the Selway River and all its tributaries upstream of the confluence of the Selway and the Lochsa Rivers. The core area encompasses approximately 520,242 hectares (1,285,516 acres), the majority of which occurs in the Selway-Bitterroot and Frank Church-River of No Return Wilderness (USFS 1999d). Approximately 76 percent (395,791 hectares or 978,000 acres) of the Selway River core area is within the Selway-Bitterroot

Wilderness, and approximately 9 percent (47,365 hectares or 117,040 acres) is within the Frank Church-River of No Return Wilderness (USFS 2001). The Selway River originates in the Bitterroot Mountains on the Idaho-Montana border at an elevation of 2,778 meters (9,110 feet), and joins the Lochsa at Lowell, Idaho, at an elevation of 448 meters (1,469 feet) to form the Middle Fork Clearwater River. Major tributaries to the Selway River include: Moose Creek, Bear Creek, Whitecap Creek, Running Creek, Three Links Creek, Marten Creek, Gedney Creek, O'Hara Creek, and Meadow Creek (USFS 1999d).

Virtually all (99 percent) of the Selway River core area is administered by the U.S. Forest Service, which includes the Nez Perce, Bitterroot, and Clearwater National Forests (USFS 1999d). The Selway River is designated as a Wild and Scenic River, and as such is protected from alterations to maintain its free-flowing and scenic characteristics. Eighty-seven kilometers (54 miles) of the Selway River between Race Creek and Paradise Guard Station are designated as Wild and Scenic, and 50 kilometers (31 miles) of the Selway River between Lowell and Race Creek and between Paradise and Magruder Guard Stations are designated as Recreational (USFS 2001).

The Selway River is 159 kilometers (99 miles) in length (USFS 1999d). Mean annual discharge, measured at the mouth of O'Hara Creek USGS gauging station, for the Selway River was estimated at 107 cubic meters per second (3,765 cubic feet per second). Minimum average monthly flows have been estimated to be 22 cubic meters per second (766 cubic feet per second) in September and maximum average monthly flows of 383 cubic meters per second (13,540 cubic feet per second) in May (USFS 1999d). Selway Falls, located approximately 29 kilometers (18 miles) from the mouth of the Selway River, consists of a severe drop in gradient with very large boulders that disrupt the flow of the river (USFS 1999d). The falls likely impedes upstream migration of bull trout under some extreme high and low flow conditions (USFS 1999d).

The State of Idaho classified three tributaries of the Selway River as Water Quality Limited Segments under section 303(d) of the Clean Water Act (CBBTTAT 1998b) (See Appendix A).

Lower and Middle Fork Clearwater River core area. This core area includes the Middle Fork and mainstem Clearwater Rivers and encompasses approximately 660,024 hectares (1,630,919 acres). The Middle Fork Clearwater River is formed at the confluence of the Selway and Lochsa Rivers near Lowell, Idaho. It flows in a westerly direction for 37 kilometers (23 miles) until it joins the South Fork of the Clearwater River near Kooskia, Idaho. At this point the river is locally known as the mainstem or lower Clearwater River (CSS 2001) and continues its westerly and northwesterly flow to the town of Ahsahka, where it is joined by the North Fork of the Clearwater River. The Clearwater River then joins the Snake River at Lewiston, Idaho, 120 kilometers (75 miles) from its source (U.S. Bureau of Land Management (BLM) 2000). Major tributaries within this core area include: Lapwai Creek, Potlatch River, Cottonwood Creek, Bedrock Creek, Big Canyon Creek, Orofino Creek, Jim Ford Creek, Lolo Creek, Lawyer Creek, Clear Creek, Maggie Creek, Big Horse Creek, and Smith Creek.

The Middle Fork Clearwater River is located in Idaho County. The lower Clearwater River is located in Nez Perce, Latah, Lewis, and Clearwater counties. The lower Clearwater River includes the lower Clearwater River and all its tributaries from the confluence of the South and Middle Fork of the Clearwater River near Kooskia, downstream to its confluence with the Snake River at Lewiston (CBBTTAT 1998c). Elevations along the Middle Fork range from 375 meters (1,230 feet) at the mouth to 2,012 meters (6,600 feet) at the headwaters of Lolo Creek. Elevations along the lower Clearwater River range from 216 meters (710 feet) at the confluence of the Snake and Clearwater Rivers to 1,844 meters (6,050 feet) at the headwaters of Lolo Creek. The vast majority of the core area lies below 1,220 meters (4,000 feet) in elevation, making it subject to mixed winter precipitation and the possibility of rain-on-snow events (BLM 2000). The change in elevation follows a change in topography from west to east, progressing from plateau to moderately sloped foothills, which are primarily agricultural, to higher elevation forested mountainous terrain.

Land ownership in the Middle Fork portion of the core area consists of federally-owned lands managed by the U.S. Forest Service, interspersed with private holdings along the river corridor, State lands, and Nez Perce Tribal lands.

The entire 37 kilometers (23 miles) of the Middle Fork Clearwater River is designated as a Recreational River segment under the National Wild and Scenic River System, and as such is protected from alterations to maintain its free-flowing and scenic characteristics (USFS 2001). Land ownership within the lower Clearwater River portion of the core area is mainly private ownership with land uses including: agriculture, timber harvest, livestock grazing, recreation, roads, urban development, and residences (CBBTTAT 1998c). Potlatch Corporation, a private timber company, has significant holdings in the upper Potlatch and Lolo Creek watersheds. Public lands are limited to blocks of U.S. Forest Service land in the upper Potlatch and Lolo Creek watersheds, and isolated parcels of Bureau of Land Management land. Portions of the core area also fall within the boundaries of the Nez Perce Indian Reservation.

Idaho Department of Fish and Game and the Nez Perce Tribe have fishery management responsibilities within the core area. The municipalities in the core area include the cities of Lewiston, Peck, Kendrick, Julietta, Lapwai, Orofino, Kamiah, Kooskia, and Lowell. All are located directly adjacent to creeks or rivers within the core area (CBBTTAT 1998c).

Annual mean flow is 427 cubic meters per second (15,090 cubic feet per second) as measured at the Spalding gauge near its mouth (CSS 2001). Stream flows follow a pattern of low flows during the late summer and fall months and high flows in late May and June. Peak discharge generally occurs in late May with an average maximum monthly mean of 1,432 cubic meters per second (50,570 cubic feet per second) (BLM 2000). October is generally the lowest flow month, with an average discharge of 45 cubic meters per second (1,577 cubic feet per second) (BLM 2000).

Thirty-eight stream segments and one lake in the Lower and Middle Fork Clearwater River core area are listed as Water Quality Limited under section 303(d) of the Clean Water Act (CBBTTAT 1998c) (See Appendix A).

DISTRIBUTION AND ABUNDANCE

Status of Bull Trout at the Time of Listing

In the final listing rule, June 10, 1998, (63 FR 31647), the U.S. Fish and Wildlife Service identified three bull trout subpopulations in the Clearwater River basin: (1) North Fork Clearwater River, (2) upper Clearwater River, and (3) Shotgun Creek. Each subpopulation can be made up of one to several local populations. Although subpopulations were an appropriate unit upon which to base the 1998 listing decision, the recovery plan has revised the biological terminology to better reflect the current understanding of bull trout life history and conservation biology theory. Therefore, subpopulation terms will not be used in this chapter.

Current Distribution and Abundance

Bull trout are distributed throughout most of the large rivers and associated tributary systems within the Clearwater River Recovery Unit (CSS 2001). Bull trout exhibit adfluvial, fluvial, and resident life history patterns within the Clearwater River Recovery Unit. Fluvial and resident bull trout populations have been commonly documented throughout the current range of bull trout in the Clearwater River Recovery Unit (USFS 1999c, 1999d). There are two naturally adfluvial bull trout populations within the Clearwater River Recovery Unit; one is associated with Fish Lake in the upper North Fork Clearwater River drainage, and the other is associated with Fish Lake in the Lochsa River drainage (CBBTTAT 1998a,CBBTTAT 1998b).

There are no data to confidently estimate bull trout abundance for the entire recovery unit. However, selected sites have been sampled and density estimates made (CBBTTAT 1998a). Redd counts have also been conducted since the mid-1990s in Fishing (Squaw) and Legendary Bear (Papoose) creeks (CBBTTAT 1998b) and since 1999 in selected reaches of Newsome Creek and the East Fork of American River (NPNF, *in litt.* 2001a). It is important to note that current data on distribution and abundance in the Clearwater River Recovery

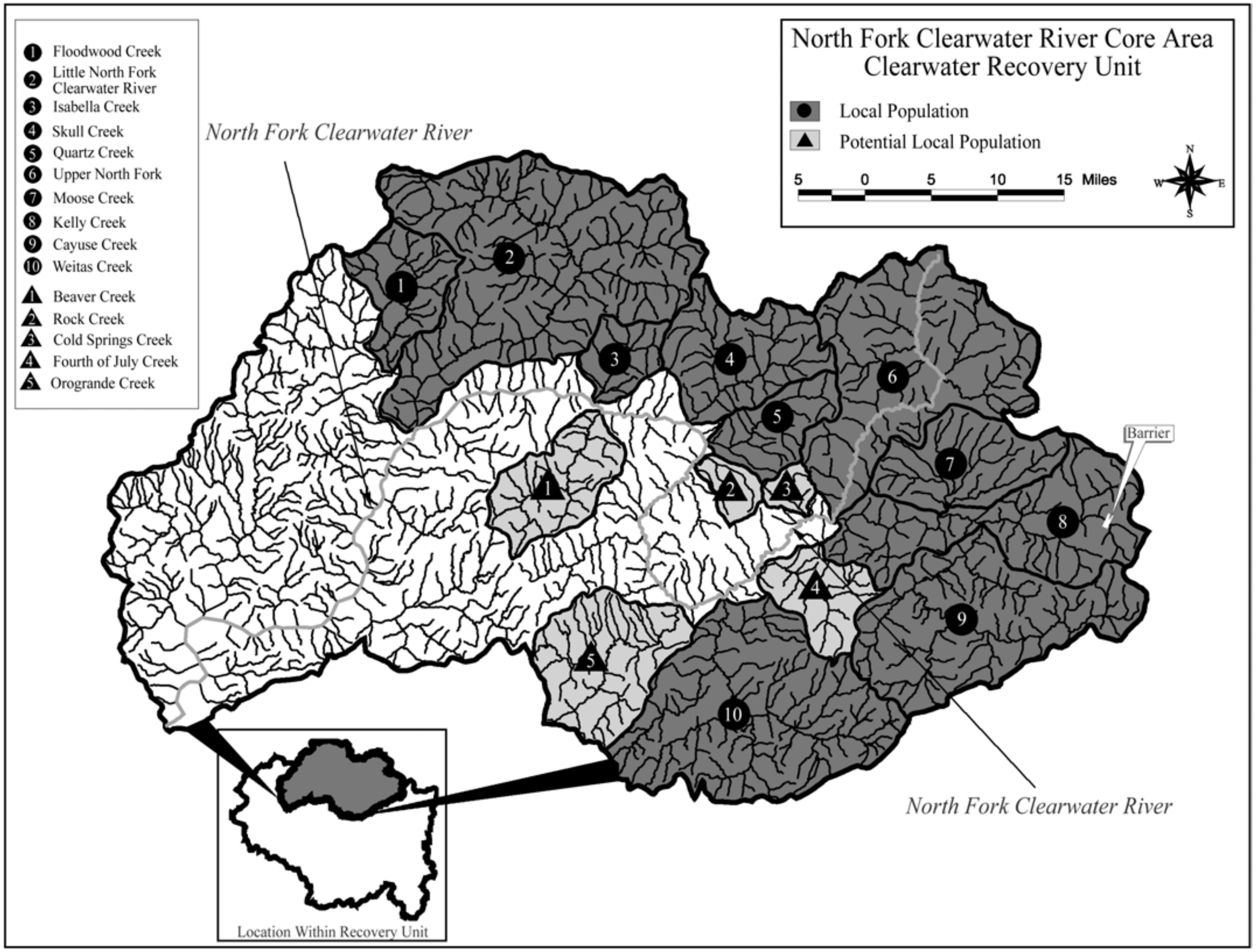
Unit is limited and not representative of a consistent sampling scheme across the area. Sources of data include historical reports, incidental bull trout counts obtained during stream habitat surveys, creel survey data, redd count data, and limited survey data obtained through bull trout sampling methodologies. It is likely that distribution and abundance is underestimated, and that some spawning and rearing areas have not been located and thus have been omitted.

The Clearwater River Recovery Unit consists of 7 core areas, with a total of 45 local populations distributed among the core areas. The recovery team also identified 27 potential local populations for some core areas. A potential local population is a local population (a group of bull trout that spawns within a particular stream or portion of a stream system) that does not currently exist, but which might exist and contribute to recovery in a known or suspected unoccupied area, if spawning and rearing habitat or connectivity is restored in that area.

North Fork Clearwater River core area. Bull trout are currently known to use spawning and rearing habitat in at least 11 streams or stream complexes (*i.e.*, local populations). These local populations include Upper North Fork Clearwater River, Kelly Creek, Cayuse Creek, Moose Creek, Fourth of July Creek, Weitas Creek, Quartz Creek, Skull Creek, Isabella Creek, Little North Fork Clearwater River, and Floodwood Creek. Potential local populations include Cold Springs Creek, Rock Creek, Orogrande Creek, and Beaver Creek (Figure 3). Density estimates for several sites throughout the North Fork Clearwater River surveyed 1990 through 1997 were 0 to 6.4 bull trout per 100 square meters (CBBTTAT 1998a). Redd counts during 1994 to 1997 at 5 to 7 sites were 0 to 7 redds per site (Appendices A, C, D and CBBTTAT 1998a).

Dworshak Dam, near the confluence of the North Fork Clearwater River with the main Clearwater River, has isolated bull trout from fish in the remainder of the Clearwater River since the dam was completed in 1971. Prior to the construction of the dam, bull trout likely migrated into the mainstem Clearwater

Figure 3. North Fork Clearwater River Core Area for Bull Trout.



River to overwinter, and mixed with other adults from the Lochsa, Selway, and South Fork Clearwater River core areas (USFS 2000). Although bull trout are widely distributed throughout the North Fork Clearwater core area, bull trout are currently considered depressed compared to their historic distribution and abundance in most of the tributaries of the North Fork Clearwater drainage (USFS 2000, CSS 2001).

Bull trout also occupy Dworshak Reservoir and use it as rearing habitat for subadult and adult fish (CBBTTAT 1998a, CSS 2001). Idaho Department of Fish and Game has radio-tagged bull trout captured in Dworshak Reservoir and documented their spawning migration into headwater tributaries of the North Fork Clearwater River and their return to the reservoir for overwintering (Cochnauer *et al*. 2001). Size of spawning bull trout in some tributaries of the North Fork Clearwater River suggests that some bull trout spend extensive amounts of time feeding in the reservoir (CSS 2001). Bull trout have also been documented using lower Butte and lower Freeman creeks, tributaries of the reservoir (CBBTTAT 1998a). Dworshak Reservoir constitutes a unique and important habitat for bull trout since it supports significant subadult and adult rearing, and it has a major role in nutrient cycling in the core area.

The upper Little North Fork Clearwater River has documented spawning and rearing bull trout populations in Lund, Little Lost Lake, Lost Lake, upper Little North Fork (Lund and Lost Lake Sub-watershed), Rutledge (Twin to Durham sub-watershed), Adair, Jungle (Adair/Rocky Run sub-watershed), and Montana (Butte to Culdesac sub-watershed) creeks (CBBTTAT 1998a). These populations, if conserved and restored, could provide stock for nearby unoccupied streams. Redd counts by Idaho Department of Fish and Game in Lund Creek, Little Lost Lake Creek, Lost Lake Creek, Rocket Creek, and the upper Little North Fork Clearwater River (Lund and Lost Lake sub-watershed) since 1994 indicate fish densities are relatively low, with 10 redds counted in 1996 and 6 redds in 1997 (Appendix C in CBBTTAT 1998a).

The middle reaches of the Little North Fork Clearwater River (Crescendo Creek to Canyon Creek) are relatively unroaded and pristine. This reach includes the Mallard Larkins Pioneer Area. Spawning and rearing is only currently known to occur in Butte Creek (D. Schiff, IDFG, pers. comm. 2002), however, few fish surveys (presence/absence) have occurred and these were not intensive. Historic spawning and rearing likely occurred in Sawtooth Creek as well as Canyon Creek, and both streams provide suitable habitat to support bull trout (CBBTTAT 1998a). Historic literature documents bull trout presence in Spotted Lewis, Foehl, and Cedar creeks and also indicates there is an impassable fish barrier in the lower third of Foehl Creek which would prevent migratory bull trout from colonizing the upper portion of the drainage (USFS 1935, CBBTTAT 1998a). Bull trout have been documented using the Little North Fork River as a migratory corridor. Juveniles, 120 to180 millimeters (5 to 7 inches) in length, have been sampled from the main river during electrofishing surveys, suggesting the river is used for summer and overwinter rearing. Fish survey data for the mainstem Little North Fork from Bear Creek to Sawtooth Creek in 1988 reported bull trout densities of 0.06 per 100 square meters, and 0.02 per 100 square meters in 1990 (CBBTTAT 1998a).

Upper Floodwood Creek is the only stream in the Breakfast Creek drainage that has a documented spawning and rearing bull trout population. Protection of this population is essential so that successful reestablishment of bull trout populations can occur in other tributaries within the Breakfast Creek drainage (CBBTTAT 1998a). The upper portion of West Fork Floodwood Creek has stream conditions similar to upper Floodwood Creek and is suspected to have a spawning and rearing population of bull trout (CBBTTAT 1998a). However, no fish surveys have been conducted in this stream reach. Subadult and adult rearing occurs in lower Floodwood, lower Breakfast, and lower Stoney creeks, and is suspected to occur in lower West Fork Floodwood Creek (CBBTTAT 1998a; D. Schiff, pers. comm. 2002). Historic records indicate bull trout occurred in Isabella and Glover creeks of the Stoney Creek watershed (USFS 1935).

The mainstem portion of the North Fork Clearwater River from Dworshak reservoir slack water upstream to the confluence with Kelly Creek is important habitat for subadult and adult rearing and migration (CBBTTAT 1998a). Current bull trout densities in this area are low (less than 0.5 fish per 100 square meters)

(CBBTTAT 1998a). Bull trout use the lower reaches of many tributaries of the North Fork of the Clearwater as essential habitat for thermal refuge during high water temperatures in summer. Current (since 1985) spawning and rearing is known to occur in Isabella, Skull, Collins, Frost, Quartz, Weitas, Windy, Johnny, and Fourth of July creeks (CBBTTAT 1998a; D. Weigel, USBOR, pers. comm. 2002; E. Key, USFS, pers. comm. 2002). Spawning and rearing is suspected in the following streams based on available suitable habitat, but surveys have not been conducted to date: Fro, Johnagan, and Corral creeks in the Weitas Creek watershed, and Shot and Bill creeks in the Fourth of July watershed (P. Murphy, USFS, pers. comm. 2002). Subadult and adult rearing occurs in the North Fork Clearwater River, Isabella, Sneak (at the mouth), Quartz, lower Washington, Rock, lower Lightning, Weitas, Little Weitas, Liz, and Fourth of July creeks, as documented during surveys conducted by the U.S. Forest Service, Idaho Department of Fish and Game, and Idaho Department of Environmental Quality (CBBTTAT 1998a, Platts *et al.* 1993; C. Huntington, Clearwater BioStudies, pers. comm. 2002; D. Weigel, pers. comm. 2002; E. Key, pers. comm. 2002). The mainstem of Weitas Creek is considered important for subadult and adult rearing and migration. U.S. Forest Service stream surveys in 1993 documented bull trout in Beaver Creek and subsequent surveys by Potlatch Corporation failed to locate any bull trout, however, recent research by Idaho Department of Fish and Game documented radio-tagged bull trout in the lower two miles of Beaver Creek (CBBTTAT 1998a; T. Cundy, *in litt.* 1998; D. Schiff, pers. comm. 2002).

Historically, bull trout are suspected to have used most tributaries of the mainstem North Fork Clearwater River for spawning and rearing (CBBTTAT 1998a). Early-rearing bull trout were documented in Beaver, Skull, Collins, Quartz, Isabella, Middle, and Weitas creeks (F. A. Espinosa and T. Bjornn, *in litt.* 1981). Early-rearing bull trout were documented in Rock, Larson, Death, Trail, Fisher, Cold Spring, Little Washington, Skull, Beaver, and Weitas Creek tributaries (Windy, Liz , Little Weitas, Middle, and Hemlock creeks) (F. A. Espinosa, U.S. Forest Service, pers. comm. 1998). Historic fish survey data collected during August and September 1983, recorded bull trout densities in Beaver Creek of 0.63 per 100 square meters and 0.74 per 100 square meters, 0.72 per 100 square meters in Isabella Creek, 0.24 per 100 square meters and 0.11 per

100 square meters in Skull Creek, and 2.5 per 100 square meters in Quartz Creek (Moffitt and Bjornn, 1984).

The North Fork Clearwater River mainstem between Lake and Kelly creeks is considered an important subadult and adult rearing area (CBBTTAT 1998a). Portions of Moose Creek and Kelly Creek currently support spawning and early-rearing. Subadult and adult rearing occurs in Hidden, Elizabeth, Pete Ott, Cayuse, and Kelly Creek downstream of the North Fork of Kelly Creek (CBBTTAT 1998a, Platts *et al.* 1993). Bull trout surveys have found adult bull trout in the Moose Creek drainage (Osier, Little Moose, and lower Moose creeks), and early-rearing bull trout in upper Moose (upstream of Independence Creek), Little Moose, and Ruby creeks (CBBTTAT 1998a, Clearwater BioStudies 1991; D. Weigel, pers. comm. 2002). Spawning and rearing is known to occur in lower Swamp Creek and is suspected to occur in upper Swamp and Pollock creeks due to habitat suitability, although bull trout surveys have not been conducted in the latter two areas (C. Huntington, pers. comm. 2002). Densities are low in the Moose Creek local population. Bull trout were present in one third of the sites sampled with densities less than 0.2 trout per 100 square meters (densities less than 0.5 trout per 100 square meters usually represent one fish observed).

Adult bull trout have been observed in Kelly Creek and this mainstem is used for subadult and adult rearing (CBBTTAT 1998a). Spawning and rearing has been documented in the North and South Forks of Kelly, Kid Lake, and Bear creeks (CBBTTAT 1998a; P. Murphy, pers. comm 2002; D. Weigel, pers. comm. 2002). Densities of bull trout in the North Fork and South Fork of Kelly Creek were 1.3 and 0.2 trout per 100 square meters, respectively (D. Weigel, *in litt.* 1998b). Spawning and rearing is suspected to occur in Junction and Barnard creeks due to habitat suitability (P. Murphy, pers. comm. 2002). Recent surveys for bull trout have not been conducted in Cayuse Creek. Available data cannot distinguish between bull trout use of Cayuse Creek for spawning and rearing or for subadult and adult rearing. (CBBTTAT 1998a). However, based on historic occurrence data and current habitat suitability, spawning and rearing is suspected in upper Cayuse, Silver, Howard, Weasel, and Mink creeks (P. Murphy, pers. comm. 2002).

Historically, subadult and adult rearing bull trout have been documented in 0mainstem Kelly (Johnson 1977); North, South and Middle Forks of Kelly; Toboggan, Monroe, Cayuse, Gravey, and Silver and Pete Ott creeks (F. A. Espinosa, pers. comm., 1998). Kelly Creek and Cayuse Creek mainstems have been utilized by subadult and adult rearing bull trout (F. A. Espinosa and T. Bjornn, *in litt.* 1981, Johnson 1977). Juvenile and staging bull trout were observed in upper Cayuse and Silver creeks (F. A. Espinosa, pers. comm., 1998). The North, South, and Middle Forks of Kelly Creek, Toboggan, Monroe, Gravey, Hidden, Elizabeth, and Deception Gulch creeks are suspected to be historic spawning and rearing streams (F. A. Espinosa, pers. comm., 1998). Recent surveys have not found bull trout in Monroe, Middle Fork of Kelly, Toboggan, or Cayuse creeks (CBBTTAT 1998a).

The upper North Fork Clearwater River (Lake Creek and upstream) supports the most extensive spawning and rearing bull trout populations and habitat in the core area (CBBTTAT 1998a). Bull trout were sampled in the upper reaches of tributary streams, with the highest densities occurring in Boundary Creek. However, high density areas are localized, and U.S. Forest Service stream surveys indicate that spawning and wintering habitat is limited. Redd counts in Placer and Vanderbilt creeks in 1994 to1997 ranged from one to four redds per year (CBBTTAT 1998a). Current (since 1985) spawning and rearing is known to occur in the North Fork Clearwater above Meadow Creek, Graves, Vanderbilt, Chamberlain, Bostonian, Niagra, Boundary, Long, Slate, Short, Rawhide, Lake, and Goose creeks. Subadult and adult rearing occurs in the North Fork Clearwater River, and Meadow Creek (CBBTTAT 1998a). Historically, the North Fork Clearwater headwaters (upstream of Meadow Creek), Meadow, Vanderbilt, Bostonian, Niagra, Boundary, Long, and Short creeks were known to have supported subadult and adult rearing bull trout (F. A. Espinosa, pers. comm., 1998). These creeks are suspected to have supported historic spawning and rearing bull trout populations.

The mainstem portion of the North Fork Clearwater River from Dworshak reservoir slack water upstream to the headwaters is important habitat for subadult and adult rearing and migration (CBBTTAT 1998a). Bull trout use the lower reaches of multiple tributaries along the North Fork of the Clearwater River as essential habitat for thermal refuge during high water temperatures in summer.

Fish Lake (North Fork Clearwater River) core area. Fish Lake contains the only naturally adfluvial bull trout population known in the North Fork Clearwater River basin. This core area contains one local population (Figure 4). Prior to the listing of bull trout there was limited information on the population within Fish Lake. Fish Lake supported a bull trout sport harvest prior to closure in 1995. Limited annual angler creel information describing catch-per-unit effort data dates back to 1973, but this data is restricted to the opening week or weekend only. In 1996, a four-hour gillnet survey conducted by Idaho Department of Fish and Game generated a catch-per-unit effort estimate of 2.5 bull trout per hour of set gillnet. Electrofishing and snorkel surveys have found age 1 bull trout in several tributaries of Fish Lake. Bull trout in Fish Lake are considered healthy based on creel data (T. Cochnauer, Idaho Department of Fish and Game, pers. comm.1998), although there is no current population estimate.

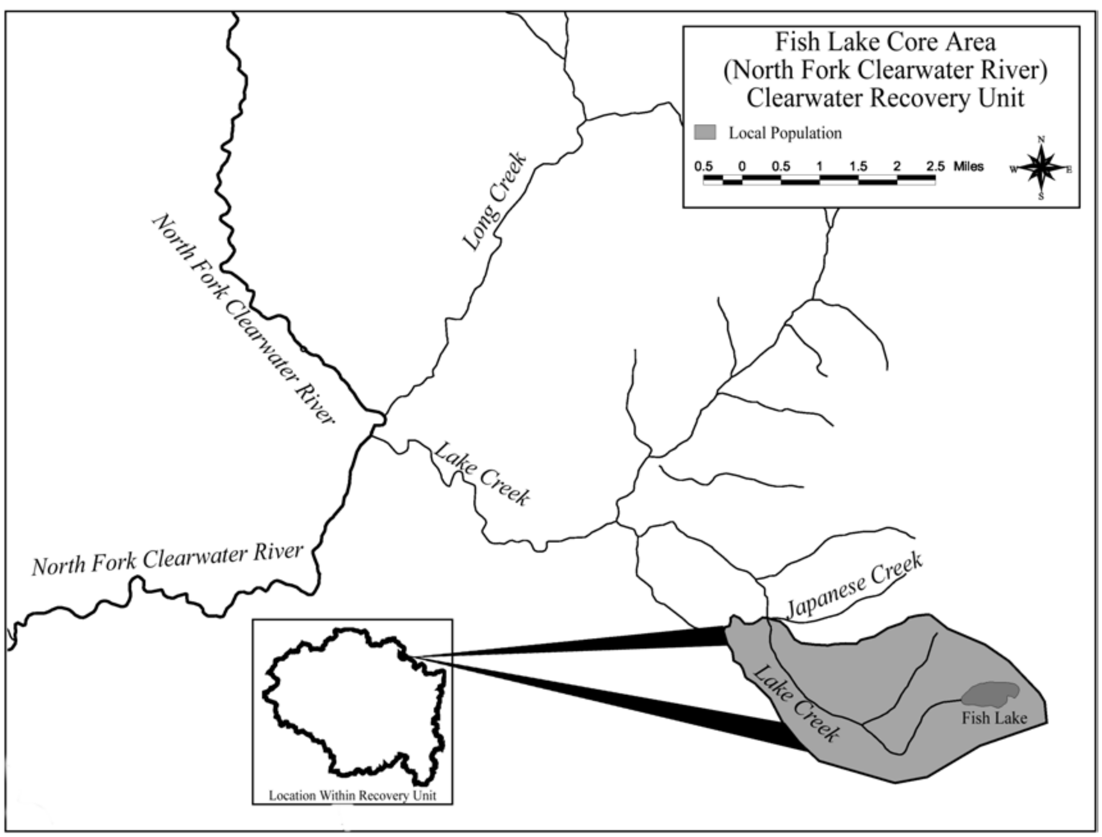
Idaho Department of Fish and Game and the Clearwater National Forest initiated a study of the bull trout population in Fish Lake when the species was listed. Research was conducted during the summer and fall of 2000 and 2001. The objectives were to determine if the population is isolated, estimate the population size within the lake, and determine the impact of incidental hooking mortality. Eighty-seven bull trout were captured and tagged. Findings indicate that Fish Lake bull trout do not appear to spawn in Lake Creek, and they likely spawn in the inlet streams. A population of fluvial bull trout from the North Fork Clearwater River spawn in Lake Creek and

juveniles have been observed and captured. Due to timing of migration by fluvial bulltrout, natural barriers may prevent genetic exchange between these populations except for individual bull trout that are flushed from Fish Lake. However, these barriers do not eliminate all resident or fluvial bull trout from migrating into Fish Lake during spring or high water flow events when migration barriers may be bypassed

(IDFG, *in litt.* 2001). Field data from 2001 has not been analyzed to date to provide a population estimate within Fish Lake.

South Fork Clearwater River core area. This core area has the most comprehensive data for bull trout within the Clearwater River Recovery Unit due to a multi-year study by the Idaho Department of Fish and Game which documented juvenile distribution in most tributaries and headwater streams (IDFG 2001a). Bull trout are currently known to use spawning and rearing habitat in five stream complexes within the South Fork Clearwater (*i.e.*, local populations). These local populations include Red River (including Upper and West Fork of South Fork Red River), Crooked River, Newsome Creek, Tenmile Creek, and Johns Creek. Potential local populations include American River, Meadow Creek, and Mill Creek (Figure 5). The current abundance and distribution of bull trout in the core area is considered

Figure 4. Fish Lake (North Fork Clearwater) Core Area for Bull Trout.

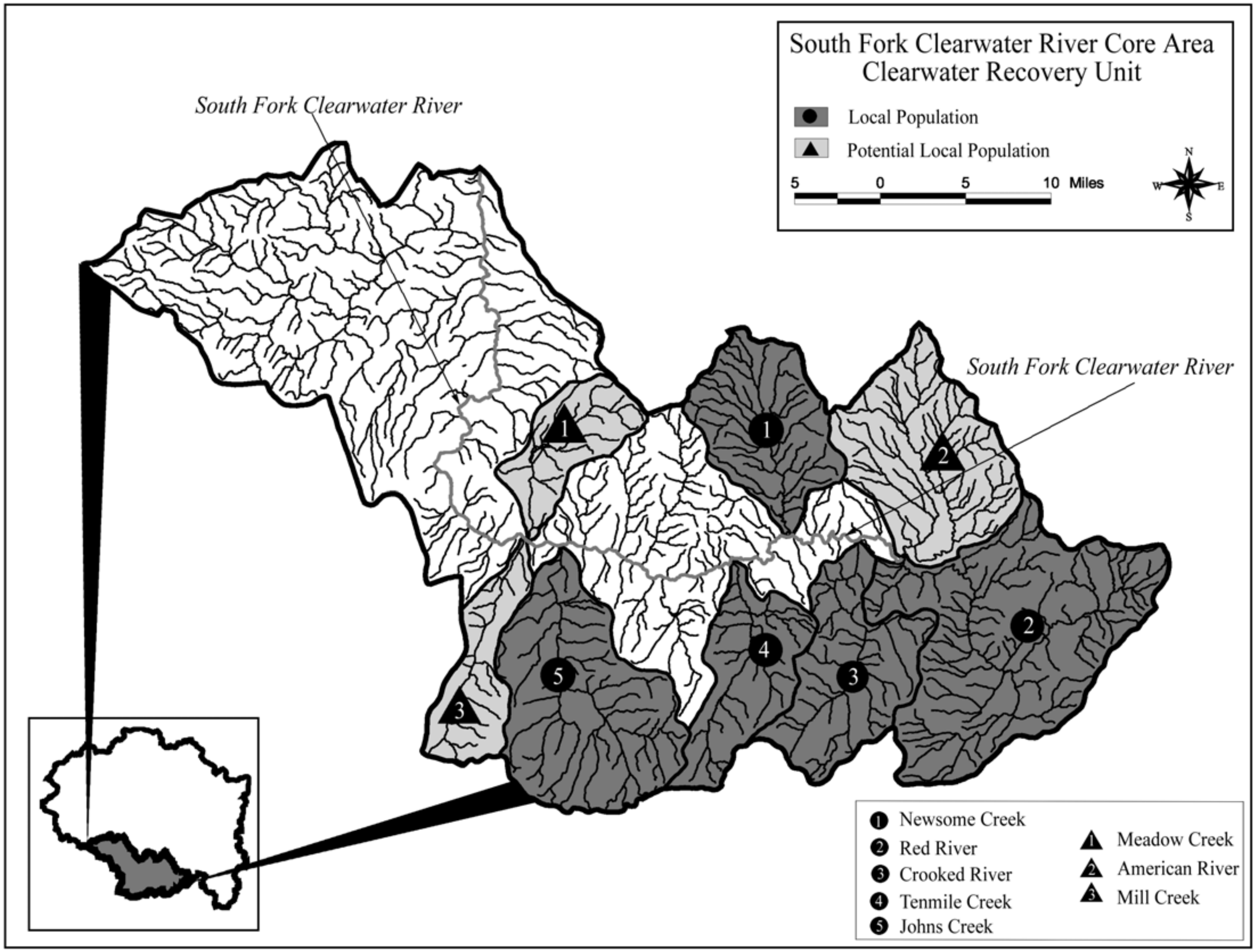


lower than historic levels, with extremely low incidence of fluvial migratory adults (USFS 1999c).

Red River historically provided highly productive habitat for bull trout in the mid to upper reaches (CBBTTAT 1998d). A survey conducted by Idaho Department of Fish and Game in 1993 measured 0.75 bull trout per 100 meters in the Red River watershed (CBBTTAT 1998d). Surveys of the South Fork Red River in 1995 indicated densities of 0.15 and 0.08 bull trout per 100 square meters in the West Fork of the South Fork and the Middle Fork Red River, respectively. A survey of Red River tributaries in 1997 documented a single bull trout in each of five streams (Olson and Brostrom 1997). Surveys conducted by the U.S. Forest Service in 2000 and 2001 located three bull trout in the upper end of the South Fork Red River. Additional U.S. Forest Service surveys in 2001 located a previously unknown concentration of bull trout in the Red River watershed by sampling 43 bull trout 35 to 280 millimeters (1.4 to 11 inches) in length from an 800 meter (2,625 feet) section of the West Fork of the South Fork (NPNF, *in litt.* 2001b). Current (since 1985) spawning and rearing is known to occur in upper and mainstem Red River, lower and upper South Fork Red River, Middle and West Fork of the South Fork Red River, Moose Butte, Dawson, Baston, Bridge, and Trapper creeks. Spawning and rearing is suspected to occur in Otterson Creek. Subadult and adult rearing occurs in lower Red River, Ditch, Soda, lower Siegel, and lower Little Moose creeks (CBBTTAT 1998d, IDFG 2001a, J.D. Mays, USFS, pers. comm. 2002).

The American River watershed was historically important for bull trout and likely supported a robust spawning and rearing bull trout population (S. Russell, USFS, pers. comm. 2002). The East Fork American River currently provides suitable habitat, but surveys have not documented spawning and rearing to date (CBBTTAT 1998d). Redd surveys conducted in the East Fork American River and Flint Creek by the U.S. Forest Service have located no bull trout redds (NPNF, *in litt.* 2001a). Low number of bull trout were observed in the mainstem American River, East Fork American River, and lower Kirks Fork during surveys conducted by Idaho Department of Fish and Game and the U.S. Forest Service in 1996 through 1999. Observations consisted of sporadic sightings of adults during snorkeling surveys and at the Idaho Department of Fish and Game fish trap on lower American River. The Bureau of

Figure 5. South Fork Clearwater River Core Area for Bull Trout.



Land Management surveys have also documented bull trout in the American River and the East Fork of the American River with first reported occurrences in 1977 and more recent sightings (C. Johnson, Bureau of Land Management, pers. comm. 2002). Migratory bull trout are thought to be present in low abundance (CBBTTAT 1998d). Bull trout habitat potential in this watershed is rated high, with the higher order channels in the lower watershed constituting important subadult/adult rearing habitat (USFS 1999c). Current (since 1985) spawning and rearing by low numbers of bull trout may occur in West and East Forks of the American River, and Lick Creek. Subadult and adult rearing by low numbers of bull trout occurs in the mainstem and lower American River and Kirks Fork (CBBTTAT 1998d).

In the Crooked River watershed, 24 bull trout were documented by surveys conducted by Idaho Department of Fish and Game in 1993, which equated to 0.89 bull trout per 100 meters (CBBTTAT 1998d). A total of 34 adult migratory bull trout were collected at a weir targeting chinook salmon in Crooked River during June to August 1997 (Olson and Brostrom 1997). Bull trout captured at the weir in 1998 were radio-tagged and tracked over 25 miles as they migrated from the middle reach of the mainstem South Fork Clearwater River to spawn in Crooked River. Recapture data from passive integrated transponder (PIT)-tagged juveniles shows movement within and between tributaries in the South Fork core area (IDFG 2001a). The weir information in conjunction with Idaho Department of Fish and Game and U.S. Forest Service observations of bull trout greater than 300 millimeters in length (12 inches) suggests that Crooked River likely harbors the greatest numbers of migratory bull trout in the South Fork Clearwater River watershed (CBBTTAT 1998d). Current (since 1985) spawning and rearing is known to occur in the middle and upper Crooked River, West Fork and East Fork Crooked River, and Relief Creek. Subadult and adult rearing occurs in lower Crooked River (CBBTTAT 1998d, IDFG 2001a, J.D. Mays, pers. comm. 2002).

In the Newsome Creek watershed, bull trout were observed during stream surveys conducted by Idaho of Department of Fish and Game during 1993 to 1995 (CBBTTAT 1998d). Thirty-four bull trout were observed in 1993, which equated to 0.19 to 2.65 bull trout per 100 meters for surveys during the 3-year period. A 203 millimeter (8 inch) bull trout was observed in upper Newsome Creek during a 1998 angling survey. In 1998, the U.S. Forest Service documented a previously unknown concentration of bull trout in a Newsome Creek tributary; 21 bull trout were sampled within 800 meters (2,625 feet) of stream. Bull trout in Newsome Creek appear to be primarily resident fish and migratory bull trout are thought to be in low abundance. Redd surveys conducted by the U.S. Forest Service since 1999 have located only two redds in upper Newsome Creek from Radcliffe Creek upstream approximately 1,500 meters (4,920 feet) including two tributaries (NPNF, *in litt.* 2001c). Current (since 1985) spawning and rearing is known to occur in upper Newsome, Pilot, and Baldy creeks, and is suspected to occur in Beaver Creek. Subadult and adult rearing occurs in lower Newsome, Mule, and Bear creeks (CBBTTAT 1998d, IDFG 2001a).

In the Tenmile Creek watershed, snorkel surveys conducted by Idaho Department of Fish and Game for monitoring anadromous fish parr during 1986 to 1997 detected 0.10 to 1.09 bull trout per 100 meters (CBBTTAT 1998d). The average density of fish throughout the watershed in 1997 was 1.49 bull trout per 100 square meters (IDFG 1986-1997). U.S. Forest Service fall 2000 surveys of Sixmile Creek (tributary of Tenmile Creek) detected two bull trout just below a barrier falls. This was the first recorded occurrence for this stream. Current (since 1985) spawning and rearing is known to occur in Tenmile and lower Wiseboy creeks (CBBTTAT 1998d, Spangler 1997). Subadult and adult rearing occurs in lower Tenmile and Sixmile creeks (CBBTTAT 1998d). This population is thought to be primarily migratory with a less significant resident component (CBBTTAT 1998d).

In the Johns Creek watershed, bull trout were observed in six annual stream surveys conducted by Idaho of Department of Fish and Game from 1986 to 1997 (CBBTTAT 1998d). Surveys detected 0.18 to 1.14 bull trout per 100 meters at various sites for the six years that bull trout were observed. Moores Creek (tributary of Johns Creek) had 0.44 to 2.38 bull trout per 100 meters during the same survey period. Current (since 1985) spawning and rearing is known to occur in upper Johns, Moores, Moores Lake, Gospel, Taylor, Hagen, and Open creeks (CBBTTAT 1998d, Spangler 1997). Subadult and adult rearing occurs in middle and lower Johns Creek. Bull trout are primarily resident with migratory fish likely in low abundance (CBBTTAT 1998d).

Adult and rearing bull trout have been documented sporadically in Meadow and Mill creeks. Habitat has been degraded in both creeks due to management activities. Mill and Merton creeks are used for subadult and adult rearing (CBBTTAT 1998d; W. Paradis, USFS, pers. comm. 2002). Mill Creek has better habitat potential than Meadow Creek, and has a higher potential to support a local population of bull trout (S. Russell, pers. comm. 2002). Meadow Creek likely never supported a strong population of bull trout because of low quality bull trout habitat (S. Russell, pers. comm. 2002). Twentymile Creek is used for subadult and adult rearing (USFS 1999c). The mainstem South Fork River provides subadult and adult rearing habitat and foraging, migrating, and overwintering habitat for bull trout (CBBTTAT 1998d). It is also essential for connectivity of local populations within the core area to bull trout from other core areas within the recovery unit. Bull trout use the lower reaches of some tributaries of the South Fork of the Clearwater River as essential habitat for thermal refuge during high water temperatures in summer.

Lochsa River core area. Bull trout are currently known to use spawning and rearing habitat in 16 streams or stream complexes within the Lochsa River drainage (*i.e.*, local populations). These local populations include Fishing (Squaw) Creek, Legendary Bear (Papoose) Creek, Boulder Creek, Fox Creek, Shotgun Creek, Crooked Fork/Hopeful Creek, Rock Creek, Haskell Creek, Colt Killed (White Sands) Creek, Beaver Creek, Storm Creek, Brushy Fork Creek, Spruce Creek, Twin Creek, Walton Creek, and Lower Warm Springs Creek. Local population streams are grouped and mapped together if they are tributary to a common watershed (Figure 6). Potential local populations include Post Office, Weir, Indian Grave, Lake, Fish, Hungery, Boulder, Old Man, Split, Fire, Coolwater, Canyon, Deadman, and Pete King creeks (Figure 6). Plum Creek Timber Company has surveyed its lands for presence/absence and the Clearwater National Forest initiated spawning and rearing surveys in the late 1990's. However, intensive surveys have not been conducted throughout the core area, and additional undocumented spawning and rearing habitat likely exists (CBBTTAT 1998b).

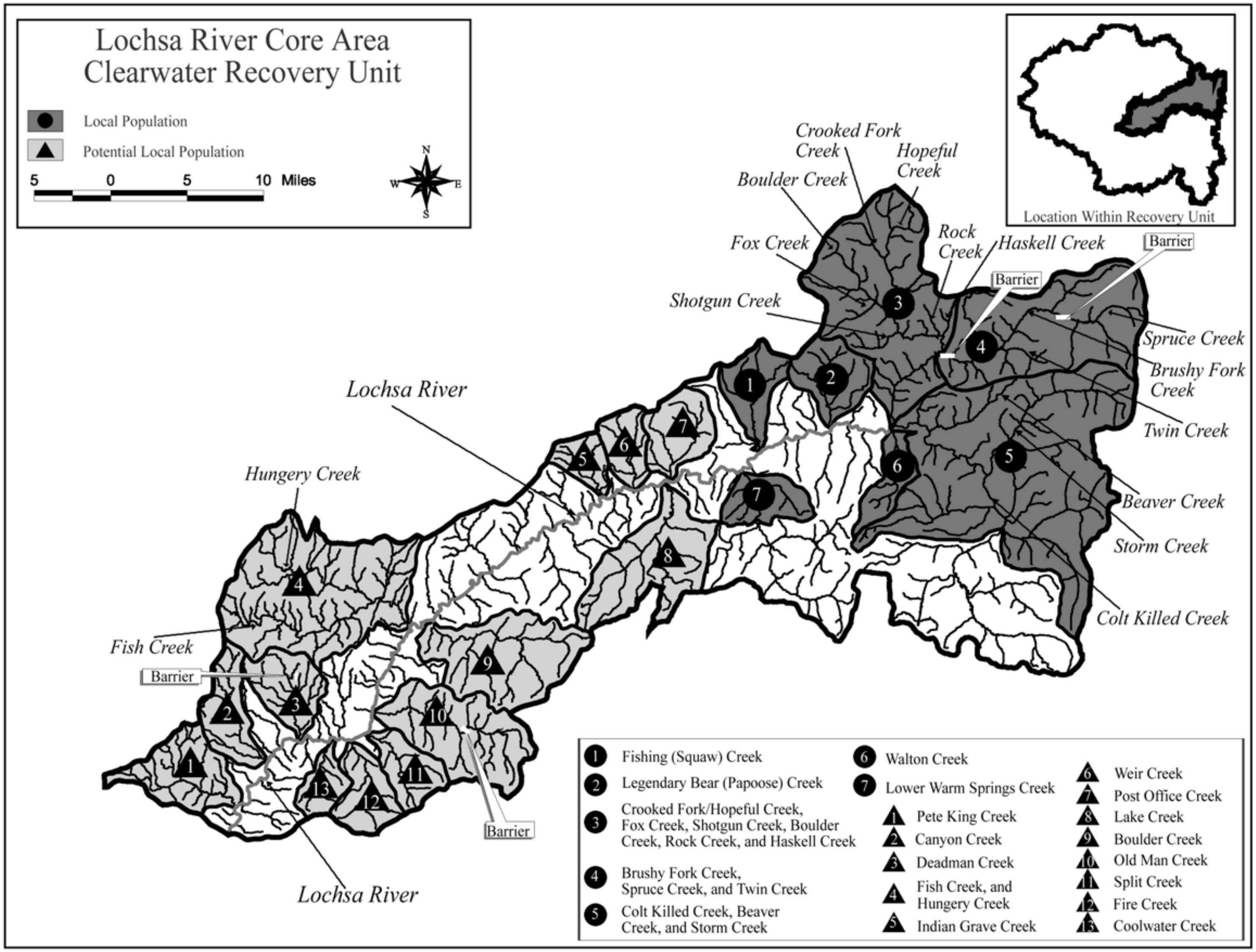
Within the Lochsa River core area, bull trout spawning and rearing has been documented in Legendary Bear (Papoose) Creek and tributaries, Fishing (Squaw), Upper Crooked Fork, Hopeful, Boulder, Shotgun, Fox, Rock, Haskell, Colt Killed, Storm, Beaver, lower Warm Springs, Cooperation, Fish Lake, Brushy Fork, Twin, and

Spruce creeks (CBBTTAT 1998a; Watson and Hillman 1997; P. Murphy, pers. comm. 2002). Bull trout are suspected to spawn in Walton Creek (CBBTTAT 1998b). Fluvial fish are thought to use the majority of spawning and rearing habitat except for Spruce and Shotgun creeks, which are likely resident populations due to migration barriers. Adult and subadult rearing is known to occur in the Lochsa River, lower Crooked Fork, Colt Killed, Walton, Warm Springs, Fish, Hungery, Weir, Post Office, Parachute, Doe, Coolwater, Fire, and Split creeks (USFS 1999a, CBBTTAT 1998b). Bull trout presence has been documented in lower Wendover, lower Lake, lower Indian Grave, lower Boulder, and lower Deadman creeks (Platts *et al.* 1993).

The most concentrated use of spawning and rearing habitat by fluvial bull trout in the Lochsa River drainage occurs in Legendary Bear (Papoose) and Fishing (Squaw) creeks (CBBTTAT 1998b). Redd count surveys have been conducted in Legendary Bear (Papoose) since 1996 and in Fishing (Squaw) Creek since 1994. In Legendary Bear (Papoose) Creek, 3 redds were observed in 1996 and 1997, and 2 in 1998; redds were also observed in the West and East Forks of Legendary Bear (Papoose) Creek (USFS 1999a). Annual surveys in Fishing (Squaw) Creek from 1994 to 1998 located 9 to 13 and 0 to 8 redds in a reach between the West Fork and East Fork of Fishing (Squaw) Creek and in West Fork Fishing (Squaw) Creek, respectively. A total of 2 to 10 redds were also observed in other stream reaches of the Fishing (Squaw) Creek drainage during various years (USFS 1999a, CBBTTAT 1998b). Fishing (Squaw) Creek supports both resident and fluvial stocks of bull trout, and contains some of the most significant known bull trout habitat within the Lochsa drainage. Based on the quantity of suitable habitat in Fishing (Squaw) Creek, this population size is considered low to moderate (Schoen *et al*. 1999).

Bull trout have been documented in upper Crooked Fork, Hopeful, Boulder, Fox, Williams, Lake, Shotgun, Rock, and Haskell creeks (CBBTTAT 1998b, Watson and Hillman 1997; P. Murphy, pers. comm. 2002). More study is required to

Figure 6. Lochsa River Core Area for Bull Trout.



determine the status and life history of these populations. Redd surveys in Shotgun Creek first occurred in 1997 and resulted in the location of two small redds and some resident-sized adult bull trout (USFS 1999a). The Shotgun population is likely resident due to a natural barrier approximately 100 meters (300 feet) from the mouth. Surveys in Hopeful Creek found large fluvial bull trout, indicating this is a fluvial population. Six bull trout redds were found in Haskell Creek in 2001 (P. Murphy, pers. comm. 2002).

Spruce and Twin creeks are tributaries of Brushy Fork Creek. In Spruce Creek, there is a bedrock migration barrier approximately 2 kilometers (1.2 miles) upstream from the mouth. Surveys in 1993 found four bull trout above the barrier: two (age 1 and 2) were found in the mainstem Spruce Creek, and two (age 1 and 2) were found in the lower reaches of the South Fork Spruce Creek (USFS 1999a). Bull trout in upper Spruce Creek are likely resident and may be a genetically distinct population due to the migration barrier. Extensive surveys in 1997 and 1998 did not locate bull trout in Spruce Creek, indicating this population has an extremely low density or has been extirpated (CBBTTAT 1998b). Twin Creek has a 12 meter (39 foot) bedrock falls approximately 1 kilometer (0.6 mile) downstream from the headwaters. Stream surveys in 1994 located a 559 millimeter (22 inch) bull trout, likely a fluvial fish staging to spawn in Twin Creek. However, redd counts in 1997 located 3 resident-sized redds and several resident adult bull trout, indicating the Twin Creek population is likely resident.

Beaver, Storm, and Colt Killed creeks were surveyed in 1994 through 1997. In Beaver Creek, the first documented bull trout redd survey in 1997 located two redds. The small size of the redds and presence of gradient barriers below their locations indicate the potential of a resident population, however, more study is needed (USFS 1999a). Storm and Maud creeks also have documented spawning and rearing, and are a fluvial population (Clearwater BioStudies 1996; P. Murphy, pers. comm. 2002). Upper Colt Killed and Big Flat creeks are connected with the Colt Killed Creek system and have documented spawning and rearing (Clearwater BioStudies 1996). There is a barrier on Big Sand Creek with no bull trout above it (P. Murphy, pers. comm. 2002).

A fish hatchery weir at the mouth of Walton Creek routinely catches bull trout, which are released upstream in Walton Creek (USFS 1999a). A fish trap in Fish Creek caught 15 bull trout in 2001. The fish were not of spawning size and were leaving Fish Creek. In Warm Springs Creek, bull trout inhabit the lower 6 kilometers (4 miles) of the watershed below an 8 meter (26 foot) waterfall that blocks upstream fish migration, and the presence of early rearing fish indicates that spawning is occurring in Cooperation Creek (USFS 1999a; D. Weigel pers. comm. 2002). Adult bull trout have been found in Post Office Creek, but it is not entirely clear whether spawning occurs as surveys have not been conducted. Fish Creek has good potential for spawning and early rearing, but this type of use of the stream has not been documented yet (P. Murphy, pers. comm. 2002). Indian Grave, Wendover, Lake, Deadman, Coolwater, Fire, and Split creeks have had bull trout sighted in them (Platts *et al.* 1993; P. Murphy, pers. comm 2002; IDFG 1986-1997). Coolwater and Split creeks were burned extensively in 1910 and historical populations were likely extirpated, but recent bull trout sightings indicate the habitat is recovering (P. Murphy, pers. comm. 2002).

Subadult and adult bull trout have been observed in the Lochsa River. Bull trout are suspected to use nearly all accessible areas of the core area for subadult and adult habitat (CBBTTAT 1998b). The Lochsa River provides important foraging, migrating, and overwintering habitat for the local populations within the core area, and connectivity to bull trout populations in other core areas of the Clearwater River Recovery Unit. Bull trout use the lower reaches of multiple tributaries of the Lochsa River as important habitat for thermal refuge during high water temperatures in summer.

Fish Lake (Lochsa River) core area. Fish Lake represents the only known adfluvial bull trout population in the Lochsa River drainage, near the headwaters of the drainage. Fish Lake is entirely within the Selway-Bitterroot Wilderness Area. Juveniles rear in a lake inlet. This core area contains one local population (Figure 7). Little is known regarding the status of this population.

There is limited information on the fish populations of Fish Lake. In 1991, the lake was surveyed in the High Mountain Lakes Fisheries Project, a cooperative effort of the Idaho Department of Fish and Game and the Clearwater National Forest. The lake was surveyed by a gill net set for 12 hours which generated a catch per unit effort relative estimate of 0.42 bull trout per gill net hour and 3.1 cutthroat per gill net hour (Murphy and Cochnauer 1998). Prior to 1995, harvest of bull trout in the lake was allowed but the lake has since been closed to harvest.

Selway River core area. The Selway River supports a significant metapopulation (an interacting network of local subpopulations) of fluvial bull trout that are widely distributed through the core area in variable densities, as well as widely distributed resident local populations in some upper tributary reaches (USFS 1999d). Local populations are well-connected within this core area. Bull trout are currently known to use spawning and rearing habitat in at least 10 streams or stream complexes within the Selway River drainage (*i.e.*, local populations) (CBBTTAT 1998b). These local populations include Meadow Creek, Moose Creek, Little Clearwater River, Running Creek, White Cap Creek, Bear Creek, Deep Creek, Indian Creek, Magruder Creek, and Upper Selway River (Figure 8). Potential local populations include Marten Creek, Mink Creek, Gedney Creek, Three Links Creek, and O'Hara Creek (Figure 8). Bull trout may also use spawning and rearing habitat in the relatively short face drainages along the Selway River, although this has not been documented. Bull trout appear to be distributed nonrandomly, according to the physical and biotic characteristics of the mainstem and tributaries (USFS 1999d). Intensive surveys have not been conducted throughout the core area, and additional undocumented spawning and rearing areas likely exist (USFS 2001).

The Selway core area supports a strong population of bull trout in the upper Columbia River basin (ICRB 1997). Total abundance is unknown, but stream survey data collected in 1997 suggest that fish density is relatively high (USFS 1999d). Bull trout are widely distributed throughout the Selway River drainage and abundance in the Selway River and tributaries is highly variable (CBBTTAT 1998b).

Moose and Meadow Creek watersheds support strong populations, and several other watersheds likely support moderate to strong populations. Moose Creek supports a significant population of fluvial and resident bull trout, and large numbers of adult fluvial bull trout have been documented within tributaries of Moose Creek

(USFS Spawning and rearing is also documented to occur in the North and East Forks Moose Creek, mainstem Moose, and Rhoda creeks; and may occur in Cedar Creek where bull trout presence has been documented (CBBTTAT 1998b, USFS 2001; K. Thompson, USFS, pers. comm. 2002).Meadow Creek supports a significant resident population in its upper reaches, and bull trout have been documented throughout the mainstem and in East Meadow and Schwar creeks (USFS 1999d). Spawning and

Figure 7. Fish Lake (Lochsa) Core Area for Bull Trout.

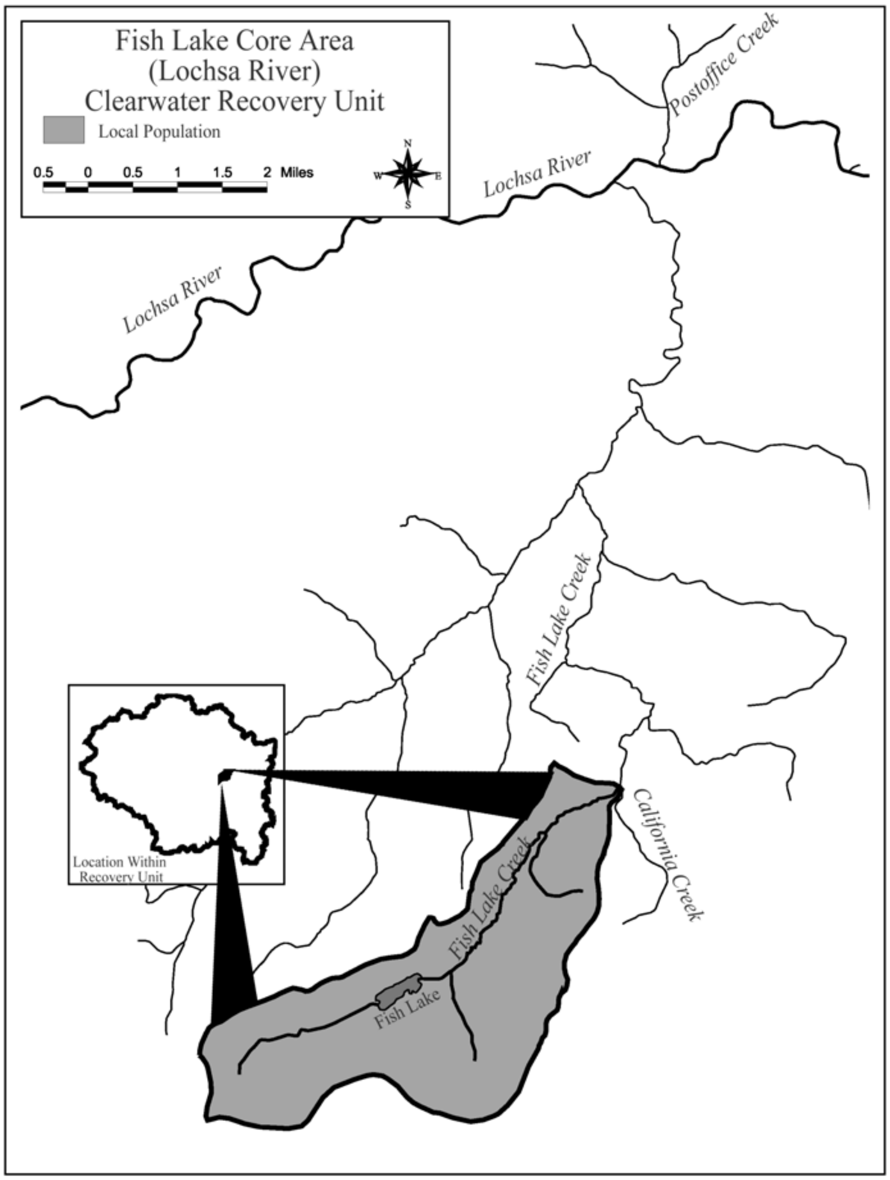
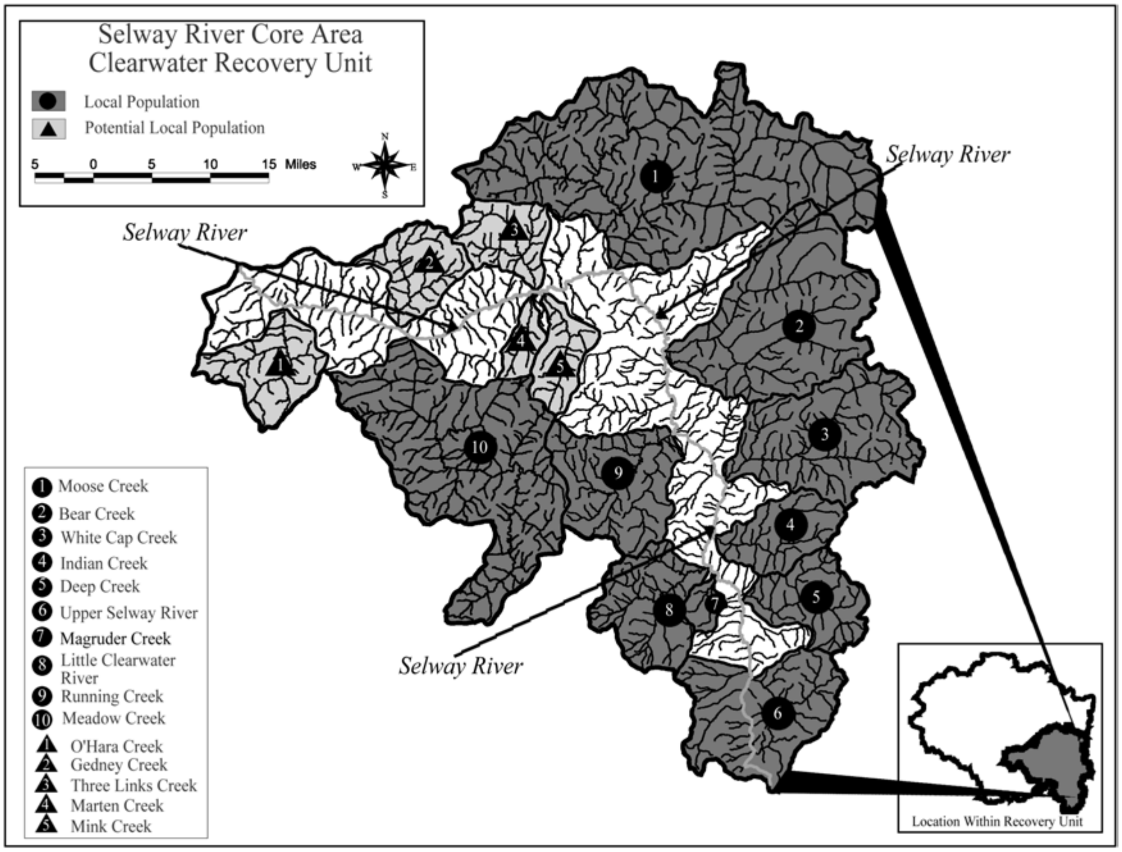


Figure 8. Selway River Core Area for Bull Trout.



rearing is known to occur in upper Meadow, and East Fork Meadow creeks (CBBTTAT 1998b).

Bull trout spawning/rearing is also known to occur in Running, South Fork Running, Lynx, and Eagle creeks of the Running Creek drainage; in White Cap and Canyon creeks of the White Cap drainage; in upper Little Clearwater River, Burnt Knob, Salamander and Flat creeks of the Little Clearwater drainage; in upper Deep, Vance, Slow Gulch, and probably Cayuse creeks of the Deep Creek drainage; in Indian, Schofield, and Burnt Strip creeks of the Indian Creek drainage; and in Magruder Creek, Wilkerson, Storm, French, Swet, Surprise, South Fork Surprise, and the upper Selway River (CBBTTAT 1998b, USFS 2001, USFS 2000; K. Thompson, pers. comm. 2002; M. Jakober, U.S. Forest Service, pers. comm. 2002). Additionally, spawning and early rearing is suspected due to suitable habitat in upper Bear, upper Cub, upper Paradise, and upper Brushy Fork creeks of the Bear Creek drainage (USFS 2001; S. Russell, pers. comm. 2002). Resident populations have been documented in Meadow and Lynx (tributary of Running Creek) creeks, and the majority of other populations are fluvial (K. Thompson, pers. comm. 2002).

Incidental sightings of adult fluvial bull trout have been documented throughout the mainstem Selway (from mouth to headwaters) and Little Clearwater Rivers, Bear, Deep, Swet, Gedney, Marten, Three Links, and O'Hara creeks (CBBTTAT 1998b, USFS 1999d). Additionally, bull trout subadult and adult habitat is also known to exist in Gedney, Bear, Deep, Swet, and Indian creeks (CBBTTAT 1998b). Due to the remote wilderness character of this core area a number of drainages have not been surveyed for bull trout, but likely provide habitat and may support (or have the potential to support) bull trout, including Marten, Mink, Otter, and Pettibone creeks (USFS 1999d). Three Links Creek likely provides lower quality habitat and has a lower potential to support a population (K. Thompson, pers. comm. 2002).

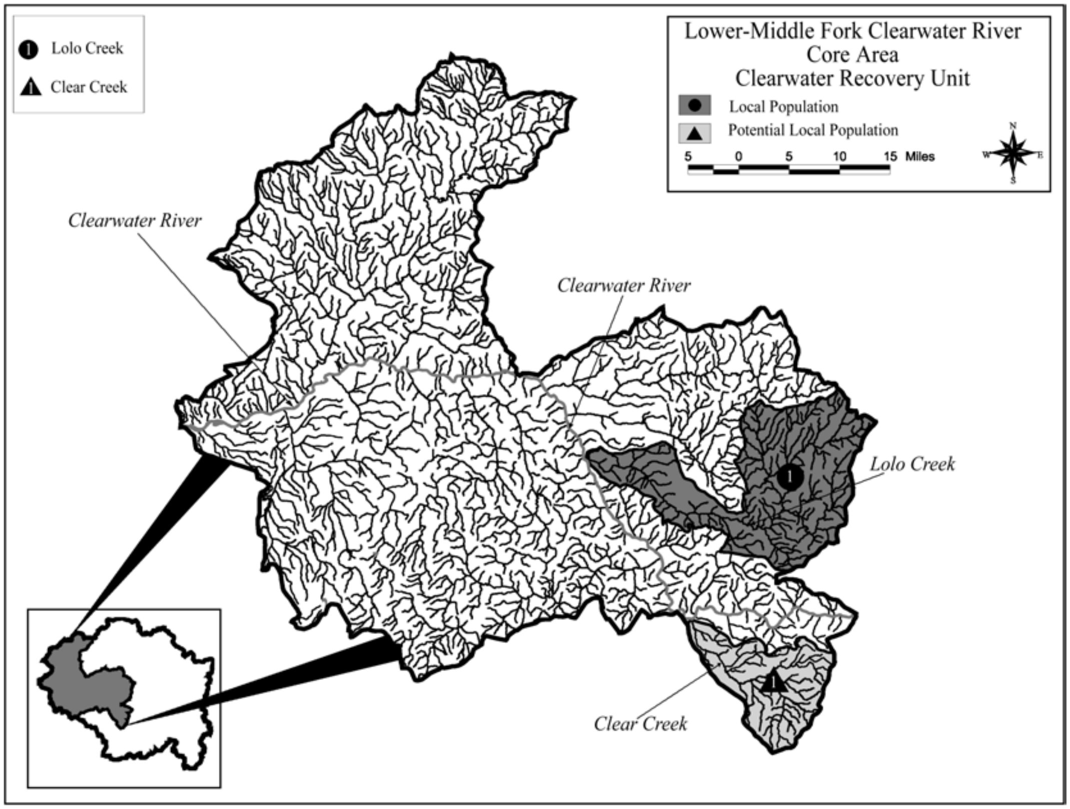
Subadult and adult bull trout have been observed in the Selway River. Bull trout are suspected to use nearly all accessible areas of the core area for subadult and adult habitat (CBBTTAT 1998b). Bull trout use the lower reaches of some tributaries of the Selway River as essential habitat for thermal refuge during high water temperatures in summer. The Selway River provides important foraging, migrating, and overwintering habitat for the local populations within the core area, and connectivity to bull trout populations in other core areas of the Clearwater River Recovery Unit.

Lower Clearwater and Middle Fork Clearwater core area. Bull trout use the lower (mainstem) Clearwater River, Middle Fork Clearwater River, and their tributaries primarily as foraging, migratory, rearing, and overwintering habitat (CBBTTAT 1998b, 1998c). No tributary streams within the core area have current documentation of bull trout spawning (BLM 2000); however, Lolo Creek has documented occurrence of juvenile bull trout (USFS 1999b). Lolo Creek is a local population because some of the small juveniles have been found above a small falls that would preclude fish of their size entry from downstream areas. Clear Creek is the only potential local population (Figure 9). Bull trout abundance is at very low levels within the core area. The larger tributaries may be used incidentally for subadult/adult rearing and foraging when stream conditions are suitable. Bull trout may also use some tributaries of the Middle Fork and lower Clearwater Rivers as thermal refuge habitat during high water temperatures in summer, although many tributaries may have even higher temperatures than these mainstems.

Of the available habitat in tributary streams, Lolo and Clear creeks potentially provide spawning and rearing habitat, although spawning and rearing has not been documented (CBBTTAT 1998c, 1998d). Information about bull trout distribution in both watersheds is limited, and substantial areas remain unsurveyed (USFS 2001, CBBTTAT 1998c). In Lolo Creek, bull trout 102 to 127 millimeters (4 to 5 inches) in length have been observed up to 10 kilometers (6 miles) above the White Creek bridge as well as in the Nez Perce Tribe's juvenile trapping facility (upstream of Eldorado Creek) in 1987, 1989, 1990, 1993, 1994, and 1995 (USFS 1999b). Idaho Fish and Game has observed undetermined numbers of rearing bull trout in Lolo Creek during parr monitoring surveys in 1989, 1990, and 1994 (CBBTTAT 1998c). It is unknown where spawning occurs within this watershed; however, tributaries of upper Lolo and Yoosa creeks provide suitable habitat. No bull trout have been documented in surveys conducted by various agencies during 1996 to 1998 (USFS 1999b). In Clear Creek, two to four bull trout are collected annually at a salmon weir during spring and released above the weir (CBBTTAT 1998d).

Length of captured bull trout has been 254 to 356 millimeters (10 to 14 inches)(Roseberg, *in litt.* 2002). This stream may occasionally be used for subadult/adult rearing. In addition to upper Clear Creek, the South and Middle Forks of Clear Creek provide the best potential habitat for spawning and rearing in this system (W. Paradis, pers. comm. 2002).

Figure 9. Lower / Middle Fork Clearwater River Core Area for Bull Trout.



Observations of individual bull trout have also been made in the Potlatch River watershed (CBBTTAT 1998d, Clearwater BioStudies 1990) and in lower Big Canyon Creek (BLM 2000). Several incidental observations of bull trout have been documented in Orofino Creek downstream from a barrier to anadromous fish (Johnson 1985, Huntington 1988). How bull trout utilize the Middle Fork Clearwater River and its tributaries is unclear and undocumented, although it provides the essential function of connectivity for local populations in the Lochsa, Selway, South Fork and mainstem Clearwater Rivers (CBBTTAT 1998b). The Middle Fork Clearwater River and one or more of its tributaries may provide habitat primarily for adult and subadult bull trout. The Middle Fork may serve an important function as common habitat for the Lochsa and Selway populations; adults and subadults may hold in the Middle Fork's deep pools, and they may use fish bearing tributaries as foraging habitat, particularly in fall through spring when water temperatures are cooler. These streams may also provide refuge habitat during high flow events (CBBTTAT 1998b).

Dworshak Dam near the confluence of the North Fork and lower (mainstem) Clearwater has likely fragmented the local population of bull trout in the Clearwater core area, and it is not known whether fish in the lower Clearwater originated from Dworshak Reservoir (Cochnauer *et al*. 2001). Bull trout subadults and adults have been observed every spring in a trap at the base of the dam, and during various years (1993, 1996, 1997, 2000, and 2001), at Dworshak National Fish Complex near the base of the dam (Roseberg, *in litt.* 2002).

Bull trout observations and records in the mainstem Clearwater subbasin are sporadic. The mainstem Clearwater River provides prey species and migration and rearing habitats for adult and subadult bull trout. It also provides connectivity among the Grande Ronde, Salmon, Imnaha, Snake River, and the upper Clearwater basin local populations, although the frequency and intensity of migration between these basins is unknown.

REASONS FOR DECLINE

Bull trout distribution, abundance, and habitat quality have declined range wide (63 FR 31647; 63 FR 31647; 64 FR 58910). Within the coterminous United States, these declines have resulted from the combined effects of: habitat degradation and fragmentation, the blockage of migratory corridors, poor water quality, angler harvest and associated hooking mortality, poaching, entrainment (process by which aquatic organisms are pulled through a diversion or other device) into diversion channels and dams, and introduced nonnative species. Land and water management activities that depress bull trout populations and degrade habitat include operation and maintenance of dams and other diversion structures, forest management practices, livestock grazing, agriculture, agricultural diversions, road construction and maintenance, mining, and urban and rural development. The reasons for decline will be discussed in detail for each core area. Appendix B presents a summary table of limiting factors for bull trout that was compiled from previous research or assessments and presented in the Clearwater Subbasin Summary (CSS 2001).

Dams

Overview. Restoring and maintaining connectivity between remaining populations of bull trout is important for the persistence of the species (Rieman and McIntyre 1993). Migration and spawning between populations increases genetic variability and strengthens population viability (Rieman and McIntyre 1993). Barriers caused by human activities limit population interactions and may eliminate life history forms of bull trout. Bull trout that migrate downstream of dams without fish passage are unable to contribute to the bull trout population upstream. In many systems controlled by dams, this loss can be significant. Research on Arrow Rock Reservoir (Boise River) found that approximately 20 percent of the bull trout in the reservoir migrated past Arrow Rock Dam (CBBTTAT 1998a).

North Fork Clearwater River core area. Dworshak Dam is the only major dam in the Clearwater River Recovery Unit and is within the North Fork Clearwater core area. It is located on the North Fork Clearwater River about 1.6 kilometers (1 mile) upstream from the confluence with the Clearwater River. Construction of the dam was completed in 1971 and it is operated by the U.S. Army Corps of Engineers (CBBTTAT 1998a). Dworshak Dam is 219 meters (717 feet) high and, at full pool, forms a reservoir extending 87 kilometers (54 miles) up the North Fork Clearwater River drainage. An estimated 14,800 square meters (159,307 square feet) of stream habitat in first to fourth order tributaries was inundated by the reservoir, and an additional 962 hectares (2,377 acres) of habitat was inundated in tributaries of the North Fork Clearwater River that were larger than fourth order (CSS 2001). The dam inundates a total of 6,868 hectares (16,970 acres) of terrestrial and riverine habitat at full pool (U.S. Army Corps of Engineers 1975).

Prior to the construction of Dworshak Dam, bull trout adults from the North Fork Clearwater River drainage likely migrated into the mainstem Clearwater River to overwinter and mix with adults from the Lochsa, Selway, and South Fork Clearwater River drainages (USFS 2000). Bull trout from various populations probably strayed and mixed on a regular basis, which may have mitigated against lengthy population declines due to catastrophic events in any one drainage (USFS 2000). Because no fish passage is provided at Dworshak Dam, it has isolated bull trout inhabiting the North Fork Clearwater River drainage from the remainder of the recovery unit (CSS 2001). Runs of anadromous fish that historically spawned in the North Fork Clearwater River no longer have access to the watershed above the dam. In addition to the biological changes due to the elimination of anadromous fish within the North Fork Clearwater River and the associated decline in prey abundance for bull trout, the input of nutrients contributed by the presence of anadromous fish has been disrupted (USFS 2000). This loss is considered significant to bull trout and other inland fish populations.

Dam operation includes seasonal spills and drawdowns of reservoir elevation up to 47 meters (155 feet) below full pool for flood control and also to supply downstream flows for anadromous fish restoration (CBBTTAT 1998a). During drawdowns, surface area of the reservoir can be reduced by as much 52 percent (CSS 2001). Substantial numbers of kokanee, which have been introduced into Dworshak Reservoir and are a forage fish for bull trout, can be entrained below the dam during spills (CSS 2001). Drawdowns of Dworshak reservoir can also entrain bull trout and carry them into the mainstem Clearwater River. These fish probably have low survival after entrainment (CBBTTAT 1998c). In addition to the loss of anadromous fish upstream of Dworshak Dam, fluctuations in reservoir levels influence turbidity, which affects nutrient dynamics and biological production. Low reservoir levels may also reduce bull trout access to tributaries entering the reservoir due to thermal and physical barriers (CBBTTAT 1998a).

The Idaho Department of Lands operates a small hydropower project on Meadow Creek, a tributary of the Little North Fork (CBBTTAT 1998a). This dam, however, does not significantly impact connectivity for bull trout between spawning, rearing, foraging and overwintering habitat in Dworshak Reservoir.

Lower Clearwater and Middle Fork Clearwater core area. A nearly impassable dam existed at Lewiston during 1927 to 1972, and reduced returns of anadromous fish and extirpated coho salmon (CBBTTAT 1998b). The resulting reduced populations of anadromous salmonids has historically impacted bull trout through reduced abundance of prey, and continues to impact bull trout in the Clearwater River Recovery Unit. Several anadromous salmonid propagation facilities operated by the U.S. Fish and Wildlife Service, the State of Idaho, and the Nez Perce Tribe produce and release spring/summer chinook salmon, fall chinook salmon, and steelhead in the recovery unit.

Forest Management Practices

Overview. Forestry activities that adversely affect bull trout and its habitat are primarily timber extraction and road construction, especially where these activities involve riparian areas (USFWS 1998a). As noted in Chapter 1, forest management practices include timber harvest and road construction and can affect stream habitat by altering recruitment of large woody debris, erosion and sedimentation rates, snowmelt timing, runoff patterns, the magnitude of peak and low flows, water temperature, and annual water yield (Cacek 1989; Furniss *et al.* 1991; Wissmar *et al.* 1994; Spence *et al.* 1996; Spencer and Schelske 1998; Swanson *et al.* 1998). Other impacts of timber harvesting may include decreased slope stability. The timber harvesting treatment of clear cutting is most often associated with decreased slope stability (McClelland *et al*. 1997).

Roads constructed for forest management are a prevalent feature on managed forest and rangeland landscapes. Roads constructed on steep, landslide-prone terrain often contribute to decreased slope stability (McClelland *et al.* 1997, Cundy and Murphy 1997, Meehan 1991). Roads have the potential to adversely affect several habitat features (*e.g.*, water temperature, substrate composition and stability, sediment delivery, habitat complexity, and connectivity) and can isolate streams from riparian areas, causing a loss in floodplain and riparian function (Baxter and McPhail 1999, Trombulak and Frissell 2000). The natural disturbance regime in most of this recovery unit is represented by infrequent large-scale disturbance events, particularly fires in mid to higher elevation areas, landslides triggered by rain-on-snow, and flooding events in lower elevations. These sediment-producing events are followed by long periods of reduced sediment input. The streams in these settings often have slow resilience to sediment inputs (CBBTTAT 1998d). Historically, streams existed in a variety of gradually improving condition classes as affected by natural distrubances, with the fish populations moving between these areas. Roads, skid trails and other ground-disturbing activities associated with timber harvest can contribute sediment to these streams on a more consistent and frequent basis. The consequence of this sediment input on streams with slow resilience has been habitat degradation (CBBTTAT 1998d). Huntington (1995) and Lee *et al.* (1996) found that bull trout were relatively more abundant in unroaded than in managed (roaded) landscapes in the Clearwater and Columbia River basins (respectively). Both the frequency of occurrence and the abundance of adult fish were higher in unroaded landscapes.

Current impacts of timber harvest on bull trout have been reduced with implementation of forest practice rules and forestry Best Management Practices on private and public lands. The application of Best Management Practices is voluntary in Idaho. These regulations prohibit equipment in or near the streams, and require leaving standing trees in riparian areas (30 to 50 feet of buffer dependent on stream type), and controlling erosion from roads, trails, and landings (CBBTTAT 1998a). However, Sullivan *et al.* (1990) stated the current leave tree (buffer) requirement may not adequately protect stream temperature in all cases. Zaroban *et al*. (1996) found that forest practice rules were implemented 97 percent of the time, and when applied, they were 99 percent effective at preventing pollutants from reaching a stream. However, sediment was not monitored as a part of the study and half of the timber sales that were audited resulted in contributions of sediment to streams, largely from inadequately maintained roads. Although audits show that compliance with Best Management Practices is high in Idaho, evaluations of various States' Best Management Practices have not been conducted relative to the protection of bull trout habitat and processes affecting water quality, such as sediment delivery, water temperature, recruitment of woody debris, and bank stability (USFWS 1998a). Even with high implementation rates, Idaho's forestry BMPs have been shown, in some cases, to be ineffective at maintaining beneficial uses, including cold water biota (McIntyre 1993). These findings illustrate the need to adequately implement all applicable rules as the misapplication of one rule, out of many, can result in sediment delivery. Federal lands have adopted PACFISH (USFS and BLM 1995b) and INFISH (USFS and BLM 1995a) management guidelines that exceed Idaho rules and were designed to protect native fish populations.

Although certain forestry practices have been restricted or altered in recent years to improve protection of aquatic habitat, the consequences of past activities continue to affect bull trout and their habitat. Early logging in the Clearwater River Recovery Unit generally occurred in river valley bottoms where logs could be easily skidded or transported by flume to the river and ultimately floated downstream to Lewiston. These log drives occurred annually during high water beginning in 1928. The last log drive in Idaho occurred in 1971 on the North Fork

Clearwater River. Prior to the establishment of the Idaho Forest Practices Act (approximately 1975), streams and riparian areas received no protection from harvesting, roading, skidding and processing impacts. Management activities in the 1970's also include removal of large woody debris from stream channels to prevent flooding and debris torrents. The legacy of these activities still affects fish habitat in portions of the recovery unit through decreased large woody debris (from log skidding directly in streams and removal of woody debris), lack of recruitable large woody debris, increased water temperatures from harvest of riparian forests, and lack of pools and habitat complexity. These impacts must be rectified to protect fish habitat (CBBTTAT 1998a).

Fire management is another forestry practice that can impact bull trout. Fire ignition may be either natural or man-made. Man-made fire ignition may be intentional (management directed) or accidental. Recent evidence suggests that successful fire suppression since the 1930's is likely to be resulting in more intense fires in some areas, and may be having little to no impact in other areas. Presumably, bull trout have adapted to the effects of fires of a natural intensity (CBBTTAT 1998a). Rieman and McIntyre (1993) document a case where a fire extirpated bull trout from a small watershed and within two years bull trout returned, other studies have found that bull trout remained in streams after fires. Catastrophic fire is associated with increased sediment delivery to streams, increased temperatures (due to burning of stream-side vegetation), lack of large woody debris (in extreme cases the existing woody debris is consumed by the fire, in other cases the fire consumes trees that would contribute to woody debris in the future), lack of habitat complexity (due to increased sediment and reduction in woody debris), and changes to runoff patterns and peak flows. However, wildfire can also have a negligible to beneficial impact on aquatic ecosystems and bull trout. Less intense fires can actually increase the complexity and diversity of the aquatic and terrestrial habitat mosaic (CBBTTAT 1998a). If the fire is not extremely hot, woody debris recruitment may increase. Woody debris in the channel provides cover, pool habitat complexity, and sediment storage in the stream.

North Fork Clearwater River core area. The Orogrande, Washington, Beaver, Quartz, Cold Springs, and Moose Creek watersheds have been intensively managed for timber production and will probably remain an important management concern in the future (CBBTTAT 1998a, USFS 2000). Impacts associated with these activities are significant and evident in streams. The Breakfast Creek drainage and the lower portion of the Little North Fork is primarily managed for timber production. Historic logging practices have reduced shade and large woody debris along much of Stony, Breakfast, Isabella, and Glove creeks. Thermographs placed in Stony Creek showed water temperatures exceed 18 degrees Celsius (64.4 degrees Fahrenheit) during summer and suggest stream shading is inadequate to maintain the cool water temperatures needed by bull trout (CBBTTAT 1998a). Water temperature above 15 degrees Celsius (59 degrees Fahrenheit) is believed to limit bull trout distribution (Rieman and McIntyre 1995).

Upper Floodwood Creek, in the Breakfast Creek drainage, has been lightly harvested (less than 25 percent harvested and a road density of 1.1 miles per square mile). Timber management is only occurring on several state-managed tributaries (Timber, Goat, and O`Donnell creeks). Little or no timber management is occurring or anticipated on Federal land in the watershed. Floodwood Creek has a high quality stream and a known spawning and rearing bull trout population (CBBTTAT 1998a). Idaho's Cumulative Watershed Effects Process was conducted in the upper Floodwood Creek drainage (IDL 2002a). The Cumulative Watershed Effects Process for stream, upland and road surveys was approved by the Idaho Land Board in 1995 and includes modules for assessing erosion and mass failure hazards, canopy closure/stream temperature (adjusted for elevation and drought conditions), stream channel stability and hydrologic risk factors, sediment delivery from roads and skid trails, beneficial use/fine sediment assessment, and nutrient assessment where applicable (IDL 2000). The survey found a functional riparian area and stable stream channel along upper Floodwood Creek (CBBTTAT 1998a). Overall, roads in this area were identified to be in good condition although some problem road segments were identified.

Idaho's Cumulative Watershed Effects Process for stream, upland and road surveys was conducted in the West Fork Floodwood Creek drainage (IDL 2002b). A fire (Mary Mix Fire) during 1986 and its associated suppression and salvage activities removed most of the vegetation along the lower two miles of West Fork Floodwood Creek and greatly accelerated sediment input and transport (CBBTTAT 1998a). A thermograph in West Fork Floodwood Creek indicated water temperatures exceed 18 degrees C (64.4 degrees F) in the area where riparian vegetation was burned.

The watersheds in the upper Little North Fork Clearwater River are managed by the Forest Service and Plum Creek Timber Company and are primarily managed for timber production. It is anticipated that these watersheds will be managed for timber production in the future. The U.S. Fish and Wildlife Service negotiated a Habitat Conservation Plan (HCP) with Plum Creek Timber Company in December 2000, and successful implementation of the HCP is expected to result in a higher standard for private timberland management activities, including reduced impacts of future actions and remediation of existing problems to the benefit of bull trout. However, historic timber management has degraded several streams in this area. Loss of streamside vegetation and significant introductions of fine sediment has occurred in Jungle, Adair, Rutledge, and Montana creeks (CBBTTAT 1998a). Skille (1991) found that the amount of instream sediment exhibited a strong correlation with road densities ($r^2 = 0.70$) and percent watershed harvested ($r^2 = 0.83$) in tributaries of upper Little North Fork Clearwater River. These relationships are expected to vary for areas with different landtypes, parent materials, road construction histories and timber harvest methods. Where cobble embeddedness exceeded 50 percent, no cutthroat trout were found (Skille 1991). Similar relationships can be expected to occur with bull trout (CBBTTAT 1998a). The Bureau of Land Management managed watersheds (*e.g.*, Little North Fork, Lost Lake, Little Lost Lake, and Lund creeks) are relatively unroaded (less than 1 mile per square mile) and few land modifying actions have occurred. This land is currently managed as a wilderness study area and is expected to be managed this way in the future.

Historic fires in the early 1900's affected large expanses (approximately 66 percent) of the middle to upper North Fork core area including upper Skull, Rock, 4th of July, Weitas, Kelly and Cayuse creeks and some tributaries of the upper North Fork Clearwater River including Vanderbilt, Bostonian, and Boundary creeks (USFS 2000). Historic fires were generally stand replacing and have resulted in legacy effects (impacts from historical activities that are still present) to streams including loss of riparian habitat and stream shading, increased temperatures, decreased woody debris and decreased recruitment of woody debris. The areas of Isabella, Skull, Quartz, and Hidden creeks have been affected by recent small fires (CBBTTAT 1998a). These fires generally burned at a lower intensity and resulted in a mosaic pattern of burned and unburned vegetation, with some portions of riparian areas burned intensely and others unburned. Weitas Creek, one of the largest tributaries in this watershed has been affected primarily by historic fire. Thermographs in Weitas Creek and tributaries document water temperatures as high as 23 degrees C (73.4 degrees F) in Weitas Creek mainstem and in Hemlock Creek, 17 degrees C (62.6 degrees F) in Little Weitas Creek, and 18 degrees C (64.4 degrees F) in Middle Creek due to loss of riparian habitat (CBBTTAT 1998a). Other lesser impacts in this watershed include some areas that have been affected by roads, timber harvest, and terracing.

South Fork Clearwater River core area. Timber harvest activities in the South Fork Clearwater core area have been extensive. The long-term adverse effects of timber management activities are thought to be mainly associated with road construction (CBBTTAT 1998d). The specific effects of these roads on bull trout habitat are discussed in the overview section above.

Timber harvest has posed the greatest risk to bull trout in the Red River drainage. The Clearwater Basin Bull Trout Technical Advisory Team utilized a risk scale of “low, moderate, and high” to describe the relative level of impact an activity has had on bull trout (CBBBTTAT 1998d). The impact of timber harvest on bull trout habitat was rated as high for this drainage due to the amount of harvest, the amount of streamside harvest, and the percentage of landslide-prone area harvested (CBTTAT 1998d). In Red River, 22 percent of the land base has been subject to timber harvest activities including timber harvest in 15 percent of streamside areas, and road encroachment into riparian areas and streams (CBBTTAT 1998d). The only areas of low development in the Red River drainage are those in the upper watersheds.

In the American River, Crooked River, and Newsome Creek, 14, 10, and 19 percent of the lands, respectively, have been managed for timber harvest (CBBTTAT 1998d). Timber harvest impacts on bull trout habitat were rated as moderate for these watersheds (CBBTTAT 1998d). In the American River, roads have encroached on riparian areas and streams, affecting riparian processes and function. Sediment yields are 14 percent above normal background levels (CBBTTAT 1998d). Although much of the upper Crooked River is largely unroaded, sediment yields of 8 percent above normal background levels occur in some areas (CBBTTAT 1998d). Road #233, which was historically established for mining access and has since been used for forest management and recreation activities, runs parallel to Crooked River within a constricted canyon reach. This has resulted in increased sediment yields and loss of riparian vegetation and shading for Crooked River (J. D. Mays, pers. comm. 2001).

Timber harvest in Tenmile Creek and Johns Creek has been low with only 1 and 3 percent of the lands, respectively, managed for harvest (CBBTTAT 1998d). Much of the upper portions of these watersheds are within designated wilderness areas. Since 1998 there have been no new proposals for management activities in these watersheds; only completion of harvest from timber sales approved in the late 1980's to early 1990's. Sediment yields are 1 percent above natural background levels in Tenmile and Johns creeks (CBBTTAT 1998d).

Timber harvest in the middle portion of the South Fork Clearwater subbasin has occurred mainly along the Meadow Creek tributary with 32 percent of the watershed harvested. Sediment yield is 16 percent over natural background levels. Other watersheds that have been harvested include Cougar and Peasley creeks with approximately 23 and 22 percent harvested. Sediment yields for these two watersheds are 15 and 20 percent over natural background levels. The Wing, Twentymile, and Mill Creek watersheds have been harvested across approximately 1, 1, and 20 percent of their areas, respectively, and sediment yields are 3, 4, and 8 percent over natural background levels (CBBTTAT 1998d).

Lochsa River core area. The entire Fishing (Squaw) Creek watershed is managed by the Forest Service, and a checkerboard ownership pattern exists in the Legendary Bear (Papoose) watershed which includes U.S. Forest Service and Plum Creek lands (CBBTTAT 1998b). Roads within these watersheds have displaced riparian vegetation, are a constant source of sediment to the streams, and have significantly impacted bull trout habitat. These factors likely affected bull trout populations in these watersheds decades ago and continue to impact them (CBBTTAT 1998d). Jammer logging systems (horizontal strip clear-cuts separated by roads on steep hillsides) were common in these areas, which resulted in high road densities. In Fishing (Squaw) Creek, for example, during the 1996 winter flood event the presence of jammer logging roads was highly associated with areas of debris torrents and landslides (J. Capurso, U.S. Forest Service, pers. comm. 1997). Large segments of these streams were cleared of large woody debris in the 1970's and 1980's (CBBTTAT 1998b).

Riparian areas of important bull trout streams in the upper Lochsa drainage have been impacted by a number of forest management practices. The quantity and quality of large instream wood in some bull trout habitat has been reduced by road building and logging in riparian areas, and stream cleaning (large wood removal) (USFS 1998, CBBTTAT 1998a). Replacement of this wood is important in both spawning/rearing habitat and adult/subadult habitat. Also, some riparian areas have been impacted by fire suppression. Dense riparian vegetation resulting from fire suppression and overstory harvest practices has the potential of burning more intensely than it would under natural conditions (CBBTTAT 1998a). These areas should be treated to reduce fuel loads, so riparian areas do not burn too intensely when fire returns. Haskell and Crooked Fork creeks were affected by a fire in 2000 that created a mosaic pattern of varying burn intensities through the riparian areas.

A checkerboard ownership pattern consisting of U.S. Forest Service and Plum Creek Timber lands exists within the upper Lochsa River drainage, particularly in the Twin and Spruce Creek watersheds, resulting in areas of high road densities and timber harvest. Several stream reaches in the Spruce Creek watershed are in a degraded condition due to sedimentation resulting from timber harvest and road construction, decreased shading and recruitment woody debris from riparian harvest, large woody debris removal in the 1960's, and restriction of stream channels (USFS 1999a). Relatively high cobble embeddedness values were reported for Spruce Creek. Large debris jams are present in the upper reaches, due partially to remnant logging debris. Valley bottom roads have confined the natural migration of the meandering low-gradient channels, reducing form and function of the creeks. Stream surveys indicate relatively low frequencies of large instream wood in the North Fork of Spruce Creek and Shoot Creek (USFS 1999a).

Lower Clearwater and Middle Fork Clearwater River core area. Timber harvesting activities occur throughout the core area on National Forest, Bureau of Land Management, State of Idaho, Nez Perce Tribe, corporate and privately-owned lands. Private land timber harvest of the steep breaklands of the mainstem Clearwater River is contributing to vegetative change and roading impacts (CBBTTAT 1998c). Although timber harvest using helicopter yarding has become more common, the higher economic return to landowners of tractor logging leads to continued road and skid trail development and increased logging impacts on these forested breaklands (CBBTTAT 1998c). Timber harvest activities on private, State and Federal lands have had varying degrees of impact on aquatic habitat. Long-term effects are generally associated with road construction. During high flow events, the Clearwater River has very high sediment loads from a variety of sources including timber harvest, roads, mining, and agriculture. Sediment typically flushes out of river segments and deposits in lower velocity areas associated with downriver dam impoundments and slack water areas (BLM 2000).

Lolo Creek has sustained impacts from timber harvest and road construction, and these activities present the greatest legacy and current threats to fisheries habitat in the watershed above the Forest Service boundary (CBBTTAT 1998c). Legacy effects of riparian logging such as loss of stream cover and potential woody debris are evident in the mid-watershed, and past and current timber harvest activities present the greatest threats to fisheries in the upper watershed (CBBTTAT 1998c). Recent surveys administered by the U.S. Forest Service have shown that a number of streams within the Lolo Creek drainage have moderate to high levels of cobble embeddedness as a primary limiting factor to fish production (USFS 1999b). Low levels of woody debris and suboptimal levels of instream cover are also limiting factors in a number of stream reaches. Approximately 20 percent of the Clear Creek drainage has been harvested for timber, 80 percent of which was clearcut. The majority of lands in the Potlatch River watershed have historically been, and continue to be, managed for timber production.

Livestock Grazing

Overview. Occupied bull trout habitat is negatively affected by some livestock grazing practices (USFWS 1998a). Livestock grazing can degrade aquatic habitat by removing riparian vegetation, destabilizing streambanks, widening stream channels, promoting incised channels and lowering water tables, reducing pool frequency, increasing soil erosion, and altering water quality (USFWS 1998a). These effects increase summer water temperatures, reduce cover, promote formation of anchor ice in winter, and increase sediment delivery into bull trout spawning and rearing habitat. Livestock grazing is causing impacts to riparian vegetation and bull trout habitat in some core areas, with the greatest impacts present in the Lower/Middle Fork Clearwater and South Fork Clearwater core areas (CBBTTAT 1998a, 1998c).

North Fork Clearwater River core area. Grazing allotments were established in the Kelly Creek and Cayuse Creek areas during the early 1900's and following the wildfires of 1889, 1910, and 1919. Large numbers of sheep were grazed until natural plant succession decreased forage, making grazing infeasible. Current grazing of pack and saddle stock by outfitters and the U.S. Forest Service is short-term and site specific. Presently, most domestic cattle grazing in the basin is limited to the tributaries of Dworshak Reservoir, and impacts vary from low to high. These tributaries have been determined to be of low priority for bull trout recovery due to the intensity of past and current land management activities. However, historic information on spawning and rearing areas is still being collected and the importance of these sub-watersheds may change with new information (CBBTTAT 1998a). Other grazing activity is limited to short-term sheep grazing after timber harvest on State of Idaho lands. Livestock grazing is not known to occur adjacent to documented spawning and rearing streams in this core area (CBBTTAT 1998a). Where grazing occurs, impacts are generally being reduced through better management practices on public and State lands. Livestock grazing does not represent a major threat to bull trout recovery in this core area.

South Fork Clearwater core area. The key watersheds of the South Fork Clearwater River have a moderate to low capability for grazing with the exception of the meadow areas of Red River which are rated high capability, but with a moderate to low suitability for grazing due to potential impacts (USFS 1998a). There are grazing allotments in the Nez Perce National Forest across much of the Newsome Creek and American River watersheds, along the western portion of Johns Creek, and along Meadow Creek. The majority of Bureau of Land Management lands within the core area are leased for grazing. Grazing on private land is known to occur in the American River and the Red River (three areas) drainages (CBBTTAT 1998d). Moderate to high levels of grazing have severely affected riparian zones on private and U.S. Forest Service land in the American River watershed (especially Elk Creek, tributary to American River), and in meadow reaches on private land in lower portions of the Red River drainage. The Bureau of Land Management and U.S. Forest Service have fenced problem areas for bull trout and have virtually eliminated most grazing along American River (C. Johnson, pers. comm. 2002).

Lochsa core area. Short-term, site-specific pack stock grazing occurs in portions of this core area. Livestock grazing does not represent a major threat to bull trout recovery in this core area.

Selway core area. Cattle grazing occurs on U.S. Forest Service land in the O'Hara Creek watershed. Short-term, site-specific pack stock grazing occurs along the lower Selway River and in the Selway-Bitterroot Wilderness. Livestock grazing does not represent a major threat to bull trout recovery in this core area.

Lower Clearwater and Middle Fork Clearwater River core area. The majority of livestock grazing within the core area occurs on private and State lands, and is relatively light and unconcentrated within the mainstem Clearwater River canyon (CBBTTAT 1998c). Most grazing is limited to small, non-commercial operations along the river corridor, although there are some confined animal feedlot operations that present risks based on their distance from streams, slope and soil types, and waste management and diversion structures. Most private land on the prairie above the river canyon has been converted to agricultural land, with steeper-sloped canyon lands used primarily for pasturing livestock. The U.S. Forest Service has established grazing allotments on lands with suitable forage for livestock in the Clear Creek and Lolo Creek drainages. Nearly 32 percent of the Clear Creek watershed is private land and private agricultural practices and grazing have resulted in removal of riparian vegetation and channel erosion (USFS 1999e). The Lolo Creek mid-watershed, defined as Cottonwood Flats upstream to the U.S. Forest Service boundary is impacted in a few localized areas by grazing in the meadows and riparian areas (CBBTTAT 1998c).

The majority of Bureau of Land Management lands within the core area are leased for grazing. Bureau of Land Management lands are often intermingled with private lands and they are grazed together. Past timber harvests in forested areas provide transitory range that is often grazed. Canyon grasslands that are grazed are primarily associated with the lower Clearwater River tributaries which have dissected the prairie lands. In the Potlatch River watershed, stream channels and hydrologic function have been extensively altered by farming and grazing, in addition to other management activities (CBBTTAT 1998c). Cattle are the most common livestock grazed within the core area.

Transportation Networks

Overview. Dunham and Rieman (1999) found that the density of roads at the landscape level was negatively correlated to bull trout occurrence. Roads not only facilitate excessive inputs of fine sediment and possible habitat degradation in streams, they also increase human access which may induce angling mortality and introductions of nonnative fishes and increase the potential for water pollution through accidental spills. A widely held principle of managing for the survival and recovery of threatened and endangered aquatic species is that remaining stronghold areas for the species and associated high quality habitats be preserved and reconnected. Wilderness, unroaded areas, and large blocks of primitive lands contain most of the best available remaining habitat for bull trout, steelhead, and salmon (Frissell 1993; Thomas *et al.* 1963; Henjum *et al.* 1994; Rhodes *et al.* 1994; and Quigley and Arbelbide 1997). In the Interior Columbia River Basin, the lack of roads is the strongest predictor of high aquatic ecosystem integrity, and bull trout strongholds show a very strong negative correlation with road densities (Quigley and Arbeldide 1997). The average road density in bull trout strongholds (areas with healthy bull trout populations) was 1.2 kilometers per square kilometer (0.5 miles per square mile), which is considerably less than the standard of 1.2 to 1.9 kilometers per square kilometer (2 to 3 miles per square mile) reported as not adversely impactive for populations of anadromous salmonids. Bull trout populations classified as "depressed" occurred in areas that had an average watershed road density of 0.9 kilometers per square kilometer (1.4 miles per square mile) and bull trout typically were absent at an average road density of 1.1 kilometers per square kilometer (1.7 miles per square mile) (Quigley and Arbeldide 1997).

Road densities in the Clearwater River Recovery Unit are lower relative to the rest of the Interior Columbia River Basin, however, localized areas exhibit high road densities. Roads are influencing bull trout habitat in all core areas, except the portions within the Selway-Bitterroot Wilderness and the Gospel Hump Wilderness areas and other wilderness study areas and roadless areas on National Forest lands. There are a number of inventoried roadless areas in the Clearwater River Recovery Unit with a combined area of 2.21 million acres (CSS 2001). Road densities are the greatest in the central portion of the recovery unit which includes the eastern half of the North Fork Clearwater, the southeastern third of the Lower/Middle Fork Clearwater, and the northern and eastern two-thirds of the South Fork Clearwater core areas. Logging roads predominate in these areas, commonly exceeding 1.9 to 3.1 kilometers per square kilometer (3 to 5 miles per square mile) (CSS 2001). See the "Forest Management Practices - Overview" section above for a discussion of the road-associated impacts to bull trout. There is relatively little road development in the eastern part of the recovery unit, with the exception of localized areas of intensive forest management (*e.g.*, portions of the upper Lochsa and upper North Fork Clearwater River drainages). The Selway-Bitterroot and Gospel-Hump Wilderness Areas contribute to the lack of road development in some areas, as does local fire history. The distribution of logging roads is notably tied to fire history, with most existing forest roads located in areas that did not burn in the major fires of 1910 and 1917 (CSS 2001).

North Fork Clearwater River core area. U.S. Forest Service roads parallel or provide access to many local population mainstem and tributary streams. Impacts from such roads include continuous sediment input from surface runoff and potential for large sediment input from road failures, sedimentation and passage barriers due to road crossing structures such as bridges and culverts, and increased fishing access to key habitat. U.S. Forest Service Roads 247 and 250 parallel the North Fork Clearwater River from the upper part of the reservoir to the top of Hoodoo Pass. Kelly, Cayuse, and Weitas creeks are accessible by a number of main U.S. Forest Service roads. U.S. Forest Service roads parallel 17.7 kilometers (11 miles) of Kelly Creek, the upper 8 kilometers (5 miles) of the Little North Fork Clearwater River, and many tributary drainages of the North Fork Clearwater such as Quartz, Skull, Cold Springs, Gravey, and Moose creeks (CBBTTAT 1998a). Mass failures have occurred in the Quartz, Moose, Toboggan, and Gravey Creek watersheds.

The highest road densities occur in areas managed primarily for timber production (CBBTTAT 1998a), and these areas typically occur in the lower third of the North Fork Clearwater core area. Floods and landslides triggered by a rain-on-snow event during the 1995/1996 winter impacted many of the areas that have been subject to timber harvest and roading (CBBTTAT 1998a). These include mass failures in Quartz, Deception, Cold Springs, Beaver, and Orogrande Creek watersheds. Beaver, Quartz, and Skull creeks have been intensively harvested and roaded. Beaver, Quartz, Cold Springs, Orogrande, and Deception creeks have also been intensively managed and show effects of sedimentation in elevated cobble embeddedness measurements. However, the headwaters and some tributaries of these subwatersheds are relatively undisturbed and may provide a foothold for the recolonization of bull trout (CBBTTAT 1998a).

During 1996 flood events, significant amounts of sediment were delivered to streams in the Breakfast Creek drainage through mass failures. Roads were associated with 83 percent of these failures (Cundy and Murphy 1997). Based on studies of the 1996 event, Potlatch Corporation is developing a landslide hazard map for their ownership. The assessment will provide information to minimize mass failures from future roads. Numerous mass failures occurred along tributaries to Dworshak Reservoir during the winter and spring of 1995 to 1996. Roads were associated with 83 percent of the mass wasting events (Cundy and Murphy 1997).

Mainline trails used by livestock packers, off-road motorists, and backpackers follow Kelly Creek, Cayuse Creek, Weitas Creek, and the Little North Fork Clearwater River and are potential sediment sources, although their impact is relatively minor compared to sediment from roads.

Fish Lake (North Fork Clearwater River) core area. Fish Lake is one of the only high elevation lakes where off-highway vehicle (OHV) access is possible and permitted. Fish Lake is accessed by a well developed trail that has been upgraded for OHVs. Since the early 1990's local OHV clubs have worked with the U.S. Forest Service to upgrade the trail and use has increased dramatically (J. Roy, USFWS, pers. comm. 2002). The increased recreation pressure has resulted in trampling of riparian vegetation along the outlet stream and along the lake shore. Fishing pressure has also increased, resulting in more catch and release of bull trout and associated impacts from hooking mortality (see Fisheries Management section).

South Fork Clearwater River core area. In the South Fork Clearwater core area, roads are thought to be one of the most important factors in habitat degradation due to the long history of road construction for mining and timber management, the amount of road, the amount of streamside road, the alteration in sediment regimes, and alteration in riparian and stream processes and functions (CBBTTAT 1998d).

Red River has the highest number of kilometers of roads and the second highest road density in the entire core area with over 946 kilometers (588 miles) of road with an overall density of 3.6 miles per square mile. Of the total number of miles of road, 280 kilometers (174 miles) have been constructed near streams. Over 13 kilometers (8 miles) of road have encroached into stream channels (CBBTTAT 1998d). The American and Crooked Rivers, and Newsome Creek have 343, 220, and 354 kilometers (213, 137, and 220 miles) of road, respectively, and road densities of 1.4, 1.2, and 2.0 kilometers per square kilometer (2.3, 2.0, and 3.3 miles per square mile). Of the total number of miles of road, 2.5, 4.3, and 3.1 kilometers (4, 7, and 5 miles) have encroached into stream channels (CBBTTAT 1998d).

The threat of habitat degradation in Tenmile and Johns creeks from roads is low. Headwater portions of these streams areas lie within the Gospel Hump Wilderness area. Tenmile Creek has a total of 39 kilometers (24 miles) of constructed road while Johns Creek has a total of 97 kilometers (60 total miles) of road development.

The mainstem of the South Fork Clearwater River has 264 kilometers (164 miles) of roads (a density of 2.7 kilometers per square kilometer, 4.4 miles per square mile) (CBBTTAT 1998d). Approximately 73 kilometers (45 miles) of road are located within the riparian area. There are many roads, including most of the main highway (Highway 14), along the river that have encroached on stream and riparian processes (CBBTTAT 1998d). Cougar and Peasley creeks have 77 and 89 kilometers (48 and 55 miles) of roads respectively, with sections of roads in both watersheds encroaching on stream and riparian processes. Similar effects occur in Wing, Twentymile and Mill creeks which have 16, 27, and 151 kilometers (10, 17, and 94 miles) of roads, respectively. Key areas of road encroachment from high-standard, well-traveled roads in the upper South Fork include Forest Service Road 233 along Crooked River from Relief Creek downstream approximately 6 kilometers (4 miles) through the "Narrows"; and various sites between Red River Hotsprings and the old Red River Ranger Station.

Lochsa River core area. Riparian vegetation along the Lochsa River and Crooked Fork Creek have been impacted by road construction and maintenance (CBBTTAT 1998b). U.S. Highway 12 runs parallel to most of the Lochsa River and the entire Crooked Fork Creek and is a narrow, sinuous river canyon road. U.S. Highway 12 has removed riparian vegetation resulting in decreased woody debris and reduced off-channel habitat. Other impacts include increased angler access, noxious weed invasion of riparian areas along the Lochsa and its tributaries, and winter road sanding that provides a persistent source of gravel and fine sediment (CBBTTAT 1998b). U.S. Highway 12 is also a major transportation route between Idaho and Montana with numerous accidents, some of which result in trucks overturning into the river. There is a high potential threat from hazardous materials spills as a result of these vehicular accidents.

Roads constructed for timber management occur throughout the upper Lochsa River. Mainline roads, constructed by the U.S. Bureau of Public Roads in the 1950's, were built within the floodplains and riparian zones of the mainstem and tributaries of Fishing (Squaw) and Legendary Bear (Papoose) creeks (CBBTTAT 1998b). These roads have displaced riparian vegetation and are a constant source of sediment to the stream. During the 1970's and 1980's, large reaches of Fishing (Squaw) and Legendary Bear (Papoose) creeks were cleared of large woody debris to improve fish passage and release sediment (CBBTTAT 1998b). Road densities in Shotgun and lower Boulder creeks are very high: 3.6 kilometers per square kilometer (5.8 miles per square mile) and 2.1 miles per square mile (3.5 miles per square mile), respectively and are degrading spawning and rearing habitat (USFS 1999a). Road density in Spruce Creek is also high 2.1 kilometers per square kilometer (3.4 miles per square mile), and has probably increased since this 1995 estimate due to large-scale timber harvest activities (mainly on Plum Creek lands) (USFS 1999a). Beaver Creek has a relatively high road density of 1.8 kilometers per square kilometer (2.9 miles per square mile) (1992 data) which contributes to its moderate cobble embeddedness (USFS 1999a).

Fish Lake (Lochsa River) core area. Two potentially significant threats to this population are associated with habitat degradation from the Fish Lake airstrip and from a trail crossing at Wounded Doe Creek (Clearwater Recovery Unit Team, *in litt.* 2000). While Fish Lake provides the only known population of adfluvial bull trout in the Lochsa River drainage and is entirely within the Selway-Bitterroot Wilderness Area, spawning and rearing habitat in the lake inlet stream has been impacted by the construction of the Fish Lake airstrip in the 1950's (CBBTTAT 1998b). Effects of the airstrip include channelization and straightening of a portion of the lower stream as a result of construction, downcut stream banks, and erosion due to past channelization, current use of campsites, livestock and pack horse access to the stream, and a ford at the Wounded Doe Trailhead. Increased access into Fish Lake afforded by the airstrip has increased fishing pressure and likely has resulted in increased catch and release of bull trout and associated hooking mortality as discussed for the North Fork Clearwater Fish Lake adfluvial population.

Selway core area. Overall, in this core area, roads present a minor impact to bull trout, with the exception of a few localized areas that have relatively higher road densities. Roads in this core area reflect two substantively different development and management histories (USFS 2001). The majority of roads (approximately 80 percent of the total road mileage) in the core area were developed and are used for a variety of purposes including community and private development, timber harvest, and recreation. These roads are found in O'Hara and Goddard creeks, and to a lesser extent, the Lower Selway Canyon. Despite a variety of uses that drive the development of roads in these areas, existing development remains relatively modest, with road density values remaining less than 1.9 kilometers per square kilometer (3 miles per square mile).

The second category of roads were developed and are used primarily for limited access needs, and are often located in a backcountry or wilderness recreation setting. These roads occur in the north Selway River face, Middle and Upper Selway River canyon, Meadow, Running, Goat, Deep, Indian, White Cap, Gedney, and Three Links creeks, and the Selway River headwaters. Existing road densities remain below 0.3 kilometers per square kilometer (0.5 miles per square mile), several of them substantially so.

Lower Clearwater and Middle Fork Clearwater core area. A well developed highway and county road system is present in the core area (CBBTTAT 1998c). U.S. Highway 12 and the Camas Prairie Railroad runs along the entire length of the Clearwater River. State and county highways encroach on the channel, riparian areas and floodplains of the Potlatch River, Big Canyon, Lapwai, and Cottonwood creeks. Off-channel habitat and backwater areas have been reduced or cut-off from the main river channel. Portions of riverbanks have been riprapped to protect highways, bridges, and private land development (BLM 2000). The communities of Kendrick and Julieatta, Kamiah, Lapwai, and Peck all are within the floodplains of the Potlatch River, Lawyers, Lapwai, and Big Canyon creeks, respectively (CBBTTAT 1998c). Roads for forest management are common. Road densities on private and State lands are expected to be over 1.9 to 2.5 kilometers per square kilometer (3 to 4 miles per square mile) within the core area. During high flow events, the Clearwater River has very high sediment loads due, in part, to road runoff and failures during weather events. Sediment deposits in lower velocity areas embedding substrates.

U.S. Highway 12 runs adjacent to the mainstem Clearwater for its entire length in this core area, creating numerous impacts to aquatic and riparian habitat. Also, encroachment of the highway on one side and the railroad on the opposite side have constrained the river meanders, eddys, and hydraulic energy (CBBTTAT 1998c). Eight bridges cross the Clearwater River within the watershed. While they do not present significant constraints on the river, they do increase hazardous spill risk and their maintenance and improvements can affect river habitat and populations. There is a high potential threat from hazardous materials spills as a result of vehicular accidents, as occurred in January 2002, when approximately 10,500 gallons of diesel fuel spilled into the Middle Fork Clearwater River near Kamiah from a tractor trailer crash on Highway 12. This spill affected the Clearwater River downstream for approximately 113 kilometers (70 miles) (USFWS, *in litt.* 2002). Highway 12 has also facilitated the spread of noxious weeds and the resulting invasion of riparian areas along the Clearwater River and its tributaries. Noxious weeds compete with desirable riparian vegetation and affect aquatic habitat by altering natural ecological processes (fire, hydrology, soil development) (Olson 1999), with potential instream impacts of increased sedimentation and water temperatures, and decreased cover and woody debris.

Lolo Creek and its major tributaries are roaded watersheds, with 3 kilometers per square kilometer (4.8 miles per square mile) of roads in the watershed (USFS 1998b). Roads are likely the most significant impact to bull trout habitat within the Lolo Creek drainage (USFS 1999b). Roads paralleling streams or within the stream floodplain are sediment sources, reduce riparian cover, limit stream hydrological function and reduce instream cover and acting and potential woody debris in Musselshell, Yakus, Eldorado, and Lolo creeks (CBBTTAT 1998c, USFS 1999b). Roads are also a significant impact to bull trout habitat in the Clear Creek drainage. There are approximately 483 kilometers (300 miles) of roads in the watershed and a road density of 1.9 kilometers per square kilometer (3 miles per square mile) (USFS 2001). Steep breaklands and basalt geology in Clear Creek drainage make it prone to landslides. Mass wasting failures along the Leitch Creek road have been a source of pulses of sediment and bedload into Clear Creek and the Middle Fork Clearwater River. Sediment pulses in Clear Creek are often observed during intense rain storms (USFS 1999e). Overall road density in the Potlatch River drainage is 3.5 miles per square mile (BLM 2000).

Residential Development

Overview: Urban land uses cover only about 0.2 percent of the Clearwater River Recovery Unit but the extent and impact of this land use is increasing (CSS 2001). Between 1990 and 1999 the human population in the recovery unit grew by approximately 8.7 percent (Idaho Department of Commerce 2000). Most of this population growth occurred in Lewiston and other established population centers in the Lower/Middle Fork Clearwater River core area (U.S. Census Bureau 2000). Increases in development result in habitat fragmentation, increases in roads, and loss of connectivity. Residential development also alters stream and riparian habitat through contaminant inputs, storm water runoff, changes in flow regimes, streambank modification and destabilization, increased nutrient loads, and increased water temperatures (MBTSG 1998). Because the majority of this recovery unit is Federal and State lands, residential development is currently not an issue in the North Fork Clearwater, Lochsa, and Selway River, and two Fish Lake core areas.

South Fork Clearwater River core area. The lower South Fork Clearwater River and its tributaries are among the most heavily impacted in the recovery unit. Residential development occurs on private land along the river corridor and in the towns of Kooskia, Harpster, Stites, and Clearwater. The towns of Grangeville and Cottonwood on the Camas Prairie above the lower South Fork River are also developing and causing indirect impacts to the river. As streams flow from the Camas Prairie via breaklands to the mainstem South Fork, erosion of channels is common due to steeper gradients and altered riparian conditions. When the streams join the South Fork, substantial deposition of bedload sediment occurs due to decreased gradient.

Impacts in the lower reaches of the South Fork Clearwater River attributable in part to residential development and urbanization include: aggradation, channelization, diking, filling of wetlands, riparian vegetation removal, and encroachment by developments such as roads and buildings (CBBTTAT 1998d). In unconfined reaches the result is a channel that is wider, shallower and with fewer large pools than existed under natural conditions. Fish habitat has been affected through reduced cover, less deep holding water, elevated sediment yields, and warmer summer water temperatures. In some years, much of the lower South Fork Clearwater River becomes unsuitable for bull trout and cold water salmonids due to warm water temperatures. For fish species that migrate through this area, either to reach upstream spawning areas or downstream rearing areas, migration of juveniles, the habitat in the mainstem has reduced connectivity and rearing capability (CBBTTAT 1998d).

Lower Clearwater and Middle Fork Clearwater River core area. Residential development and urbanization is a threat along the mainstem (lower) Clearwater River corridor. This area is largely privately owned and undergoing urban population growth. Highways and railroad ownership limit development immediately adjacent to the river. Private residence development and fragmented land ownership are resulting in increased road densities and human development pressures. Lewiston, Peck, Orofino, Kamiah, Greer, and Kooskia are the centers of development. Subsequently, urbanization, road development, increased housing densities, floodplain development, stream encroachment and channelization, diking, and vegetative changes will impact bull trout habitat and populations. The communities of Kendrick and Julieatta, Kamiah, Lapwai, and Peck all are within the floodplains of the Potlatch River, Lawyers, Lapwai, and Big Canyon creeks, respectively (CBBTTAT 1998c). Development and zoning in these communities has and does affect channel stability, hydrology, and management of these streams (CBBTTAT 1998c). These impacts will affect water quality, change stream hydrology, and affect potential bull trout habitat and the abundance of bull trout prey species (CBBTTAT 1998c). In lower Clear Creek, residential development in the flood plain and associated activities including flood control measures implemented by the U.S. Army Corps of Engineers are impacting bull trout habitat potential. Residential development along the Middle Fork is restricted to single family residences and summer homes along the river corridor, and a few small towns defined by clusters of homes and a café or motel along Highway 12.

Agriculture

Overview. Agriculture primarily affects the western third of the recovery unit on lands below 762 meters (2,500 feet) elevation, primarily on the Camas Prairie both south and north of the mainstem Clearwater and the Palouse Rivers. Additional agriculture is found on benches along the main Clearwater River and its lower tributaries such as Lapwai, Potlatch, and Big Canyon creeks. These areas are primarily within the Lower/Middle Fork Clearwater River core area. Agricultural practices, such as cultivation, irrigation, and chemical application can release sediment, nutrients, pesticides, and herbicides into streams, and reduce riparian vegetation (USFWS 1998a). Most sediment releases from irrigation ditches or from agricultural fields into bull trout habitat are non-point sediment releases. In recent years programs run by Natural Resources Conservation Service have made headway in addressing some of the worst erosion problems in the recovery unit (CSS 2001).

Agricultural impacts are currently not an issue in the North Fork Clearwater, Lochsa, and Selway River, and two Fish Lake core areas.

South Fork Clearwater River core area. With the exception of grazing activities, there is little agricultural production in the South Fork Clearwater core area upriver from the Nez Perce National Forest boundary (CBBTTAT 1998d). Primary agricultural production is associated with hay production in meadow areas of Red River and Big Elk Creek, a tributary to American River. However, the Camas Prairie above the lower South Fork Clearwater River is intensively farmed. Agricultural practices and hydrologic effects are similar to those discussed for the Lower/Middle Fork Clearwater River core area.

Lower and Middle Fork Clearwater River core area. Agriculture practices within the lower Clearwater basin are extensive and have both an ongoing and legacy effect on fisheries and water quality in the core area (CBBTTAT 1998c). The predominant crops on the Palouse, Weippe, and Camas prairies comprising the uplands of the basin include winter wheat, rapeseed, peas, lentils, oats, and hay. Farming practices include the use of fertilizers, insecticides, and herbicides, and drain ditches, channel straightening, and field tiling to improve drainage. Soil erosion rates are some of the highest in the country. Changes in land cover from grass/herbaceous/tree to tilled cropland, combined with stream channel alterations and increased runoff, have cumulatively changed the form and hydrologic function of all the tributaries in the lower Clearwater basin (CBBTTAT 1998c). The timing, peak, and magnitude of flows have changed in these tributaries. The results are increased flood frequencies and intensities, decreased water remaining in the watersheds for late season base flows, increased water temperatures, increased incidence of intermittent stream flows due to low water and high bedload conditions, and decreased stream complexity (CBBTTAT 1998c). Many of these lower elevation tributaries have experienced severe high flow flood scouring events which have significantly degraded fish habitat (BLM 2000). Agricultural practices and grazing have impacted a large percentage of stream habitat on private and Federal lands in the Lolo and Clear Creek drainages (USFS 1999b, 1999e). Agricultural activities consisting mainly of wheat farming on the benches above the Potlatch River canyon, and to a lesser extent in the river valley, have impacted stream habitat and water quality in the Potlatch River (CSS 2001). Bank erosion and sedimentation are two primary impacts from these activities.

Mining

Overview. Mining consists of two broad categories based on the method of extraction. Surface (placer) mining includes dredging, sluicing, dispersed gold panning, and pit mining while underground (lode) mining utilizes tunnels or shafts to extract minerals. Activities associated with mining include construction of roads and infrastructure, transportation and use of hazardous chemicals and petroleum products, and water treatment and use. Mining degrades aquatic habitat used by bull trout by altering water chemistry (*e.g.*, pH); altering stream morphology and flow; and causing sediment, fuel, heavy metals and other toxics to enter streams (Martin and Platts 1981; Spence *et al.* 1996).

Placer mining such as dredging in streams and valley bottoms is the most common mining activity that affects bull trout in this recovery unit. These types of mining are associated with increased sediment load, substrate disturbances, resuspension of fine sediments, stream channelization, bank destabilization, channel incision from streambed destabilization, and removal of large woody debris. Streams that have been mined usually lack habitat complexity, large woody debris, and suitable spawning and wintering habitat (Nelson *et al*. 1991). Dredge piles may confine the stream channel and their revegetation may be slow and sparse, creating a long-term potential for sedimentation which can degrade stream substrates and decrease dissolved oxygen levels (Levell *et al*. 1987, Nelson *et al*. 1991). Griffith (1981) found that entrainment of salmonid eggs and sac fry by suction dredges resulted in 35 to100% mortality dependent upon developmental stage. Tailings dams, waste dumps, and diversions can provide barriers to bull trout migratory corridors and spawning sites. Mining in upland areas for sand, gravel, and aggregate are not a major threat to bull trout unless sediment delivery to streams is not controlled (CBBTTAT 1998a).

The South Fork Clearwater River core area in particular has a complex mining history that included periods of intense mining by varied methods including dredging, hydraulic, draglines, drag shovels, and hand operations (CSS 2001). Mining activity within the North Fork Clearwater River drainage was more dispersed and methods used were similar to the South Fork Clearwater core area (CSS 2001). Mines are distributed throughout the recovery unit, with the lowest number of occurrences in the Selway River core area. The majority of mines pose a low relative degree of environmental risk, however there are mines with high ecological hazard ratings located in the South Fork Clearwater River core area and in the Orofino drainage of the Lower/Middle Fork Clearwater River core area (CSS 2001). Mining impacts are not currently an issue in the in the Lochsa and Selway River, and two Fish Lake core areas.

North Fork Clearwater River core area. Historic hard rock and placer mining exploration and development activity occurred from Lake Creek downstream to Fix Creek and from Moscow Bar on the North Fork Clearwater River downstream to Dworshak Reservoir (CBBTTAT 1998a). Stone, sand, and gravel (aggregates) are mined for local use, primarily for road construction and surfacing. Several aggregate sources are located within the core area (CBBTTAT 1998a). Aggregate mining is generally located on upland areas away from streams and riparian areas.

Currently, there are approximately 50 registered recreational suction dredges in the core area, a portion of which may operate during any given summer (CBBTTAT 1998a). There are approximately six patented mining claims on private property in the Moose and Chamberlain Creek watersheds. There are also 15 unpatented placer mining claims within the core area. There are approximately an additional 100 mining claims on public land under the General Mining Act; these are administered by the Bureau of Land Management, and surface resources are regulated by the U.S. Forest Service. A pit mine in Moose Creek encompassing public and private land has been proposed. Total recorded production in the North Fork Clearwater River basin in 1990 was estimated to be 6.9 grams (197 ounces) of gold and 1.6 grams (44 ounces) of silver (U.S. Bureau of Mines *et al.* 1993).

Historic and active mining claims in the Moose Creek watershed and the Moose and Independence Creek drainages have affected streams and bull trout habitat.

Tailing piles and channelization have been identified as problems in this watershed. Thirty-eight claimants work mining claims with suction dredges from July 1 to September 30 in the Moose Creek drainage. Bull trout spawning is potentially impacted due to the late closing date (USFS 2000). In the upper North Fork Clearwater River local population area, active mining occurs in Vanderbilt, Niagra, and Meadow Creek basins. Historic mining has affected Meadow Creek, Vanderbilt Gulch, and the upper North Fork Clearwater River (CBBTTAT 1998a).

South Fork Clearwater River core area. Mining activities in the South Fork Clearwater core area have been extensive in the Crooked, Red, and American Rivers and Newsome Creek watersheds, and resulted in significant habitat degradation (CBBTTAT 1998d). Historic dredge mining of streams (particularly the mainstems and larger tributaries) and road construction associated with mining and timber management are the two predominent causes of habitat degradation in the core area. Newsome Creek and Crooked River have experienced the greatest intensity of dredge mining activity with over 40 and 23 kilometers (25 and 14 miles) respectively, historically dredge mined. The larger watersheds of Red, American, and mainstem South Fork Clearwater Rivers have experienced moderate levels of dredge mining activity (CBBTTAT 1998d).

Historic dredge mining has had substantial adverse effects on fish habitat including severe alteration of channels and natural sinuosity, channel destabilization, reduced instream cover, increased width-to-depth ratios, poor (lower) pool to riffle ratios, aggradation, headcutting, increased sediment and bedload inputs, and decreased aquatic and riparian habitat complexity. The impact of mining in this core area is significant based on the level of activity and the direct effects this activity has had on the formerly high value rearing habitat in the tributary mainstems (CBBTTAT 1998d). Habitat degradation from mining was rated based on past activities and legacy effects with the following results: the impact was rated as high in Crooked, Red, and American Rivers and Newsome Creek watersheds, and low in Tenmile and Johns creeks (CBBTTAT 1998d).

Crooked River has been significantly affected by human activity, primarily in the lower one-half to two-thirds of the watershed (CBBTTAT 1998d). The majority of the headwaters of Crooked River are in near pristine condition (J.D. Mays, pers. comm. 2002). The overall condition of this watershed is considered low; most of this designation is based on the direct impacts to the channel from dredge mining in the lower two-thirds of the mainstem. The predominant legacy is the historic dredge mining along the mainstem river, which has altered stream and riparian processes. The lower reaches of the Crooked River, which historically meandered through a forested wide valley bottom, have been forced into a tortuous, symmetrical meander pattern with large piles of dredged material placed on either side of the stream. Numerous dredge ponds also exist within the valley bottom (CBBTTAT 1998d).

In the late 1980's and early 1990's, a large restoration project was initiated to improve these reaches of stream (CBBTTAT 1998d). Some of the large piles of dredge tailings were trucked away leaving a flatter floodplain, and existing dredge ponds were connected to the main channel to provide additional pools and side-channel rearing habitat for anadromous fish. Pool-creating structures were also placed in the stream channel. Although the stream and channel condition were improved, the unnatural meander pattern is unchanged. The improvement project did not include the entire dredged section in the lower reaches, and the lower 6 kilometers (4 miles) remain unrestored (CBBTTAT 1998d). In the sections upstream of the canyon ("Narrows"), the Crooked River flows through another dredged section where impacts are similar to the lower dredged reaches, except that the channel has been straightened and overwidened. Pool-creating habitat improvement structures were placed in these reaches in mid to late 1980's, but some of these structures have since failed (CBBTTAT 1998d). A number of fish habitat improvement projects have been conducted to restore dredge-mined areas in Newsome Creek, American, and Red Rivers. These projects resulted in improvements in localized areas and did not fully restore stream channels.

Lower Clearwater and Middle Fork Clearwater River core area. Recreational dredge mining is open year-round on the lower (mainstem) Clearwater River, and in the main tributaries from July 1 to March 15. Dredge mining on the mainstem is relatively light but dredging activity commonly occurs in or near the mouth of Lolo Creek (CBBTTAT 1998c). Mining impacts in the Potlatch River watershed include limited historical and current clay and gem mines (H. Jageman, U.S. Forest Service, pers. comm. 2002).

Fisheries Management

Overview: Introduced brook trout threaten bull trout through hybridization, competition, and possible predation (Learn *et al*. 1993, Thomas 1992, WDW 1992, Clancy 1993, Rieman and McIntyre 1993, MBTSG 1996). Brook trout were widely stocked in the mid 1900's, and there are currently several populations in the recovery unit. Bull trout can hybridize with brook trout. Bull-brook trout hybrids have low egg to adult survival and are sterile in most cases. Learn *et al.* (1993) believe that brook trout are always favored over bull trout because brook trout mature at a much earlier age. Hybrids may also have a competitive advantage over bull trout; Dunsmoor and Bienz (L. Dunsmoor and C. Bienz, Klamath Tribe, *in litt.* 1997) noted that hybrids are aggressive and larger than resident bull trout. Brook trout competition and hybridization have resulted in complete displacement of bull trout in some resident local populations (Dambacher *et al*. 1992, Learn *et al*. 1991).

Introductions and the subsequent spread of brook trout to many areas within the Clearwater River Recovery Unit may threaten the status of bull trout local populations in areas of their coexistence (CSS 2001). Currently methods are being tested in the Clearwater River Recovery Unit to remove brook trout from mountain lakes and small outlet streams where they are threats to bull trout (Murphy *et al.* 2001). Idaho Department of Fish and Game has a bonus brook trout limit in the Clearwater River Recovery Unit which allows an angler to keep 10 brook trout (any size) in addition to the normal trout limit. Additional measures will be necessary to effectively reduce brook trout in tributaries within watersheds that contain, or are likely to contain, bull trout (CBBTTAT 1998a).

Legal harvest of bull trout was closed in 1995 by Idaho Department of Fish and Game. Nez Perce Tribal fishing harvest of bull trout occurred until May 2001, when the Tribe issued a fishing regulation prohibiting the take of bull trout within the ceded area (1855 Treaty Area) (D. Statler, Nez Perce Tribe, pers. comm. 2002). Harvest of bull trout, however, continues to occur through both misidentification and deliberate illegal catch (CBBTTAT 1998a). Spawning bull trout are particularly vulnerable to harvest since the fish are easily observed during fall low flow conditions. Even when an angler catches and releases a fish, incidental hooking mortality has been documented to occur (Thurow 1990, Schill and Scarpella 1997). Illegal harvest and incidental mortality associated with sport fishing (tribal and non-tribal) are threats to bull trout within the Clearwater Recovery Unit, however, the level of impact on local populations is currently unknown (E. Schriever, IDFG, pers. comm. 2002).

The piscivorous diet of fluvial and adfluvial bull trout makes them susceptible to fluctuations in the densities of other fish populations. Ratliff and Howell (1992) found that abundance of bull trout in several watersheds declined as salmon declined. The North Fork, South Fork, Middle Fork, and mainstem Clearwater Rivers, and the Lochsa and Selway Rivers historically sustained much larger populations of anadromous fish than they do currently. Dworshak Dam has eliminated anadromous fish from the entire North Fork Clearwater River core area, and densities of anadromous fish have declined dramatically in the other core areas. Bull trout relied upon these fish as prey. There are numerous current programs and management actions underway to recover listed anadromous salmon and steelhead. These actions will assist with bull trout recovery by increasing prey abundance.

North Fork Clearwater River core area. Ongoing fishery management activities that may threaten bull trout local populations include incidental catch while sport fishing (CBBTTAT 1998a). In 1992, people invested more time in fishing than any other recreational pursuit in the North Fork Clearwater River basin. In 1995 fishermen spent an estimated 64,542 hours in the North Fork Clearwater and caught 28,457 fish (IDFG 2001b. The same report estimated 0.01 bull trout per hour, or 645 bull trout, were caught by fishermen; it is possible some bull trout were caught multiple times (CBBTTAT 1998a). The magnitude of the impacts of incidental and illegal harvest on local populations have not been quantified.

Illegal bull trout harvest has been documented sporadically in this area. Harvest associated with the campgrounds (Hidden and Cedars creeks and Fish Lake), mining camps, and road access (*e.g.*, Long Creek) could be a problem (CBBTTAT 1998a). Harvest in Black Canyon of the North Fork Clearwater River could affect staging adults migrating into these tributary streams to spawn. Bull trout in the upper North Fork Clearwater River upstream of Long Creek are also affected by illegal harvest (USFS 2000).

Brook trout were widely stocked in the early 1900's, and there are currently several populations in the North Fork Clearwater basin. Areas to which the species was introduced include high mountain lakes in the Meadow Creek drainage, and in the Orogrande and Beaver Creek drainages. Brook trout are present in Isabella, Larson, Elizabeth and Meadow creeks and are abundant in Adair and Jungle creeks in the upper Little North Fork Clearwater River (CBBTTAT 1998a). Hybridization with brook trout appears to be a localized problem in this core area. Genetic tests have detected a hybrid in upper Isabella Creek (D. Weigel, *in litt.* 1998b). However, until further research is conducted to determine the extent of hybridization and its effects on bull trout populations, the magnitude of the impact cannot be quantified (E. Schriever, pers. comm. 2002).

Kokanee salmon, the dominant sport fish in Dworshak Reservoir, provide both food for bull trout and nutrient enhancement to the watershed when they die after spawning (Bennett 1997). In Dworshak Reservoir, introduced kokanee may partially compensate for losses to the bull trout’s historic anadromous salmonid prey base and for losses of anadromous fish-related nutrient flow into the basin. Bennett (1997) indicated that an abundant kokanee population would provide food for potential bull trout population increases.

Fish Lake (North Fork Clearwater River) core area. This lake is unique in the North Fork Clearwater River basin in that it supports bull trout and native westslope cutthroat trout local populations. Westslope cutthroat trout are known to utilize the lake outlet for spawning. Eggs were collected in 1957, 1958, 1970, 1971, and 1972 to start a westslope cutthroat trout hatchery broodstock program for lake stocking. Westslope cutthroat trout have been stocked four times in Fish Lake: 1970, 1971, 1972, and 1977. Except for the 1977 stocking, all fish that were stocked are believed to originate from eggs collected from Fish Lake. The 1977 stocking is from hatchery-raised brood stock originating from Fish Lake in 1972. Since 1970, Fish Lake has been managed under a restricted sport-fishing season that opens August 1. Annual season closing dates have varied from September 15 to November 30. The late season opening has allowed for westslope cutthroat trout to spawn prior to the sport-fishing season. Fish Lake supported a bull trout sport harvest prior to closure in 1995.

The primary threat identified for this population is illegal angler harvest (Clearwater Recovery Unit Team, *in litt.* 2000). Additionally, estimates of incidental hooking mortality on caught and released bull trout in Fish Lake appear to be high, however, an assessment of bull trout population level effects cannot be made until a total population estimate is available (IDFG 2001b). Idaho Department of Fish and Game conducted angler creel surveys in 2000, during the sportfishing season, to determine the number of bull trout handled by anglers and possible injury to the fish. An estimated 227 bull trout were caught and released during August. Hooking mortality was estimated using a range of values documented in the literature from a variety of hooking studies (Wydoski 1977, Mongillo 1984). Mortality was estimated to range between 132 (worst-case scenario of 60% mortality) to 11 (best-case scenario of 5% mortality) (IDFG 2001). Twelve bull trout mortalities were documented during August, thus the best-case scenario did not occur. It is unknown whether the 2000 estimate of catch-and-release mortality exceeds harvest of bull trout that occurred prior to the no consumptive regulation changes in 1995. Additional information regarding population size and structure is required to determine the impacts that hooking mortality is having on this bull trout local population (IDFG 2001).

South Fork Clearwater River core area. In the South Fork Clearwater core area the loss of prey species, particularly the loss of anadromous fish numbers, has dramatically changed the prey availability for bull trout (CBBTTAT 1998d). Although the decline of anadromous fish from historical levels has affected bull trout in all the local population areas, the decline has been the greatest in the watersheds of the upper South Fork core area, where the threat to bull trout from management activities is rated as high (CBBTTAT 1998d).

Brook trout are a threat to bull trout in the South Fork Clearwater core area, although the current distribution of brook trout is scattered (CBBTTAT 1998d). Brook trout populations in the Red and American Rivers are extensive. Individuals have been found in lower Crooked River, lower Tenmile, Santiam, and Rabbit creeks (Nez Perce National Forest, *in litt.* 2001d), although these are thought to represent individual migrating/rearing fish and not established populations. In the West Fork Crooked River, a population of brook trout exists in the headwaters as a result of emigration from Rainbow Lake. In the Red River watershed brook trout comprise 44 percent of the salmonids surveyed (CBBTTAT 1998d). Brook trout have been found in Meadow Creek (one brook trout at the mouth) below McComas Meadow and in North Meadow Creek. No brook trout/bull trout hybrids have been documented to date.

Harvest of adult bull trout before the 1995 closure is considered to have had a significant impact, particularly during the steelhead season, on the number of large migratory individuals in the South Fork Clearwater River core area. Most of the larger order streams have easy access from streamside roads, including the South Fork Clearwater mainstem, Red River, portions of American River, Crooked River, and Newsome Creek. Johns and Tenmile creeks are not easily accessible from roads for most of their length, but are accessible from trail systems (CBBTTAT 1998d).

Lochsa River core area. Most angling occurs in the mainstem rivers and larger streams. Angling mortality may be occurring in the mainstem Lochsa River and large tributary creeks (*e.g.*, Crooked Fork and Colt Kill creeks). Brook trout are known to occupy Colt Killed Creek and its tributaries, and Fish Lake, Sponge, Bimerick, Deadman, Big Sands, Stanley, Boulder, and Old Man creeks (CBBTTAT 1998b). The reintroduction of chinook salmon to Colt Killed Creek has likely resulted in an increase of the prey base for bull trout (CBBTTAT 1998b).

Fish Lake (Lochsa River) core area. This lake is unique in the Lochsa River basin, and in the North-central Idaho batholith geology in that it is one of the larger, glacial lakes that have native populations of westslope cutthrout trout and bull trout. There are no stocking records for the lake. The lake is subject to the general sport-fishing season. Prior to 1995, there was harvest of bull trout in the lake, but has since been closed to harvest.

Illegal angler harvest of bull trout is one of the potential significant threats to this population (Clearwater Recovery Unit Team, *in litt.* 2000). Research has not been conducted to assess impacts of the sport-fishing season on the bull trout population. This lake receives moderate to heavy recreation pressure associated with the backcountry airstrip and also with a network of trails used by horse packers and backpackers. It is likely that incidental hooking mortality of bull trout caught and released during the cutthroat trout fishing season is similar to rates documented for the North Fork Clearwater River Fish Lake population. Such mortality could pose a threat to this population, however, further research is needed to determine relative risk to the population. A strong population of brook trout occurs in Sponge Creek and could threaten the Fish Lake bull trout population if it expands.

Selway River core area. The three primary threats identified for this core area are related to fisheries management: illegal angler harvest, presence of brook trout, and reduced prey base due to declining anadromous fish populations (Clearwater Recovery Unit Team, *in litt.* 2000). Angling mortality to bull trout has been documented in the mainstem Selway River below Meadow Creek (CBBTTAT 1998b). Fishing pressure in the Selway River below Meadow Creek is heavy throughout the summer, especially due to heavily used roads such as Forest Service Road 223 along the Selway River. These areas allow for fish harvest of rainbow and cutthroat trout for consumption, whereas the rest of the Selway River above Meadow Creek is catch and release only. Fishing pressure within the wilderness area ranges from light to heavy use, depending on accessibility. In the wilderness and unroaded areas, low presence of law enforcement personnel and assumed low risk of detection, as well as seemingly limitless fishery resources contribute to illegal harvest of bull trout (USFS 2001). Illegal harvest of bull trout is possible but generally not prevalent in these areas.

However, an outfitter's camp is 15 meters (50 feet) from an important spawning reach, and has had problems with illegal harvest (USFS 1999d). Heavy fishing pressure has been documented near the Moose Creek and Shearer airstrips, and illegal bull trout harvest has been documented in both areas (CBBTTAT 1998b).

Brook trout occur in Three Links, Gedney, Rhoda, Meadow, Mink, Buck Lake, East Moose, O'Hara, Pettibone, and Running creeks. The group of brook trout causing perhaps the most adverse impacts occurs in East Moose Creek. These fish have resulted in the extirpation of the native fish assemblage from Moose Lake downstream seven miles (USFS 1999d).

Lower Clearwater and Middle Fork Clearwater River core area. There is a high risk of illegal or accidental bull trout harvest in the North Fork Clearwater River. Brook trout were widely stocked in the early 1900's, and there are currently several populations in the lower Clearwater basin. Brook trout occur within Orofino, Whiskey, Big Canyon, Mission, and Lolo creeks, and in the Potlatch River system (CBBTTAT 1998c). Within the Musselshell and Yoosa Creek drainages of Lolo Creek, strong brook trout populations may hinder recovery of bull trout due to competition and potential hybridization (USFS 1999b). Brook trout also occur in Kay Creek, a tributary of Clear Creek (USFS 2001).

Habitat Fragmentation and Isolation

Overview: Habitat alteration, primarily through the construction of impoundments, dams, and water diversions, has fragmented habitat, eliminated migratory corridors, and isolated bull trout in the headwaters of tributaries (Rieman *et al.* 1997, Dunham and Rieman 1999, Spruell *et al.* 1999, Rieman and Dunham 2000). Impacts to bull trout from dams were discussed above under "Dams". Fragmentation results from other types of passage barriers including culverts (often associated with road crossings) that are impassable to fish, or barriers caused by degraded habitat such as elevated water temperatures. Although fish passage barriers are often considered negative impacts to population connectivity, in some instances they may have a beneficial effect by limiting the spread of exotic species such as brook trout and the associated competition and hybridization impacts to bull trout (CSS 2001).

Increased habitat fragmentation reduces the amount of available habitat and increases isolation from conspecifics (Saunders *et al.* 1991). Burkey (1989) concluded that when species are isolated by fragmented habitat, low rates of population growth are typical in local populations and the probability of their extirpation is directly related to the degree of isolation and fragmentation. Based on population genetics, there is more divergence among bull trout than among salmon (Learn and Allendorf 1997), indicating less genetic exchange among bull trout populations. However, maintenance of migratory corridors for bull trout is essential to provide connectivity among local populations, and allows the reestablishment of extirpated populations. However, the recolonization rate for bull trout is very low and reestablishment may require extended periods of time, especially in light of the current degree of isolation of various bull trout populations.

Evidence suggests that landscape disturbances, such as floods and fires, have increased in frequency and magnitude within the range of bull trout (Henjum *et al.* 1994; USDA and USDI 1997). Where immigration and recolonization are prevented by passage barriers and unsuitable habitat, bull trout may be extirpated by landscape disturbances (USDA and USDI 1997). Also, isolated populations are typically small, more likely to be extirpated by local events than larger populations (Rieman and McIntyre 1995). Small isolated populations can also suffer from loss of genetic diversity and can exhibit negative genetic effects such as inbreeding depression.

The degree to which connectivity limits fish migration and production within the Clearwater River Recovery Unit is thought to be under-represented by existing data and reports (CSS 2001). No consistent and usable data exists which accurately document known or potential barriers to fish migration within the Clearwater River Recovery Unit. Particularly lacking are records of culvert conditions with respect to fish passage, which is thought to be a substantial issue throughout the core area (CSS 2001). Culvert barriers with negative effects on bull trout should be removed or modified to provide for fish passage. The Idaho Forest Practices Act (enforced by

Idaho Department of Lands), the stream channel Protection Act (enforced by IDWR) and Idaho Code 36-906 (enforced by Idaho Department of Fish and Game) require stream crossings on fish-bearing streams to provide unrestricted fish passage.

Further, any barrier blocking anadromous fish passage could have negative impacts on prey distribution and abundance for bull trout. Also barriers blocking the lower reaches of tributaries along the mainstem rivers could negatively impact bull trout because these areas are used (or were historically used) as thermal refuge and as foraging areas by bull trout in the mainstem river (C. Johnson, pers. comm. 2002). Such barriers are threats to bull trout recovery and should be addressed.

North Fork Clearwater River core area. Bull trout habitat connectivity between the North Fork and mainstem Clearwater Rivers has been fragmented by Dworshak Dam. Bull trout populations in the North Fork Clearwater River drainage have been isolated from other populations in the Clearwater River Recovery Unit since the dam was constructed in 1971. See discussion in the “Dams” section above.

Within the North Fork Clearwater River core area habitat is relatively unfragmented, with a few developed areas in need of barrier removals to restore connectivity. There are two culverts on the Little North Fork Clearwater River between Butte and Culdesac creeks that are passage barriers to bull trout (CBBTTAT 1998a). Other identified passage barriers include two culverts in Beaver Creek below Sheep Mountain sub-watershed; three culverts in the North Fork Clearwater River above the Isabella Creek sub-watershed; two culverts in the Death/Fisher/Trail sub-watershed; one culvert in the Cold Springs sub-watershed; two culverts in the Long/Short/Slate sub-watershed; one culvert in the Moose Creek sub-watershed; and one culvert barrier in Mae Creek in the Cayuse Creek watershed (Tables 2 through 11 in CBBTTAT 1998a, USFS 2000).

South Fork Clearwater core area. The threat of passage barriers to bull trout in the South Fork Clearwater River core area is rated as high (CBBTTAT 1998d). The loss of connectivity is primarily associated with habitat degradation in larger streams and rivers that are used for foraging, migrating, and overwintering (CBBTTAT

1998d). Habitat degradation due to loss of cover and increases in water temperature in these larger streams is believed to have significantly reduced the ability of bull trout to move between local population areas within the core area. Although migration and overwintering habitat in Tenmile and Johns creeks remain largely intact, Red River, American River, Newsome Creek, and Crooked River have all experienced substantial degradation of mainstem habitat. This habitat degradation may also be impacting connectivity of this core area to other core areas within the recovery unit. In some years, much of the lower South Fork Clearwater River becomes unsuitable for cold water salmonids during the day and evening due to warm water temperatures. For fish species that migrate through this area, either to reach upstream spawning areas or downstream rearing areas, the habitat in the mainstem has reduced connectivity and rearing capability (CBBTTAT 1998d).

A culvert installed on private land at the mouth of the East Fork of American River is a partial barrier for bull trout (C. Johnson, pers. comm. 2001). There is also a culvert on Big Elk Creek that is a passage barrier to bull trout (CBBTTAT 1998d), and a partial or full barrier to bull trout at a culvert on U.S. Forest Service Road 222 in the headwaters of the South Fork Red River.

Lochsa River core area. Culverts placed in conjunction with road construction in the West Fork of Fishing (Squaw) Creek, Badger, Cold Storage, and Noseeum creeks have hindered or eliminated fish migration or prevented access to foraging habitat. It is unknown whether passage barriers exist in the majority of watersheds in this core area (CBBTTAT 1998b), and further surveys are needed.

Selway River core area. Within the lower Selway River watershed, passage barriers between the Selway River and three tributaries have been identified (CBBTTAT 1998b). At the mouth of Boyd Creek a road culvert at the U.S. Forest Service Road #223 crossing has been identified as a partial or complete barrier to fish migration. Boyd Creek provides the best potential bull trout habitat of the three tributaries. Johnson Creek has a small diversion dam near the headwaters and the reservoir provides irrigation water for the U.S. Forest Service Ranger Station. Island

Creek has a natural five-foot falls at the mouth which is likely passable only during high flows.

Lower Clearwater and Middle Fork Clearwater River core area. Dworshak Dam does not permit bull trout passage between the North Fork Clearwater and the rest of the lower Clearwater basin. Because population isolation may affect long term survival at the bull trout local and metapopulation levels, genetic and ecological studies are necessary to determine the effects of isolation due to Dworshak Dam. Other passage barriers (mainly culverts) also exist within this core area, but have not been consistently documented. Surveys should be conducted to identify passage barriers within the identified potential local population areas.

ONGOING RECOVERY UNIT CONSERVATION MEASURES

Over the last decade planning efforts to restore and recover bull trout have been initiated, and many on-the-ground activities specifically designed to benefit bull trout and other native salmonids within the Clearwater River Recovery Unit have been implemented. Ultimately, the measure by which these efforts should be judged is the degree to which they have produced positive response in the numbers, distribution, trend, and security of bull trout local populations. However, because most of these efforts are relatively young and would not be expected to produce measurable population responses for perhaps several bull trout generations, it is premature to judge the success of most of these programs.

General Aquatic Conservation Measures by Multiple Agencies

Ongoing conservation efforts in the recovery unit for resident and anadromous fish species are summarized in the draft Clearwater Subbasin Summary (CSS 2001) under the section "Existing and Past Efforts," pages 172 to 189. This document is available on the Columbia Basin Fish and Wildlife Authority internet website: www.cbfwf.org/files/province/mtnsnake/clearwater. Nnumerous public and private efforts to alleviate problems with listed anadromous and resident fishes in the Clearwater River basin are discussed. Past conservation efforts in the recovery unit for resident and anadromous fish species are listed in Appendix I, pages 299 to 307. Many of these ongoing and past efforts are primarily designed to improve habitat for anadromous species, but have also benefitted bull trout habitat in mainstem rivers and important tributaries. Actions that support recovery of anadromous fish species are also benefit bull trout recovery by increasing prey abundance, and improving habitats, and connectivity within the Clearwater Recovery Unit.

Several anadromous salmonid propagation facilities operated by the U.S. Fish and Wildlife Service, the State of Idaho, and the Nez Perce Tribe produce and release spring/summer chinook salmon, fall chinook salmon, and steelhead in the recovery unit. A nearly impassable dam existed at Lewiston during 1927-1972, and reduced returns of anadromous fish and extirpated coho salmon (CBBTTAT 1998b). Native (*e.g.*, rainbow trout) and nonnative fish species (*e.g.*, smallmouth and largemouth bass) have been stocked in Dworshak Reservoir by Idaho Department of Fish and Game. Several special angling regulations enacted by the Idaho Department of Fish and Game and the Nez Perce Tribe (*e.g.*, no harvest, gear and bag limits) apply to various areas within the recovery unit.

<u>State of Idaho</u>

The Idaho Department of Fish and Game, in cooperation with several Federal and State agencies, developed a management plan for bull trout in 1993 (Conley 1993), and the State of Idaho approved a plan (governor's plan) for the conservation of bull trout in July 1996 (Batt 1996). The governor's plan identified an overall mission of maintaining or restoring interacting groups of bull trout throughout the species' historic range in the State, and four goals to accomplish the mission: (1) maintenance of habitat conditions in areas supporting bull trout; (2) instituting cost-effective strategies to improve bull trout abundance and habitat; (3) establishing stable or increasing bull trout populations in a set of well-distributed sub-watersheds; and (4) providing for the economic viability of industries in Idaho (Batt 1996). The overall approach of the plan was to use existing, locally developed groups established by Idaho legislation (*i.e.*, Watershed Advisory Groups and Basin Advisory Groups), which were formed to strengthen water quality protection and improve compliance with the Clean Water Act. With the assistance of technical advisory teams, Watershed Advisory Groups were to develop problem assessments in 59 key watersheds containing bull trout and submit the problem assessments to the Basin Advisory Groups by January 1999. The problem assessments were then to be used in developing a conservation plan for each key watershed, with at least six conservation plans developed per year.

The Watershed Advisory Groups have drafted 21 problem assessments throughout Idaho addressing all 59 key watersheds. The Watershed Advisory Groups, however, have not continued to function as was originally intended. To date, a conservation plan has been completed only for the Pend Oreille key watershed.

Angling regulations in Idaho have become more restrictive than in the past. Several conservation actions identified in the problem assessments have been completed or are ongoing, including activities to improve bull trout access to habitat, investigations of methods to reduce abundance of nonnative fish species in bull trout habitat, and angler education regarding bull trout identification.

The Idaho Department of Fish and Game reports annually on bull trout recovery activities throughout the State as a part of the Endangered Species Act Section 6 Agreement with the U.S. Fish and Wildlife Service and the accompanying biological opinion. The Idaho Department of Fish and Game completed a mapping effort in 1998 to update bull trout distribution data within the State of Idaho, including all known occurrences, spawning and rearing areas, and potential habitat.

The State of Idaho classified numerous tributaries of the Clearwater River as Stream Segments of Concern. Mandatory site-specific Best Management Practices developed by local working committees for each of these watersheds, help minimize impacts that may result from timber management. These Best Management Practices may exceed current Forest Practices Act regulations. Although Stream Segments of Concern and the associated local working committees no longer exist due to legislation, development of the Basin Advisory Group and Watershed Advisory Group process allows for continued involvement of local working committees. The developed Best Management Practices are still in effect today and can be updated if a watershed analysis indicates they are inadequate to protect water quality.

The Idaho Department of Lands took a proactive stance with regard to evaluating the effects of forest practices on water quality in 1991 when the Idaho Legislature amended the Forest Practices Act to include cumulative effects. In 1995, the Land Board accepted and approved the Cumulative Watershed Effects Process for Idaho. This process includes modules for assessing erosion and mass failure hazards, canopy closure/stream temperature (adjusted for elevation and drought conditions), stream channel stability and hydrologic risk factors, sediment delivery from roads and skid trails, beneficial use/fine sediment assessment, and nutrient assessment where applicable (IDL 2000). Since 1995, the Cumulative Watershed Effects analysis has been conducted on many watersheds throughout the State. The data generated by this process is currently being used by the State Department of Environmental Quality to develop Total Maximum Daily Loads and site specific implementation plans to alleviate identified water quality threats. The Idaho Department of Lands is in the process of compiling Cumulative Watershed Effects results in the form of a report for several sixth field hydrologic unit codes units within the Clearwater River Basin. These reports, approximately fifty from within the Clearwater River Basin, will be field verified during the summer of 2002 and finalized for publication by spring 2003. Information in these reports that may be useful to bull trout recovery efforts include; forest road inventories and identification of management problems such as road surface-generated sediment delivery and the location and size of road-induced mass failures. This information could be utilized to identify and correct road-related problems.

Idaho Department of Lands has been actively graveling roads that closely parallel bull trout streams, to help minimize sediment delivery (J. Dupont, Idaho Department of Lands, pers. comm. 1998). They also have adopted a more stringent stream shading standard to insure that timber harvest activities near streams will not increase stream temperatures above the preferred range for bull trout and coldwater salmonids (J. Dupont, pers. comm. 1998).

The Idaho Soil Conservation Commission and the Soil and Water Conservation Districts in Idaho implement a wide variety of Best Management Practices aimed at controlling nonpoint source pollution to Idaho streams. These Best Management Practices are cost-shared through various State and Federal grant programs. The Natural Resources Conservation Service is the lead agency that supplies the necessary standards and specifications used in the design of these Best Management Practices. The 1991 Idaho Agricultural Pollution Abatement Plan places increased emphasis on livestock grazing/riparian management, non-permitting livestock confinement areas, agri-chemical management, and ground water quality protection. The goal of this plan is to restore and maintain Idaho waters impacted by agricultural nonpoint sources to the point of fully supporting identified beneficial uses

Federal Agencies

Aside from the standard Columbia Basin land management, water management, and Endangered Species Act guidelines that apply to Federal actions (see Chapter 1), there have been several significant Federal efforts with specific implications to bull trout in the Clearwater River Recovery Unit.

The U.S. Fish and Wildlife Service has negotiated a Habitat Conservation Plan with Plum Creek Timber Company. The Habitat Conservation Plan includes bull trout and native salmonids occurring on over 688,500 hectares (1.7 million acres) of corporate lands that are primarily (over 90 percent) within the Clark Fork recovery unit and partially in the Clearwater River Recovery Unit, upper Lochsa drainage. A Final Environmental Impact Statement was published in September, 2000, and the Habitat Conservation Plan was signed in December, 2000. Successful implementation of the Habitat Conservation Plan is expected to result in a higher standard for private timberland management activities, including reduced impacts of future actions and remediation of existing problems to the benefit of bull trout.

As a requirement of section 303(d) of the Clean Water Act, a list of impaired waters must be prepared by each state, and approved by the U.S. Environmental Protection Agency, for all waterbodies that do not fully support their beneficial uses. The majority of streams within the Clearwater River Recovery Unit have designated beneficial uses (*e.g.*, recreation, primary and secondary contact recreation, salmonid spawning, domestic water supply, agricultural water supply, and cold water biota) assigned by Idaho Department of Environmental Quality. Several waterbodies fail to meet water quality standards and have been designated as Water Quality Limited Segments (see core area descriptions above) (CSS 2001). Pollutants identified include sediment, dissolved oxygen, flow, habitat alteration nutrients, thermal modification and pathogens. Waterbodies on the 303(d) list are reviewed through the subbasin assessment process to determine if they should remain on the list or be proposed to the Environmental Protection Agency for delisting. Total Daily Maximum Loads (TMDL) are required for all impaired water bodies that remain on the section 303(d) list. This process includes development of a watershed assessment, and a load allocation and implementation plan (CSS 2001). Five TMDLs have been developed within the Clearwater River Recovery Unit and four additional TMDLs are planned for completion between 2001 and 2003: South Fork, Middle Fork, Lower North Fork, and mainstem Clearwater Rivers (CSS 2001). However, implementation of these plans are voluntary under Idaho State law. These TMDLs have no statutory implementation authority by the Environmental Protection Agency under the Clean Water Act or under Idaho State Law. Appendix A 3 contains the State of Idaho's 303(d) list for the Clearwater River Recovery Unit.

Approximately 10 watershed biological assessments have been completed to date that address federal land management actions in watersheds with bull trout in the Clearwater River Recovery Unit (CSS 2001 and USFWS, *in litt.* 1995-2001). These assessments provide a description of baseline habitat and population conditions as required to assess Federal actions during Endangered Species Act Section 7 consultation. These consultations have taken place in accordance with streamlining procedures required under a Memorandum of Understanding between the U.S. Fish and Wildlife Service, U.S. Forest Service, Bureau of Land Management, and National Marine Fisheries Service (USFS, BLM, NMFS and USFWS 1999). Of the completed formal consultations, none of the Federal actions were determined to jeopardize the continued existence of the Columbia River Basin distinct population segment for bull trout, and many actions were modified to minimize the impacts to bull trout. The corresponding biological opinions include conservation recommendations to suggest additional actions that the consulting agencies may take which would be beneficial to listed species.

The U.S. Forest Service and the Bureau of Land Management are continuing efforts to rehabilitate areas where roads are contributing excess sediment to bull trout habitat in the recovery unit. These rehabilitation activities are outlined in site-specific watershed analyses and biological assessments for ongoing and proposed activities in watersheds occupied by bull trout. For example, during 1998 to 2000 the U.S. Forest Service removed 22.5 kilometers (14 miles) of road in the Fishing (Squaw) Creek watershed of the Lochsa River core area (CSS 2001).

The National Marine Fisheries Service and the U.S. Fish and Wildlife Service released the Federal Columbia River Power System biological opinions on the effects to listed species from operation of the Federal Columbia River Power System in the Columbia Basin in December 2000 (USDC 2000 and USFWS 2000). Ten federal agencies responded by crafting the Conservation of Columbia Basin Fish: Final Basin-Wide Recovery Strategy (Federal Caucus 2000) to provide the framework for development of recovery plans for individual species and for effects determinations for actions under consultation. Actions in the Strategy focus on tributary habitats, (both Federal and non-Federal), mainstem habitat, and estuary habitat. The Clearwater Basin would be a target for recovery efforts under this strategy. While the salmon recovery framework has only recently been adopted, and thus the benefits of this recovery framework have not yet been realized, the U.S. Fish and Wildlife Service envisions significant improvements in habitat conditions for listed salmonids as the actions of the framework are implemented. In particular, watersheds with substantial portions of non-Federal lands such as the Lower/Middle Fork Clearwater River core area are likely to benefit more than those that are largely federally managed lands.

As part of the Pacific Northwest Electric Power Planning and Conservation Act of 1980, the Bonneville Power Administration has the responsibility to protect, mitigate and enhance fish and wildlife resources affected by operation of Federal hydroelectric projects in the Columbia River and tributaries. The Northwest Power Planning Council develops and implements the Columbia River Basin Fish and Wildlife Program which is funded by the Bonneville Power Administration and implemented by the U.S. Army Corps of Engineers, Bureau of Reclamation, Federal Energy Regulatory Commission and other agencies. The Northwest Power Planning Council has identified subbasin planning as a key means for identifying projects that will be funded to protect, mitigate, and enhance the Columbia River Basin's fish and wildlife resources in accordance with the Regional Act and the Columbia Basin Fish and Wildlife Program. The subbasin planning process involves conducting subbasin assessments, developing subbasin plans, and prioritizing actions based on those plans. Once the assessments are complete, the Federal agencies will participate with State agencies, local governments, tribes and stakeholders to develop subbasin plans. Subbasin plans identify status of fish and wildlife resources, limiting factors, and recommended actions and strategies at the subbasin level. Subbasin plans address species listed under the Endangered Species Act, and coordination between the Northwest Power Planning Council and the U.S. Fish and Wildlife Service is facilitating development of subbasin plans and U.S. Fish and Wildlife Service recovery plans. The Draft Clearwater River Basin Summary (CSS 2001) has been utilized in the preparation of this bull trout recovery unit chapter.

Native American Tribal Activities

The Nez Perce people have been residents in the study area for over 8,000 years. The early users of this area relied heavily upon salmon fishing for subsistence, supplemented with big game. The Nez Perce Treaty of 1855 retained the Tribe's rights to activities in the area, and it established a responsibility for the management of fish and wildlife resources (CBBTTAT 1998a). The Nez Perce Tribe cooperatively and individually implements fish and wildlife restoration and mitigation activities throughout the Clearwater River Recovery Unit.

Coho salmon runs were extirpated from the Clearwater River basin by 1986, likely as a result of the Lewiston Dam (Nez Perce Tribe and Idaho Fish and Game 1990). The Nez Perce Tribe began a coho reintroduction program in 1995, and adults have been returning since 1997. The Tribe continues to expand the program, but no tribal or sport harvest has been initiated.

The Tribe leads and cooperates with other agencies on a number of projects related to bull trout recovery (D. Statler, pers. comm. 2002). They are a co-lead with the State of Idaho in the Focus Watershed Project. As such, they led an interagency team in the preparation of the draft Clearwater Subbasin Summary (CSS 2001) that was prepared for the Northwest Power Planning Council, and are currently finalizing the associated Assessment for the Clearwater Subbasin. This assessment will specifically identify necessary habitat improvement measures for listed species (including bull trout) such as road closures, road removal, riparian rehabilitation, and in-stream habitat improvements. The Tribe is also working with the Corps of Engineers, Idaho Water Resources, and National Marine Fisheries Service on the operating plan for Dworshak Dam to maintain health of the reservoir, which has been documented by Idaho Department of Fish and Game to provide essential foraging and overwintering habitat for bull trout. The Nez Perce Tribe also participated as a member of the Clearwater Watershed Advisory Group formed under the Idaho Governor's Bull Trout Conservation Plan (Batt 1996). The Watershed Advisory Group completed four Problem Assessments for Bull Trout in the Clearwater basin (CBBTTAT 1998a, b, c, d).

The Fish and Wildlife Commission of the Nez Perce Tribe enacted a fishery regulation on May 2, 2001, prohibiting the take of bull trout within the ceded area (1855 Treaty area), which includes the majority of the Clearwater Recovery Unit. The Tribe is collaborating with the Clearwater National Forest to accomplish habitat improvement and research projects (D. Statler, pers. comm. 2002). Habitat improvements primarily involve road removal projects, and research has included genetics testing of bull trout in the Lochsa and North Fork Clearwater drainages to determine hybridization rates with brook trout.

STRATEGY FOR RECOVERY

A core area represents the closest approximation of a biologically functioning unit for bull trout. The combination of core habitat (*i.e.*, habitat that could supply all the necessary elements for the long-term security of bull trout, including for both spawning and rearing, as well as for foraging, migrating, and overwintering) and a core population (*i.e.*, bull trout inhabiting a core habitat) constitutes the basic core area upon which to gauge recovery within a recovery unit.

Bull trout are widely distributed in the Clearwater River Recovery Unit. The Clearwater River recovery team identified local and potential local populations through application of a matrix exercise. The Clearwater River Recovery Unit consists of 7 core areas, with a total of 45 local populations and 27 potential local populations distributed among the core areas (Table 2) (Clearwater Recovery Unit Team, *in litt.* 2000; Clearwater Recovery Unit Team, *in litt.* 2002). The number of local populations includes those stream complexes for which the presence of bull trout spawning and rearing is known or determined through professional judgement as highly likely. As more fish distribution and abundance information is collected, the number of local populations identified will likely increase. The recovery team also identified potential local populations for some core areas. A potential local population is a known or suspected unoccupied area (due to habitat degradation or access barriers) that has the potential to provide spawning and rearing habitat for bull trout, and support a local population in the future as bull trout are recovered and after habitat or access has been restored.

Table 2. List of bull trout local populations and potential local populations, by core area, in the Clearwater River Recovery Unit.

Core Area	Local Population	Potential Local Population
North Fork Clearwater River	Kelly Creek	Cold Springs Creek*
	Cayuse Creek	Rock Creek*
	Moose Creek	Orogrande Creek

Core Area	Local Population	Potential Local Population
	Upper North Fork Clearwater (including Black Canyon)	Beaver Creek
	Fourth of July Creek	
	Weitas Creek	
	Quartz Creek	
	Skull Creek	
	Isabella Creek	
	Little North Fork Clearwater River	
	Floodwood Creek	
Fish Lake (North Fork Clearwater River)	Fish Lake	
Lochsa River	Fishing (Squaw) Creek	Post Office Creek*
	Legendary Bear (Papoose) Creek	Weir Creek*
	Fox Creek	Indian Grave Creek*
	Shotgun Creek	Lake Creek*
	Crooked Fork / Hopeful Creek	Boulder Creek*
	Boulder Creek	Old Man Creek*
	Haskell Creek	Hungery Creek*
	Rock Creek	Fish Creek*
	Brushy Fork Creek	Split Creek*
	Spruce Creek	Pete King Creek
	Twin Creek	Canyon Creek
	Colt Killed (White Sands) Creek	Deadman Creek
	Beaver Creek	Fire Creek
	Storm Creek	Coolwater Creek
Lochsa River (cont'd)	Walton Creek	
	Lower Warm Springs Creek	
Fish Lake (Lochsa River)	Fish Lake	

Core Area	Local Population	Potential Local Population
Selway River	Upper Selway River	Marten Creek*
	Magruder Creek	Mink Creek*
	Deep Creek	Gedney Creek*
	Little Clearwater River	O'Hara Creek*
	Indian Creek	Three Links Creek
	White Cap Creek	
	Running Creek	
	Bear Creek	
	Moose Creek	
	Meadow Creek	
South Fork Clearwater River	Red River	Mill Creek*
	Crooked River	American River*
	Newsome Creek	Meadow Creek
	Tenmile Creek	
	Johns Creek	
Lower and Middle Fork Clearwater River	Lolo Creek	Clear Creek*

* Denotes an Essential Potential Local Population (see Recovery Criteria #1).

Recovery Goals and Objectives

The goal of the bull trout recovery plan is to **ensure the long-term persistence of self-sustaining, complex, interacting groups of bull trout distributed across the species native range, so that the species can be delisted**. To accomplish the goal, recovery objectives addressing distribution, abundance, habitat and genetics were identified.

The recovery objectives for the Clearwater River Recovery Unit are as follows:

- Maintain the current distribution of bull trout and restore their distribution in previously occupied areas within the Clearwater River Recovery Unit.

- Maintain stable or increasing trends in abundance of bull trout in the Clearwater River Recovery Unit.
- Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.

- Conserve genetic diversity and provide opportunity for genetic exchange.

Rieman and McIntyre (1993) and Rieman and Allendorf (2001) evaluated the bull trout population numbers and habitat thresholds necessary for long-term viability of the species. They identified four elements, and the characteristics of those elements, to consider when evaluating the viability of bull trout populations. These four elements are (1) number of local populations; (2) adult abundance (defined as the number of spawning fish present in a core area in a given year); (3) productivity, or the reproductive rate of the population (as measured by population trend and variability); and (4) connectivity (as represented by the migratory life history form and functional habitat). For each element, the Clearwater River Recovery Unit Team classified bull trout into relative risk categories based on the best available data and the professional judgment of the team.

The Clearwater River Recovery Unit Team also evaluated each element under a potential recovered condition to produce recovery criteria. Evaluation of these elements under a recovered condition assumed that actions identified within this chapter had been implemented. Recovery criteria for the Clearwater River Recovery Unit reflect (1) the stated objectives for the recovery unit, (2) evaluation of each population element in both current and recovered conditions, and (3) consideration of current and recovered habitat characteristics within the recovery unit. Recovery criteria will probably be revised in the future as more detailed information on bull trout population dynamics becomes available. Given the limited information on bull trout, both the level of adult abundance and the number of local populations needed to lessen the risk of extinction should be viewed as a best estimate.

This approach to developing recovery criteria acknowledges that the status of populations in some core areas may remain short of ideals described by conservation biology theory. Some core areas may be limited by natural attributes or by patch size and may always remain at a relatively high risk of extinction. Because of limited data within the Clearwater River Recovery Unit, the recovery unit team relied heavily on the professional judgment of its members.

Local Populations. Metapopulation theory is important to consider in bull trout recovery. A metapopulation is an interacting network of local populations with varying frequencies of migration and gene flow among them (Meffe and Carroll 1994) (see Chapter 1). Multiple local populations distributed and interconnected throughout a watershed provide a mechanism for spreading risk from stochastic events. In part, distribution of local populations in such a manner is an indicator of a functioning core area. Based in part on guidance from Rieman and McIntyre (1993), bull trout core areas with fewer than 5 local populations are at increased risk, core areas with between 5 and 10 local populations are at intermediate risk, and core areas with more than 10 interconnected local populations are at diminished risk.

In the North Fork Clearwater River and Lochsa River core areas there are currently 11 and 16 known local populations, respectively. Based on the above guidance, bull trout in these core areas are at a diminished risk of adverse effects from stochastic events. Bull trout in the Selway River Core Area are at an intermediate risk because there currently are 10 known local populations. In the South Fork Clearwater River Core Area there are currently five known local populations; these bull trout are at an increased risk from stochastic events. There is one known local population in each of the Fish Lake (North Fork Clearwater River), Middle Fork/Lower Clearwater River, and Fish Lake (Lochsa River) core areas. Based on the above guidance, bull trout in these core areas are at an increased risk of adverse effects from stochastic events, and additional local populations are needed to reduce this risk.

Adult Abundance. The recovered abundance levels in the Clearwater River Recovery Unit were determined by considering theoretical estimates of effective population size, historical census information, and the professional judgment of recovery team members. In general, effective population size is a theoretical concept that allows us to predict potential future losses of genetic variation within a population due to small population sizes and genetic drift (see Chapter 1). For the purpose of recovery planning, effective population size is the number of adult bull trout that successfully spawn annually. Based on standardized theoretical equations (Crow and Kimura 1970), guidelines have been established for maintaining minimum effective population sizes for conservation purposes. Effective population sizes of greater than 50 adults are necessary to prevent inbreeding depression and a potential decrease in viability or reproductive fitness of a population (Franklin 1980). To minimize the loss of genetic variation due to genetic drift and to maintain constant genetic variance within a population, an effective population size of at least 500 is recommended (Franklin 1980; Soule 1980; Lande 1988). Effective population sizes required to maintain long-term genetic variation that can serve as a reservoir for future adaptations in response to natural selection and changing environmental conditions are discussed in Chapter 1 of the recovery plan.

For bull trout, Rieman and Allendorf (2001) estimated that a minimum number of 50 to 100 spawners per year is needed to minimize potential inbreeding effects within local populations. In addition, a population size of between 500 and 1,000 adults in a core area is needed to minimize the deleterious effects of genetic variation from drift.

For the purposes of bull trout recovery planning, abundance levels were conservatively evaluated at the local population and core area levels. Local populations containing fewer than 100 spawning adults per year were classified as at risk from inbreeding depression. Bull trout core areas containing fewer than 1,000 spawning adults per year were classified as at risk from genetic drift.

Abundance estimates for the Clearwater River Recovery Unit are currently not available due to limited and nonrepresentative data. Similarly, detailed abundance estimates are not available at the local population scale. However, the recovery unit team was able to estimate abundance for some core areas. For the Fish Lake (Lochsa River) and the Middle Fork/Lower Clearwater River core areas, there are likely less than 500 adult-sized fish present. Based on the above guidance, these core areas are at an increased risk of genetic drift. The recovery unit team estimated that there are likely at least 500 adult-sized fish present in the remaining core areas: North Fork Clearwater River, Fish Lake (North Fork Clearwater River), Lochsa River, Selway River, and South Fork Clearwater River. However, additional monitoring data is needed to thoroughly evaluate the risk that genetic drift poses to these core areas.

Productivity. A stable or increasing population is a key criterion for recovery under the requirements of the Endangered Species Act. Measures of the trend of a population (the tendency to increase, decrease, or remain stable) include population growth rate or productivity. Estimates of population growth rate (*i.e.*, productivity over the entire life cycle) that indicate a population is consistently failing to replace itself also indicate an increased risk of extinction. Therefore, the reproductive rate should indicate that the population is replacing itself, or growing.

Since estimates of the total population size are rarely available, the productivity or population growth rate is usually estimated from temporal trends in indices of abundance at a particular life stage. For example, redd counts are often used as an index of a spawning adult population. The direction and magnitude of a trend in the index can be used as a surrogate for the growth rate of the entire population. For instance, a downward trend in an abundance indicator may signal the need for increased protection, regardless of the actual size of the population. A population that is below recovered abundance levels, but that is moving toward recovery, would be expected to exhibit an increasing trend in the indicator.

The population growth rate is an indicator of probability of extinction. This probability cannot be measured directly, but it can be estimated as the consequence of the population growth rate and the variability in that rate. For a population to be considered viable, its natural productivity should be sufficient for the population to replace itself from generation to generation. Evaluations of population status will also have to take into account uncertainty in estimates of population growth rate or productivity. For a population to contribute to recovery, its growth rate must indicate that the population is stable or increasing for a period of time. Based on the lack of survey data in the North Fork Clearwater River, Lochsa River, Fish Lake (Lochsa River), Selway River, South Fork Clearwater

River, and Middle Fork/Lower Clearwater River core areas, bull trout in these areas are considered at an increased risk. In contrast, bull trout in the Fish Lake (North Fork Clearwater River) Core Area are at a diminished threat due to long-term creel data that indicates a stable population trend.

Connectivity. The presence of the migratory life history form within the Clearwater River Recovery Unit was used as an indicator of the functional connectivity of the recovery unit. If the migratory life form was absent, or if the migratory form is present but local populations lack connectivity, the core area was considered to be at increased risk. If the migratory life form persists in at least some local populations, with partial ability to connect with other local populations, the core area was judged to be at intermediate risk. Finally, if the migratory life form was present in all or nearly all local populations, and had the ability to connect with other local populations, the core area was considered to be at diminished risk.

Migratory bull trout likely persist in most local populations in the North Fork Clearwater River, Fish Lake (North Fork Clearwater River), Lochsa River, Fish Lake (Lochsa River), and Selway River core areas; these areas are therefore considered at a diminished risk. Migratory bull trout may persist in some local populations in the South Fork Clearwater River Core Area and thus are considered at an intermediate risk. Migratory bull trout in the Middle Fork/Lower Clearwater River Core Area are believed to be absent. Based on the above guidance, this core area is at increased risk. The low abundance of the migratory life history strategy limits the possibility for genetic exchange and local population re-establishment.

Recovery Criteria

Recovery criteria for bull trout in the Clearwater River Recovery Unit are the following:

1. **Maintain the current distribution of bull trout in the 45 currently identified local populations, restore or confirm distribution in the 18 potential local populations that are necessary for recovery, and**

determine the feasibility of establishing 8 additional potential local populations (Table 2 and Figures 3 through 9). The Clearwater recovery team identified several potential local populations where there is either documented bull trout presence but no documentation of spawning and rearing, or historical presence but no current (or insufficient) survey data to indicate bull trout presence or absence. These areas currently provide suitable habitat, or did historically and could again if restored. The Clearwater recovery unit team determined that 26 potential local populations are important for bull trout recovery within the recovery unit. Due to varying levels/degrees of threats/degradation and funding practicalities (MTBTSG 1998), the recovery unit team divided these 26 potential local populations to one of two groups in an effort to provide maximum recovery benefits to bull trout. Eighteen potential local populations were assigned a higher priority and determined to be essential to bull trout recovery because they will assist with attainment of the recovery objectives and criteria for distribution and abundance and will improve connectivity within and between core areas. These potential local populations include Rock, Cold Springs, Post Office, Weir, Hungery, Fish, Indian Grave, Lake, Boulder, Old Man, Split, Marten, Mink, Gedney, O'Hara, Clear, and Mill creeks, and American River. Most of these streams do not have adequate survey data and should be investigated to determine whether local populations are currently present. Eight potential local populations were assigned a lower priority because they currently either have degraded habitat or threats present such that support of bull trout may not be currently possible. The second priority potential local populations include Beaver, Orogrande, Deadman, Canyon, Coolwater, Fire, Pete King, Meadow, and Three Links creeks (Clearwater Recovery Unit Team, *in litt.* 2000; Clearwater Recovery Unit Team, *in litt.* 2002). Should limited funding be available, recovery actions should first be directed toward the higher priority 18 potential local populations.

2. **Achieve estimated abundance of adult bull trout of at least 21,500 individuals in the Clearwater River Recovery Unit including at least 500 individuals in each of the Fish Lake (North Fork Clearwater River), the Fish Lake (Lochsa River), and the Lower/Middle Fork**

Clearwater River core areas; and at least 5,000 individuals in each of the North Fork Clearwater River, the Lochsa River, the Selway River, and the South Fork Clearwater River core areas (Table 3). Abundance of adult bull trout for the recovery unit was estimated based on professional judgement using surveyed fish densities, consideration of current habitat conditions and potential conditions after threats have been addressed (Clearwater Recovery Unit Team, *in litt.* 2000).

3. **Restore adult bull trout local populations to exhibit stable or increasing trends in abundance in the Clearwater River Recovery Unit, based on at least 15 years of monitoring data.** The intent of this criterion is that adult bull trout in core areas presently below their recovered abundance exhibit increasing trends, whereas bull trout in core areas that may be at their recovered abundance exhibit stable trends. See Monitoring Strategy section of this chapter for further clarification.

4. **Address specific known barriers to bull trout migration in the Clearwater River Recovery Unit, and identify and address additional barriers. Known passage barriers that must be addressed include: culvert on Forest Service Road 222 (T26N, R8E, S3) in South Fork Red River; private road culvert at confluence of East Fork American River with American River; culvert on county road crossing in Big Elk Creek approximately 0.65 miles upstream from Little Elk Creek confluence; culvert on Forest Service Road 108 in the West Fork Fishing (Squaw) Creek; culverts on Highway 12 at Badger, Cold Storage, and Noseeum creeks; culvert on Forest Service Road 223 at the mouth of Boyd Creek. Other passage barriers that must be addressed are those that have been identified within a general location and need further investigation on the specific location, including: Little North Fork Clearwater River (two culverts between Butte and Culdesac creeks); Beaver Creek below Sheep Mountain sub-watershed (two culverts); North Fork Clearwater River above Isabella Creek sub-watershed (three culverts); Death/Fisher/Trail sub-watershed (two culverts); Cold Springs sub-watershed (one culvert), Long/Short/Slate sub-watershed (two culverts); Moose Creek sub-watershed (one**

culvert); Cayuse Creek watershed (culvert barrier in Mae Creek). Substantial gains in reconnecting fragmented habitat may be achieved in all core areas by restoring passage over or around many of the barriers that are typically located on smaller streams, including road crossings, culverts, and water diversions. The priority for elimination of passage barriers and re-establishment of connectivity by core area is; the South Fork Clearwater, Lochsa, North Fork Clearwater, Lower/Middle Fork Clearwater, and Selway River core areas. Within the core areas, priority should be placed on watersheds currently occupied by bull trout.

The known barriers are listed above and in the Recovery Measures Narrative (section 1.2) portion of this plan, but many have not yet been identified. However, they are collectively very important to recovery. Tasks to identify and assess barriers to bull trout passage are recommended in this recovery plan and appropriate actions must be implemented. A list of all such artificial barriers should be prepared in the first five years of implementation. Surveys to identify passage barriers should be prioritized by core area as follows: South Fork Clearwater, Lochsa, North Fork Clearwater, Lower/Middle Fork Clearwater, and Selway River core areas. Substantial progress must be made in providing passage over the majority of these sites, consistent with the protection of upstream populations of westslope cutthroat trout and other native fishes, to meet the bull trout recovery criteria for connectivity.

Recovery criteria for the Clearwater River Recovery Unit were established to assess whether recovery actions are resulting in the recovery of bull trout. The Clearwater River Recovery Unit Team expects that the recovery process will be dynamic and will be refined as more information becomes available. While removal of bull trout as a species under the Endangered Species Act (*i.e.*, delisting) can only occur for the entity that was listed (Columbia River distinct population segment), the criteria listed above will be used to determine when the Clearwater River Recovery Unit is fully contributing to recovery of the population segment.

Table 3. Summary of the recovery criteria for bull trout in the Clearwater River Recovery Unit.

Core Area in the Clearwater River Recovery Unit	Number of Local and Potential Local Populations[1]	Minimum Adult Abundance[1]	Trend in Abundance	Number of Known and Suspected Barriers Addressed
North Fork Clearwater River	11 local populations, 2 potential	5,000	stable to increasing	at least 14
Fish Lake (North Fork Clearwater River)	1 local population	500	stable to increasing	none
Lochsa River	16 local populations, 9 potential	5,000	stable to increasing	at least 4
Fish Lake (Lochsa River)	1 local population	500	stable to increasing	none
Selway River	10 local populations, 4 potential	5,000	stable to increasing	at least 2
South Fork Clearwater River	5 local populations, 2 potential	5000	stable to increasing	at least 3
Lower and Middle Fork Clearwater River	1 local population, 1 potential	500	stable to increasing	no currently known
Total Numbers	45 local populations, 18 potential	21,500	stable to increasing	at least 23

[1] Local population numbers and estimated adult abundance were derived from the Clearwater River bull trout recovery team meetings of June 12, 2000, and April 2002 (Clearwater Recovery Unit Team, *in litt.* 2000; Clearwater Recovery Unit Team, *in litt.* 2002).

Research Needs Related to Bull Trout Abundance, Distribution, and Actions Needed

Based on the best scientific information available, the Clearwater River Recovery Unit Team has identified recovery criteria, and actions necessary for recovery of bull trout within the recovery unit. However, the recovery unit team recognizes that uncertainties exist regarding bull trout population abundance, distribution, and actions needed to achieve recovery. The recovery team feels that if effective management and recovery are to occur, the recovery plan for the Clearwater River will be viewed as a “living” document, which will be updated as new information becomes available. The recovery unit team will rely on adaptive management to guide recovery implementation. Adaptive management is a continuing process of planning, monitoring, evaluating management actions, and research. Adaptive management will involve a broad spectrum of user groups and will lay the framework for decision-making relative to recovery implementation and ultimately the possible revision of recovery criteria in this recovery unit. As a part of this adaptive management approach, the recovery unit team has identified research needs which are essential within the recovery unit.

A primary research need is a complete understanding of the current, and future, role that the mainstem Snake River should play in the recovery of bull trout. It is likely that a portion of the fluvial bull trout in the Clearwater River basin historically migrated into the mainstem Snake River to overwinter and feed, resulting in intermingling with other bull trout populations. The construction of two dams for power and irrigation in 1925 on the lower Clearwater River 5,027 and 6,764 meters (5,500 and 7,400 yards) above the mouth may have impacted connectivity of bull trout populations from the Clearwater River Recovery Unit with other recovery units. These dams reduced fish runs in the Clearwater River basin more than any other factor because the lower dam (built to provide power) was built without any provision for fish passage until 15 years after it was constructed. For example, chinook counts over the diversion dam declined from 335 in 1928, to 103 in 1929, to 7 in 1938. Legacy effects include reduced native anadromous fish populations, and may also include reduced levels or loss of connectivity of Clearwater bull trout local populations with other Columbia River basin bull trout local populations.

Uncertainty as to the current use of the mainstem Snake River by fluvial bull trout that also use the habitat in the recovery unit has led the recovery team to identify bull trout use of the Snake River as a research need. Given that bull trout have recently been found in the Snake River in the Hells Canyon Complex and downstream of the mouth of the Grand Ronde River, a better understanding of migration patterns between basins would greatly enhance the opportunities for recovery. The recovery team believes that migrational studies for the Clearwater River Recovery Unit should be coordinated with the Hells Canyon Complex, Grande Ronde, Imnaha, and Salmon River recovery units to provide a more complete understanding of adult bull trout habitat requirements.

The team has identified an urgent need for the development of a standardized monitoring and assessment program which would more accurately describe the current status of bull trout within the recovery unit, as well as identify improvements in sampling protocols and allow for monitoring the effectiveness of recovery actions. Development and application of models that assess extinction risk relative to abundance and distribution parameters are critical in refining recovery criteria as the recovery process proceeds. In addition, the development of a scientifically based approach for detecting bull trout presence is essential for recovery implementation.

This recovery unit chapter is the first step in the planning process for bull trout recovery in the Clearwater River Recovery Unit. Monitoring and evaluation of population levels and distribution will be an important component of any adaptive management approach. The Service will take the lead in developing a comprehensive monitoring approach which will provide guidance and consistency in evaluating bull trout populations. An important component in the application of adaptive management in recovery implementation will be the evaluation of the implementation of recommended actions and monitoring of their effectiveness.

The effects of Dworshak dam on bull trout populations in the Clearwater River Recovery Unit have been significant and should be researched. Dworshak dam does not permit any fish passage between the North Fork Clearwater and the rest of the Clearwater River basin, except downstream passage on occasion. Bull trout populations in the North Fork Clearwater have been isolated from the Lochsa, Selway and South Fork populations since the dam was constructed in 1971. It is unclear to what degree these populations interacted prior to construction of the dam. Because population isolation may affect long-term population survival at the bull trout individual, local population, and metapopulation levels, genetic and ecological studies are necessary to provide information to determine the effects of isolation due to Dworshak Dam (CBBTTAT 1998b). Genetic comparisons between these populations would help determine if there is a need to re-establish the connection between these subbasins. In addition, the releases of water from Dworshak Dam have large affects on water flows and temperatures in the Clearwater River below the dam. Altered water temperatures may affect the spawning locations of bull trout prey species such as fall chinook, resulting in redd placement that is lower in the Clearwater and Snake Rivers compared to historic placement. The effects of warmer winter water temperatures and cooler summer water temperatures, resulting from the regulation of Dworshak Dam flows, on bull trout distribution and movements in the lower Clearwater River are unknown and should be investigated (CBBTTAT 1998c). Investigations should also determine whether summer drawdowns of Dworshak reservoir create a thermal barrier at the head of the reservoir, hindering bull trout migration and access to upstream tributaries in the North Fork core area.

ACTIONS NEEDED

Recovery Measures Narrative

In this chapter and all other chapters of the bull trout recovery plan, the recovery measures narrative consists of a hierarchical listing of actions that follows a standard template. The first-tier entries are identical in all chapters and represent general recovery tasks under which specific (*e.g.*, third-tier) tasks appear when appropriate. Second-tier entries also represent general recovery tasks under which specific tasks appear. Second-tier tasks that do not include specific third-tier actions are usually programmatic activities that are applicable across the species' range; they appear in *italic type*. These tasks may or may not have third-tier tasks associated with them; see Chapter 1 for more explanation. Some second-tier tasks may not be sufficiently developed to apply to the recovery unit at this time; they appear in *a shaded italic type (as seen here)*. These tasks are included to preserve consistency in numbering tasks among recovery unit chapters and intended to assist in generating information during the comment period for the draft recovery plan, a period when additional tasks may be developed. Third-tier entries are tasks specific to the Clearwater River Recovery Unit. They appear in the implementation schedule that follows this section and are identified by three numerals separated by periods.

The Clearwater River Recovery Unit chapter should be updated or revised as recovery tasks are accomplished, or revised as environmental conditions change, and monitoring results or additional information become available. Revisions to the Clearwater River Recovery Unit chapter will likely focus on priority streams or stream segments within core areas where restoration activities occurred, and habitat or bull trout populations have shown a positive response. The Clearwater River Recovery Unit team should meet annually to prioritize recovery activities, review annual monitoring reports and summaries, and make recommendations to the U.S. Fish and Wildlife Service.

1 Protect, restore, and maintain suitable habitat conditions for bull trout.

1.1 Maintain or improve water quality in bull trout core areas or potential core habitat.

1.1.1 Reduce fine sediment production. Identify and reduce fine sediment sources from agriculture and forest management practices in watersheds of the Clearwater River Recovery Unit. Stabilize roads, road stream crossings, landslides and other known sources of sediment delivery. Implement recommendations from the U.S. Forest Service and Bureau of Land Management Watershed Analyses and other plans that are geared to remediation of sediment production. Implement Best Management Practices in timber sale planning to minimize sediment production associated with logging activities. Monitor the effectiveness of sediment reduction projects.

Priority watersheds include those with known or potential bull trout populations. In the North Fork Clearwater and Lochsa River basins, several watersheds have been intensively managed for timber production and are subject to elevated sedimentation from the activities and resulting landslides (*e.g.* Quartz, Cold Springs, Deception, Breakfast, and Fishing (Squaw) Creek watersheds). Roads constructed for logging and mining are a constant source of sediment in the Fishing (Squaw), Legendary Bear (Papoose), Shotgun, Spruce, Beaver, and lower Boulder Creek watersheds; Red River; American and Crooked Rivers; and Newsome Creek. Roads and agricultural practices are sediment sources for Lolo and Clear creeks. Highway 12 is a source of gravel and fine sediments to the Lochsa River, Crooked Fork Creek, Middle Fork Clearwater River, and the Lower Clearwater River. In the Middle-Lower Clearwater basin, agricultural practices have contributed excessive sediment to the Potlatch River.

Additional priority sediment sources may be identified in the watershed analyses conducted in Task 1.3.1.

1.1.2 Address forest road maintenance and areas with high sediment loading. Identify maintenance needs, exacerbated sediment production areas, and surplus forest roads. Improve roads that negatively impact water quality by removal, access restrictions, making alternative routes, and/or upgrading roads and applying all maintenance procedures. Emphasize maintenance of extensive U.S. Forest Service and State lands secondary road systems by increased application of Best Management Practices, with a focus on remediation of sediment producing hotspots, and maintenance of bridges, culverts, and crossings in drainages supporting bull trout spawning and rearing. Decommission/remove surplus forest roads: especially those that are chronic sources of fine sediment and/or those located in areas of highly erodible geological formations. Remove culverts and/or bridges on closed roads that are no longer maintained. Idaho Department of Lands and U.S. Forest Service have made significant efforts in this arena, but areas that continue to require particular attention include those listed in Task 1.1.1, and any others that are identified in the watershed analyses conducted in Task 1.3.1. Monitor the effectiveness of forest road maintenance and sediment reduction projects.

1.1.3 Identify areas of excess fine sediment delivery due to trail use and implement actions to reduce or eliminate fine sediment delivery. Although sediment production from trails is usually less than that from roads and landslides, the following areas are currently known to receive heavy recreational use, and should be prioritized for surveys and management action. Mainline trails used by livestock packers, off-road motorists, and backpackers follow Kelly Creek, Cayuse Creek, Weitas Creek, and the Little North Fork Clearwater River. Fish Lake (North Fork Clearwater) is accessed by a well developed off-highway vehicle (OHV) trail and is one of the only high elevation lakes where OHV access is permitted. Riparian areas along the outlet creek and around the lake may be impacted by OHV use. Impacts to the Fish Lake (Lochsa) inlet stream from stream-side campsites and a ford at Wounded Doe trailhead should be addressed by efforts to repair cut banks, restore overused campsites, construct trail bridges at stream crossings, and restrict livestock access to the stream. Monitor the effectiveness of the above sediment reduction projects.

1.1.4 Improve maintenance along transportation corridors. The maintenance of all major roads along riparian corridors should be improved to reduce impacts of fine sediment and floodplain encroachment. Whenever possible, relocate problem (high sediment-producing) road reaches out of riparian corridors. Locate all dump areas for excess road material in stable upland areas away from stream/riverbeds. Priority areas include the Highway 12 corridor along Crooked Fork Creek and the Lochsa River; the Middle Fork and lower (mainstem) Clearwater Rivers and their major tributaries; the Highway 14 corridor along the South Fork Clearwater River; U.S. Forest Service Road 233 along Crooked River; the Camas Prairie railroad along the mainstem Clearwater River; U.S. Forest Service Roads 247 and 250 from the upper part of Dworshak reservoir to the Cedars campground near the mouths of Long and Lake creeks, and Road 250 from Long Creek to Hoodoo pass on the Montana border.

1.1.5 Decrease the potential of, and improve quick response capability for, dealing with potential hazardous material spills. Coordinate with Idaho Department of Transportation, Idaho Department of Environmental Quality, Idaho Department of

Fish and Game, and National Marine Fisheries Service to investigate what hazardous materials are being transported on Highway 12 (high priority) and Highway 14. Evaluate the need to form a task force (including the above agencies and others) to investigate ways to decrease the potential of a hazardous materials spill and to rapidly respond to such an event.

1.1.6 Restore areas degraded by historical timber harvest. Legacy impacts from timber harvest include lack of riparian trees and vegetation, high road densities, large areas of clearcuts, altered hydrologic regimes including increased peak flows, and other impacts that have created excessive fine sediment sources for watersheds. Potential restoration treatments include channel stabilization, riparian and upland plantings, placement of instream woody debris, etc. The following drainages have been degraded by historic timber harvest and have embedded and de-stabilized streams: Quartz, Cold Springs, Skull, Deception, Beaver, Isabella, and Moose creeks; Fishing (Squaw), Legendary Bear (Papoose), Shotgun, Spruce, Beaver, and lower Boulder creeks; Red River, American and Crooked Rivers, and Newsome Creek; and Lolo and Clear creeks. Streams in the upper Little North Fork Clearwater River include Adair, Jungle, Rutledge, and Montana creeks, where historic management has removed streamside vegetation and increased fine sediment delivery.

1.1.7 Identify problem mine sites and remediate tailings, ponds, and other associated waste. Monitor and control mining runoff from roads, dumps, and ponds, and remove and stabilize mine tailings and waste rock deposited in the stream channel and floodplains and restore stream channel function. The South Fork Clearwater River core area has the greatest scope and magnitude of impacts from mining activities, and the North

Fork Clearwater River is second. Top priority watersheds within the South Fork core area include Newsome Creek and Crooked River, followed by Red, American and mainstem South Fork Clearwater Rivers. In the North Fork core area, Moose (Moose and Independence Creek drainages especially) and Chamberlain Creek watersheds are a high priority; followed by Vanderbilt, Niagra and Meadow Creek watersheds and the upper North Fork Clearwater River. Monitor erosion control measures at aggregate pits in the North Fork, South Fork, and Middle Fork/Lower Clearwater River core areas and make improvements as necessary.

1.1.8 <u>Assess and mitigate point and nonpoint thermal pollution</u>. Assess and attempt to remove affects to bull trout from thermal pollution that negatively impacts receiving waters and migratory corridors downstream. Priority watersheds include those listed (for thermal pollution) in Appendix A 3: South Fork Clearwater River mainstem and tributaries; Osier Creek and tributaries to Dworshak Reservoir; Lochsa River mainstem and tributaries; major tributaries to the mainstem Clearwater River and their tributaries; as well as Potlatch River, Lapwai Creek, Lolo Creek, and Big Canyon Creek.

1.1.9 <u>Reduce nutrient input</u>. Assess and continue to address effects of nutrient enrichment from practices associated with forest management in the North Fork and South Fork Clearwater, and Lochsa River core areas. Reduce nutrient delivery throughout the developed portions of the Lower/Middle Fork and South Fork core areas by improving sewage disposal, agricultural practices, and ranching practices.

1.1.10 <u>Eliminate or reduce the number and length of stream segments with impaired water quality</u>. Eliminate or modify factors responsible for stream reaches listed as “water quality limited segments" under section 303(d) of the Clean Water Act. See Appendix A for a complete list of streams by core area. Most streams appearing on the 303(d) list do not meet beneficial uses for sediment, some are listed due to temperature, and some are listed for numerous pollutants including sediment, temperature, nutrients, biochemical contamination, and habitat alteration. Prioritize streams within identified bull trout local populations and essential potential local populations (Table 2 and recovery criteria 1) and streams identified as providing foraging, migrating, and overwintering habitat. Priority 303(d) list streams by core area include: South Fork Clearwater River core area (Dawson, Buffalo Gulch, Big Elk, Little Elk, Beaver, Nuggett, Sing Lee, and Newsome creeks, and mainstem South Fork Clearwater River); Lochsa River core area (Storm, Fish, and Deadman creeks, and mainstem Lochsa River); North Fork Clearwater River core area (China, Laundry, Osier, Sugar, Swamp, Deception, Gravey, Marten, Cold Springs, Cool, Cougar, Grizzly, Middle, Beaver, Bertha, Bingo, Sourdough, South Fork Beaver, Isabella, Dog, and Floodwood creeks, and mainstem North Fork Clearwater River below Dworshak Dam); and Middle Fork/Lower Clearwater River core area (Clear, Lolo, Jim Brown, Texas, Schmidt, Yakus, and Mud creeks, and

mainstem Clearwater River). There are no streams in the Selway River core area on the 303(d) list. Priority for rehabilitation of the remaining 303(d) streams should be by proximity to the streams listed above.

1.2 Identify barriers or sites of entrainment for bull trout and implement tasks to provide passage and eliminate entrainment.

1.2.1 Identify culverts and other man-made barriers inhibiting fish passage. Identify fish passage barriers in all watersheds where bull trout currently exist and in watersheds that bull trout could potentially occupy. Analyze existing culvert survey data collected by the U.S. Forest Service, Bureau of Land Management, State and private landowners to identify culverts and other barriers inhibiting fish passage Where no survey data exists, surveys should be conducted by Federal and State land managers to identify culverts and barriers inhibiting fish passage. Each land manager should prepare an annual report of identified fish passage barriers, including a plan to address passage barriers, and progress toward addressing barriers and other accomplishments. Priority should be placed on watersheds currently occupied by bull trout.

Passage barriers that have been identified within a general location and need further investigation on the specific location include: **North Fork core area** - Little North Fork Clearwater River (two culverts between Butte and Culdesac creeks); Beaver Creek below Sheep Mountain sub-watershed (two culverts); North Fork Clearwater River above Isabella Creek sub-watershed (three culverts); Death/ Fisher/Trail sub-watershed (two culverts); Cold Springs sub-watershed (one culvert); Long/Short/Slate sub-watershed (two culverts); Moose Creek sub-watershed (one culvert); Cayuse Creek watershed (culvert barrier in Mae Creek, a tributary to Gravey Creek).

1.2.2 <u>Eliminate known culvert and other man-made passage barriers (including those identified by task 1.2.1)</u>. Utilize data gathered from task 1.2.1 and where beneficial to native fish, replace, modify, or remove existing culverts, bridges, or other man-made barriers that impede passage. Consider native fish genetic concerns and the potential for invasion by nonnatives in all such evaluations. New culverts should be constructed/installed to avoid inhibiting passage of all life history phases of fish. New appropriately designed culverts or bridges are recommended at stream crossings in habitat used by all life stages of bull trout. Monitor all projects after completion to determine if fish passage is restored. The highest priority for eliminating passage barriers and re-establishing connectivity is the South Fork River core area, followed in priority order by the Lochsa, North Fork Clearwater, Lower/Middle Fork Clearwater, and Selway River core areas.

Known passage barriers that need to be addressed include: **South Fork Clearwater River core area** - Modify the culvert (or replace with a bridge) on U.S. Forest Service Road 222 (T26N, R8E, S3) in South Fork Red River to allow upstream passage of age one and older bull trout. Replace the private road culvert at confluence of East Fork American River with American River to allow upstream passage of age one and older bull trout. Modify or replace the culvert on the county road crossing in Big Elk Creek approximately 0.65 miles upstream from Little Elk Creek confluence. **Lochsa River core area** - Modify or replace the culvert on U.S. Forest Service Road 108 to allow bull trout passage to the West Fork Fishing (Squaw) Creek. Modify or replace impassable culverts of Highway 12 to allow bull trout passage into Badger, Cold Storage, and Noseeum creeks. **Selway River core area** - Modify or replace the culvert on U.S. Forest Service Road 223 at the mouth of Boyd Creek to allow bull trout access to unoccupied habitat.

1.2.3 <u>Consider providing passage around natural barriers</u>. Evaluate removal of natural "semi-permanent" fish passage barriers (such as debris dams) and implement if necessary. The removal of the barriers should be evaluated to determine their effects and potential to increase habitat accessibility for bull trout. Evaluate and make recommendations concerning potential benefits of fish passage around, or establishment of resident bull trout populations upstream from, natural barriers as a means of conserving genetic diversity in existing bull trout populations. Several known barriers exist, and others would need to be identified through stream surveys. Known natural barriers exist in: upper Brushy Fork, Pack, Warm Springs, Shotgun, and Big Sand, Crab, Old Man, and Deadman creeks in the Lochsa River core area; South Fork Kelly, Orogrande, and Foehl creeks in the North Fork Clearwater core area; and Twenty-mile Creek in the South Fork Clearwater core area.

1.3 Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.

1.3.1 Conduct watershed assessments in the North Fork, South Fork, and Middle/Lower Clearwater River, and Lochsa Core Areas. Watershed analysis is an assessment procedure used to understand the condition, trend, and interactions in a watershed. Key components of an analysis include evaluations of the transportation system, upland and riparian vegetation, social and human uses, and the aquatic habitat and species status. These assessments provide understanding of the management opportunities and needs within an area, and should facilitate project identification and prioritization for planning. Assessments include management recommendations on road maintenance needs and road removal, fish passage barrier removals, riparian vegetation management, and woody debris placement or removal. Such assessments have not been done for the majority of the key bull trout watersheds in the recovery unit. Watershed analysis should be a high priority for Red, American, and Crooked Rivers and Newsome Creek (in progress, to be completed in 2002) (South Fork Clearwater River core area); Crooked Fork and tributaries, Brushy Fork and tributaries, Colt Killed Creek and tributaries, Walton and Warm Springs creeks, Lochsa River (Loshsa River core area);

Middle Fork Clearwater River, Clear and Lolo creeks (Middle/Lower Clearwater River core area); North and South Forks Kelly Creek, Gravey, Long, Slate, Short, Lake, Goose, Weitas, Beaver, Isabella, and Floodwood creeks (North Fork Clearwater River core area). Other priority areas include known or suspected spawning and rearing streams, foraging and migratory habitat, and potential spawning, rearing and foraging habitat throughout the recovery unit.

1.3.2 Revegetate denuded riparian areas. Develop site specific plans to promote revegetation of riparian areas to ensure sufficient shade and canopy, large woody debris recruitment, riparian cover, and native vegetation are present to support native salmonids. Highest priority is on streams with existing bull trout populations. Revegetate riparian areas affected by logging in: Kelly Creek drainage, particularly in the Moose Creek and Cayuse Creek watersheds (North Fork Clearwater River core area); lower Red River, Crooked River along U.S. Forest Service Road #233, mainstem of upper South Fork Clearwater River (South Fork Clearwater River core area); and other watersheds as identified in watershed assessments (Task 1.3.1). Restore riparian vegetation removed by fire and timber salvage along the lower 3.2 kilometers (2 miles) of West Fork Floodwood Creek. Restore riparian vegetation removed by fires in: Hidden, Isabella, Skull, Quartz creeks (North Fork Clearwater River core area); and Haskell and Crooked Fork creeks (Lochsa River core area).

1.3.3 Restore stream reaches degraded by dredge and placer mining. Restore habitat, as feasible, in stream reaches that have been channelized and affected by mine tailing piles in the Moose Creek watershed of the North Fork Clearwater River core area. Mining activities in the South Fork Clearwater core area have been extensive in the Crooked and American River, and Newsome Creek watersheds, and to a lesser degree in the Red

River watershed. Restoration of mainstem reaches is critical to improving connectivity for fluvial fish between local populations in this core area. Restoration of lower and middle Crooked River, and Newsome Creek is a high priority.

1.3.4 Improve instream habitat. Conduct stream restoration in areas impacted by legacy and ongoing road effects, logging, agriculture, grazing, and urban development, stream cleaning, and mining. Increase or improve instream habitat by restoring recruitment of large woody debris, pools, or other appropriate habitat, wherever the need is identified. Priority watersheds include the upper North Fork Clearwater River, including Meadow, Caledonia, Vanderbilt, and Niagara creeks (North Fork Clearwater River core area); the upper Lochsa River drainage, including North Fork Spruce, Shoot, Twin, Legendary Bear (Papoose), and Fishing (Squaw) creeks (Lochsa River core area); upper South Fork Clearwater mainstem, American, Red and Crooked Rivers and Newsome Creek (South Fork Clearwater River core area); and Lolo and Clear creeks (Middle/Lower Clearwater River core area). Improve instream habitat for other priority areas identified by watershed assessments (Task 1.3.1).

1.3.5 Evaluate and implement actions to restore areas of Fish Lake Creek (Lochsa River) degraded by channelization and excessive bank erosion associated with the Fish Lake airstrip and campsites. Restore over-used campsites, reduce erosion on exposed banks, restrict pack animals from the stream, and construct trail bridges at two popular crossings (one at the trailhead). Evaluate the potential of restoring a natural meander pattern in the channelized reach of the inlet stream, either on the airstrip (where it was originally), or in the meadow complex to the southeast of the airstrip.

1.3.6 Evaluate and implement actions to restore degraded riparian habitat at Fish Lake (North Fork core area). Fish Lake (North Fork Clearwater) is accessed by a well developed off-highway vehicle (OHV) trail and is one of the only high elevation lakes where access is permitted. Riparian areas along the outlet creek and around the lake may be impacted by OHV use.

1.3.7 Identify and restore riparian areas where livestock grazing is impacting bull trout habitat. Identify problem areas cooperatively with U.S. Fish and Wildlife Service, Natural Resource Conservation Service, and land management agency personnel and private landowners. Revise grazing management plans to include performance standards that maintain stream channel condition that maintains high quality bull trout habitat and continue to enforce those already in place. Fence riparian areas to eliminate riparian degradation from grazing in problem areas. Monitor fencing effectiveness along riparian areas on Lolo Creek and its tributaries from Cottonwood Flats to the U.S. Forest Service boundary. Other priority areas include private land in lower Elk Creek (American River tributary); private land in lower and middle portions of the Red River; and private land in Clear Creek.

1.3.8 Identify riparian areas threatened by nonnative plant invasion, and evaluate and implement actions to restore native vegetation. Nonnative plant species compete with native riparian vegetation and affect aquatic habitat by altering natural ecological processes, with potential instream impacts of increased sedimentation and water temperatures, and decreased cover and woody debris. Bull trout spawning and rearing habitats have higher priority, particularly in such areas as the Lochsa, South Fork, and North Fork Clearwater, and Potlatch Rivers, and major tributaries paralleled by roads. Evaluate potential methods to control nonnative plant invasion and implement where necessary.

1.3.9 Improve stream channels near transportation corridors. Improve stream conditions where current and legacy highway and railroad encroachment, channel straightening, channel relocation, and undersized bridges exist. Coordinate with highway departments to minimize impacts of planned or existing highways on bull trout habitat. Initial areas to focus efforts include: the Lochsa River Highway 12 corridor, South Fork Clearwater Highway 14 corridor, Middle Fork/Lower Clearwater River railroad, and Highway 12 corridors. Highway 12 has reduced large wood recruitment and access to off-channel habitat in the Lochsa River, Crooked Fork Creek, and Middle Fork Clearwater River.

1.3.10 Identify areas in which secondary roads have been constructed in the floodplain and implement restoration actions. These roads have displaced riparian vegetation and are a constant source of fine sediment to the streams. Appropriate remedial measures should be developed and implemented. Priority areas include those in occupied bull trout habitat: Fishing (Squaw) and Legendary Bear (Papoose), North Fork Spruce and Shoot creeks (Lochsa River core area); Red River, Crooked and American Rivers, and Newsome Creek (South Fork Clearwater River core area); and Kelly, Cayuse, and upper North Fork Clearwater River (North Fork Clearwater core area). Include other priority areas identified by watershed assessments (Task 1.3.1).

1.3.11 Reduce campsite impacts. Identify areas of impact and develop methods to reduce impacts of concentrated and dispersed campsites in riparian areas. Priority areas include occupied bull trout habitat. Examples are mining camps in the Moose Creek drainage (North Fork Clearwater core area); and campsites along the upper North Fork and South Fork Clearwater, Lochsa, and lower Selway Rivers, and Newsome Creek.

1.3.12 <u>Minimize potential stream channel degradation from flood control and response actions</u>. Identify negative effects to bull trout from ongoing flood control activities (*e.g.*, dredging, channel clearing, bank stabilization, bank barbs and other structures or actions) and address where possible. Minimize future negative effects to bull trout habitat from flood control activities by coordinating with responsible agencies in development of flood control and response plans. Initial areas to focus include the South Fork and Middle/Lower Clearwater River core areas.

1.3.13 <u>Evaluate overwintering habitat in the mainstem rivers</u>. Identify specific overwintering areas utilized by bull trout in the mainstem rivers in the recovery unit and classify general overwintering habitat. Survey the habitat conditions in overwintering habitat areas to determine if it is degraded and could be restored. Determine if unoccupied overwintering habitat areas are degraded by sediment accumulation or through bedload movement, and would have potential to be utilized, if restored. Agricultural practices have caused heavy soil erosion, and altered the timing, peak, and magnitude of flows; resulting in high bedload, channel aggradation, and embeddedness in these mainstem rivers and their larger tributaries.

1.3.14 <u>Implement restoration of overwintering habitat in the mainstem rivers, if needed</u>. Implement necessary restoration activities to improve overwintering habitat, as identified by Task 1.3.13. Priority areas include the Middle Fork/Lower and South Fork Clearwater Rivers.

1.4 Operate dams to minimize negative effects on bull trout in reservoirs and downstream.

1.4.1 Evaluate direct losses of bull trout through Dworshak Dam. Drawdowns of Dworshak Reservoir can entrain bull trout and carry them into the mainstem Clearwater. In addition to causing a direct loss of individuals (and their genetic material) from local populations in the North Fork Clearwater River core area, these fish probably have low survival after entrainment. The loss of individuals from the upriver core area should be quantified and then evaluated in terms of its significance to long-term sustainability of the affected local populations.

1.4.2 Operate Dworshak Dam to reduce losses of kokanee salmon. Substantial numbers of kokanee, which have been introduced into Dworshak Reservoir and are a forage fish for bull trout, can be entrained below the dam during spills. Methods to reduce kokanee losses should be evaluated and implemented.

1.4.3 Evaluate the impact of summer drawdowns of Dworshak reservoir on upstream migration of bull trout. Summer drawdowns may create a thermal barrier at the head of the reservoir that may hinder bull trout migration and access to upstream tributaries in the North Fork core area. If upstream migration is hindered, evaluate options of limiting drawdowns or trapping and transporting bull trout above the thermal barrier.

1.5 Identify upland conditions negatively affecting bull trout habitat and implement tasks to restore appropriate functions.

1.5.1 Monitor and mitigate fire effects, where necessary. Monitor effects from wildfires and pursue habitat restoration actions where warranted. Adhere to programmatic fire suppression Biological Assessments and concurrence letters issued by the U.S. Forest Service and Bureau of Land Management. Prioritize upland and stream restoration where recent fires have occurred and impacted bull trout habitat, including: Haskell and Crooked Fork creeks (Lochsa River core area), and Hidden, Quartz, Skull, upper Isabella, and West Fork Floodwood creeks (North Fork Clearwater River core area).

1.5.2 Compensate for legacy timber harvest and associated roading practices. Continue to mitigate for the legacy of intensive timber harvest and poor silvicultural and road construction practices in steep and highly erosive canyon breaklands. Past clearcutting practices and high density jammer-type road systems have resulted in mass wasting events and continued erosion and sediment introduction into bull trout habitat. Practices such as replanting, obliterating roads, and improving maintenance of roads should be continued and new techniques implemented. Priority areas include the upper Lochsa River checkerboard ownership areas (Lochsa River core area); Lake, Moose, Osier, Quartz, Skull, Orogrande, Sheep Mountain, Beaver Block, Floodwood, and Breakfast Creek drainages (North Fork Clearwater River core area); Red River, Newsome Creek, and American River (South Fork Clearwater River core area); Clear and Lolo creeks (Middle/Lower Clearwater River core area).

2 Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.

2.1 *Develop, implement, and enforce public and private fish stocking policies to reduce stocking of nonnative fishes that affect bull trout.*

2.2 *Enforce policies for preventing illegal transport and introduction of nonnative fishes.*

2.3 Provide information to the public about ecosystem concerns of illegal introductions of nonnative fishes.

2.3.1 Discourage unauthorized fish introductions. Focus an intensive public outreach campaign on the Clearwater basin to reduce the potential spread of illegally introduced nonnative fish species.

2.3.2 Develop a bull trout education program. Develop a public information program with an emphasis on bull trout ecology and life history requirements and more specific focus on regionally or locally important recovery issues. Coordinate with Idaho Department of Fish and Game and the U.S. Forest Service to utilize existing programs and develop an interagency program, if possible.

2.4 Evaluate biological, economic, and social effects of control of nonnative fishes.

2.4.1 Identify overlap in bull trout and nonnative fish (brook trout) distribution in all core areas. Utilize existing stream and fish survey data, and conduct surveys in unsurveyed areas. Prioritize local population areas where spawning and rearing has been documented, followed by potential local population areas. Evaluate potential effects of control of each overlapping brook trout population.

2.4.2 Develop protocols for suppressing nonnative fish and monitor impacts of ongoing actions. Continue to conduct research and develop protocols to describe the most effective methods for suppressing or eradicating brook trout populations from waters where they currently, or may in the future, negatively impact bull trout recovery in the Clearwater River system. Monitor the impact of the bonus brook trout limit in the Clearwater River Recovery Unit on reducing populations and limiting expansion of brook trout.

2.5 Implement control of nonnative fishes where found to be feasible and appropriate.

2.5.1 Reduce brook trout competition with bull trout where they are known to coexist, and where brook trout numbers are relatively low. Evaluate opportunities for selectively removing brook trout (*e.g.*, through liberalized angling and electrofishing) in areas where brook trout densities are relatively low and not expanding, and where there is a potential problem of competition with bull trout. Priorities include upper Crooked River (South Fork Clearwater River core area); Adair and Jungle creeks in the upper Little North Fork Clearwater River (North Fork Clearwater River core area); and Colt Killed Creek and its tributaries (Lochsa River core area).

2.5.2 Experimentally remove established brook trout populations from priority streams. Evaluate the feasibility of removing brook trout and develop an appropriate program. Where brook trout appear to be expanding in distribution in areas that offer suitable habitat for bull trout, eradication may be needed. Upper Crooked River and Fish Lake Creek (Lochsa core area) are areas where the threat from brook trout hybridization and competition can be reduced or forestalled by active removal of brook trout from the lakes and/or streams. Evaluate the potential of removal of established brook trout populations in: Meadow Creek drainage and associated high mountain lakes in the North Fork Clearwater core area, Elizabeth, Isabella, Larson, and Beaver creeks (North Fork Clearwater core area); Bimerick, Deadman, Stanley, Boulder, and Old Man creeks (Lochsa River core area); Yoosa and Musselshell Creek drainages of Lolo Creek, and Kay Creek (tributary of Clear Creek) (Middle/Lower Clearwater core area).

2.5.3 Monitor brook trout expansion and prevent brook trout from entering areas that overlap with occupied and unoccupied bull trout habitat, wherever possible. Monitor fish species distribution and trends in areas where the two species do not currently coexist and where the threat from brook trout appears to be small, to increase understanding of the threat these brook trout represent. Known areas include Newsome Creek, and upper Crooked River where low numbers of brook trout have been found in the lower ends of the mainstems. Other areas include Orogrande Creek in the North Fork Clearwater core area; and dependent upon wilderness use/management constraints, Three Links, Gedney, Rhoda, Meadow, Mink, Buck Lake, Pettibone, and Running creeks in the Selway-Bitterroot Wilderness.

2.5.4 <u>Evaluate extent of hybridization between bull and brook trout in areas where brook trout are firmly established and eradication is not possible</u>. In areas where brook trout are firmly established and there is little opportunity to reduce the threat to bull trout, the priority should be genetic evaluation of the extent of hybridization that has occurred, along with continued trend analysis of the distribution and populations of both species. Priority areas are Red and American Rivers (South Fork Clearwater River core area); and East Moose Creek in the Selway core area.

2.6 *Develop tasks to reduce negative effects of nonnative taxa on bull trout.*

3 Establish fisheries management goals and objectives compatible with bull trout recovery, and implement practices to achieve goals.

3.1 Develop and implement State and tribal native fish management plans integrating adaptive research.

3.1.1 <u>Develop a comprehensive fishery management plan for the Clearwater River Recovery Unit incorporating bull trout recovery and utilizing adaptive management</u>. Develop and implement native fish management plans that emphasize integration of research into management programs. Integrate bull trout recovery objectives and management plans for anadromous fish recovery; as management actions that support recovery of steelhead and salmon species will be beneficial for bull trout by improving prey base and habitat for coldwater salmonids.

3.2 Evaluate and prevent harvest and incidental angling mortality of bull trout.

3.2.1 Evaluate the amount and relative threat of illegal bull trout harvest and incidental fishing mortality. Information on the current threat of illegal harvest and fishing mortality on bull trout is very limited. An evaluation of these threats should be completed to determine their significance to bull trout recovery and potential management opportunities to minimize their impacts. The level of threat should be evaluated within an overall Clearwater River Recovery Unit context, and also evaluated with respect to other mortality threats for each local population (or logical combinations of local populations). Seasonal road closures should be implemented where roads readily access bull trout spawning areas, and illegal bull trout harvest is determined to be significant. Focus areas should include: Fish Lakes (North Fork and Lochsa core areas); Selway River below Meadow Creek and near Moose and Shearer airstrips; Red and Crooked Rivers; North Fork Clearwater River below Dworshak Dam; upper North Fork Clearwater River in Black Canyon and above Long Creek; and Crooked Fork and Colt Killed creeks and upper Lochsa River. This evaluation should consider the need for additional public awareness and outreach, which should be implemented wherever access to public lands is restricted.

3.2.2 Continue public outreach about fishing regulations, bull trout identification, and proper handling/release techniques. Maintain signs that are currently posted on Federal and State land throughout the recovery unit. Display posters (the "Bull Trout Alert" poster) annually, especially at angling access areas and backcountry portals such as trailheads. Sign boards and posters should be displayed at backcountry airstrips at Fish Lake (Lochsa River core area); Moose Creek and Shearer (Selway River core area). Produce educational materials (pamphlets, wallet cards, etc.) for anglers addressing bull trout identification, proper handling and release techniques to reduce hooking mortality, regulations, and reasons for protective regulations. Distribute materials using U.S. Forest Service, Idaho Department of Fish and Game, and Bureau of Land Management personnel and offices; local businesses; and tourism centers.

3.2.4 Decrease incidental mortality of bull trout due to angling. Conduct additional patrols in sensitive areas at critical times. Consider regulation changes such as tributary closures to protect bull trout. Patrols should focus on identified staging (June to August), spawning (September to October), and wintering (November to March) areas for bull trout. Staging areas include larger mainstem streams below headwater tributaries, such as Black Canyon of the North Fork Clearwater River. Wintering areas include large mainstem rivers at lower elevations, such as the Middle Fork and lower Clearwater Rivers. For example, incidental mortality of wintering fluvial bull trout may be occurring during the winter and spring steelhead/salmon seasons in the Clearwater River.

3.2.5 Increase enforcement activities relating to the no bull trout harvest regulations. Specifically target known or identified (Task 3.2.1) problem areas where unauthorized harvest of bull trout is occurring. Increase backcountry enforcement patrols in the Selway-Bitterroot Wilderness around human concentration areas and near spawning and rearing areas. Increase enforcement patrols at the two Fish Lakes. Increase enforcement along mainstem rivers paralleled by roads, especially in areas with late winter and spring steelhead and salmon fishing seasons. Also target known problem areas on the lower Selway, upper North Fork Clearwater, and upper Lochsa Rivers.

3.2.6 Inform the public about bull trout issues and general fisheries biology and management issues. Develop an outreach program to inform the general public, and key contacts such as anglers and outfitters/guides, about bull trout issues and general fisheries biology and management issues. Evaluate the potential of combining bull trout outreach with other fish conservation efforts. Begin efforts through the news media and other means to inform the public, emphasis should be on bull trout and bull trout recovery efforts being made by various agencies and other entities. Develop a school program and present information at local area schools.

3.3 Evaluate potential effects of introduced fishes and associated sport fisheries on bull trout recovery and implement tasks to minimize negative effects on bull trout.

3.3.1 Evaluate the potential for release of excess hatchery stock of anadromous fish into occupied bull trout habitat. Evaluate the positive and potential negative impacts of anadromous fish stocking programs currently operating in the Clearwater River Recovery Unit. The Lochsa, Selway and Middle Fork of the Clearwater Rivers historically sustained much larger populations of anadromous fish, which supported larger populations of bull trout. Release of excess hatchery stock in areas where bull trout and anadromous fish historically coexisted, and where anadromous populations are currently depressed, may aid bull trout recovery. Such streams include Crooked Fork and Colt Killed creeks, and the Lochsa, Selway, and South Fork Clearwater Rivers. Review annual fish stocking programs to assure those programs for anadromous fish are not contributing fish diseases, exotic invertebrates or other problems such as increased competition, that could interfere with bull trout recovery.

3.4 Evaluate effects of existing and proposed sport fishing regulations on bull trout.

3.4.1 Evaluate effects of existing and proposed angling regulations on bull trout. Evaluate the impacts of rapidly increasing angler pressure on adequacy of angling regulations to protect bull trout, unintentional mortality and other angler-related issues affecting bull trout. Target the most heavily fished waters such as Kelly Creek, Lochsa River and main tributaries, and lower Selway River.

3.4.2 Evaluate the impact of the sport fishing season in the two Fish Lake core areas on the adfluvial bull trout populations. The North Fork Clearwater Fish Lake sport season for cutthroat trout opens August 1 and closes in mid-fall. The Lochsa Fish Lake sport season is a general season. Both lakes draw heavy recreational pressure, and heavy fishing pressure. The impacts of these sport seasons on bull trout spawning, and illegal and hooking mortality should be investigated and appropriate actions taken if recovery of bull trout is impacted.

3.4.3 Evaluate the impact of the bonus brook trout limit in the Clearwater River Recovery Unit and increase the limit, if possible. Investigate the result of the increased brook trout limit on reducing populations and limiting expansion of brook trout. Maintain these regulations and increase the limit where necessary to achieve objectives of removing brook trout competition and hybridization threats to bull trout recovery.

4 Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.

4.1 Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans.

4.1.1 Conduct a genetic inventory. Collect samples for genetic analysis to contribute to establishing a program to understand the genetic baseline and monitor genetic changes throughout the range of bull trout (see Chapter 1 narrative). Collect genetic samples from known spawning and rearing streams (local populations), with priority given to populations where hybridization with brook trout presents the most imminent threat. Evaluate genetic diversity and the extent of hybridization. This information will be valuable for the conservation of the species across its range, and if local populations are extirpated within the Clearwater River Recovery Unit, this research may indicate what population may be best for future reintroduction efforts. Incorporate information and recommendations into management plans.

4.1.2 Describe and monitor genetic and phenotypic characteristics of bull trout in all core areas, and incorporate information into management strategies. The interaction of bull trout genetic composition with particular environments results in phenotypic diversity and perhaps local adaption. Such information for particular groups of bull trout and their habitat should be generated for all core areas in the Clearwater River Recovery Unit, and incorporated into management strategies to improve their effectiveness. Develop a phenotypic and/or morphometric key to separate, if possible, resident from fluvial or adfluvial bull trout.

4.2 Maintain existing opportunities for gene flow among bull trout populations.

4.2.1 Investigate additional opportunities to improve passage. Utilize information from task 4.1.1 to maintain current genetic interchange between local populations and core areas. Conduct further surveys to identify passage barriers that may inhibit genetic interchange; priority areas include the South Fork Clearwater and Lochsa River core areas. Annually monitor "problem areas" where recreationists construct man-made check dams to create swimming holes (*i.e.*, American River and Lolo Creek-Woodland Bridge area). These unauthorized dams may block fish passage if not removed. Coordinate with management agencies to retain existing connectivity as management actions are planned by preventing the establishment of barriers (*e.g.,* structural barriers or unsuitable habitat conditions), that may inhibit the movement of bull trout within the Clearwater River Recovery Unit.

4.3 Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.

4.3.1 Evaluate the need for reestablishing genetic connectivity between the North Fork Clearwater River and the remainder of the recovery unit. Based on research determinations of the degree of genetic isolation between the North Fork Clearwater and the Lochsa, Selway and South Fork Clearwater bull trout local populations and related management recommendations (Task 4.1.1), evaluate the need for re-establishing the connection between these subbasins. If connection is needed, investigate fish passage opportunities downstream and upstream over Dworshak Dam. Evaluate the potential for a trap and transport facility at the base of the dam for upstream migrants and at the head of the reservoir for downstream migrants.

5 Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.

5.1 Design and implement a standardized monitoring program to assess the effectiveness of recovery efforts affecting bull trout and their habitat.

5.1.1 Develop coordination infrastructure to facilitate restoration. Restoration efforts in the Clearwater River Recovery Unit do not appear to be well coordinated among the various agencies and publics. No forum for the exchange of restoration information, projects, and strategies appears to be in place. Existing work groups such as the Clearwater Basin Advisory Group should consider opportunities for facilitating the establishment of a group to coordinate the restoration in the recovery unit. Develop a GIS database to track progress on implementation of recovery tasks, and data collected from bull trout inventories, monitoring, and research. These would be accessible to all participating entities and managed by a central party (*e.g.*, Idaho Department of Fish and Game, Conservation Data Center). Coordinate development of this database with Bonneville Power Association's Restoration Tracking Program, currently in development.

5.1.2 Implement the population monitoring strategy identified for the Clearwater River Recovery Unit. Implement the initial monitoring strategy and revise the strategy as necessary under the principles of adaptive management. Add a monitoring component for the potential local populations that are identified as essential for recovery.

5.2 Conduct research evaluating relationships among bull trout distribution and abundance, bull trout habitat, and recovery tasks.

5.2.1 Determine the abundance of fluvial, adfluvial, and resident bull trout and habitat used in the Clearwater River Recovery Unit. Continue implementation of existing bull trout population abundance and distribution studies, and initiate new studies. Identify and map the extent of habitat utilized by each local population. For fluvial bull trout, continue to determine spawning and wintering habitat and migratory pathways. Conduct studies similar to those ongoing in the North Fork Clearwater River and throughout the recovery unit. Priority areas include local populations identified in Table 2.

5.2.2 Develop and implement protocol to estimate the mortality factors for local populations. Evaluate the factors comprising total annual mortality for local populations and use this information to refine current understanding of threat and risk for local populations. Revise recovery management strategies and actions for local populations to include this research, according to principles of adaptive management.

5.2.3 Map spawning habitat. Develop a comprehensive map of primary bull trout tributary spawning reaches in all core areas within the Clearwater River Recovery Unit, for focusing habitat protection and recovery efforts.

5.2.4 Conduct presence/absence surveys in previously uninventoried areas. Areas of the Clearwater River Recovery Unit, especially wilderness areas, have not yet been fully inventoried. Utilize survey protocols that can assign confidence limits to survey results. Balance the need to have statistically significant survey results with the difficulty of accessing remote areas for the surveys. Priority areas include the Selway-Bitterroot and Gospel Hump wilderness areas and priority areas designated by local biologists.

5.2.5 Evaluate water temperature as a limiting factor. Determine the range of temperature tolerances for bull trout life stages in different local populations and habitats within the Clearwater River Recovery Unit. Evaluate the suitability of temperature regimes in currently occupied and potential bull trout habitat. Identify potential thermal migration barriers within the recovery unit.

5.2.6 Identify suitable unoccupied habitat. Identify suitable unoccupied habitat in the Clearwater River Recovery Unit that might be reconnected or enhanced to increase recruitment of bull trout to the system. Within five years complete a comprehensive list of all known passage barriers blocking access to suitable habitat by upstream migrating bull trout. Consider establishment of resident bull trout populations upstream from natural barriers to provide a genetic reserve.

5.2.7 Evaluate importance of contributing waters. Evaluate the importance and contribution to bull trout recovery of streams with only incidental bull trout presence. Develop a management strategy for contributing waters that are determined to negatively impact occupied (local populations) or necessary core habitat (potential local populations). Include strategy in overall Clearwater Recovery Unit bull trout management plan (Task 3.1.1).

5.3 Conduct evaluations of the adequacy and effectiveness of current and past best management practices in maintaining or achieving habitat conditions conducive to bull trout recovery.

5.3.1 Evaluate existing Best Management Practices to determine if they provide for conditions necessary for bull trout recovery. Continue and expand monitoring of compliance and effectiveness of Idaho Best Management Practices to ensure they are implemented as described in the Idaho Forest Practice

Act. Recommend adjustments to and revise Best Management Practices to correct any documented deficiencies where those practices provide inadequate protection to bull trout on State and private lands. Priority areas include: the upper Lochsa River core area; the South Fork Clearwater River core area; the Beaver Block, Floodwood Creek, Little North Fork River, Moose and Chamberlain creeks in the North Fork Clearwater River core area; and the Lower/Middle Fork Clearwater core area, particularly Clear and Lolo Creek drainages.

5.4 *Evaluate the effects of diseases and parasites on bull trout, and develop and implement strategies to minimize negative effects.*

5.5 Implement research and monitoring studies to improve information concerning the distribution and status of bull trout, as described in Chapter 1.

5.5.1 <u>Conduct migrational studies for the Clearwater River Recovery Unit and coordinate with the Hells Canyon Complex, Grande Ronde, Imnaha, and Salmon River recovery units</u>. This information is necessary to provide a more complete understanding of adult bull trout habitat requirements, and the interrelationship of fluvial populations between the recovery units.

5.6 Identify evaluations needed to improve understanding of relationships among genetic characteristics, phenotypic traits, and local populations of bull trout.

5.6.1 <u>Determine the life history requirements of resident and migratory bull trout populations</u>. The recovery unit has both resident and migratory (fluvial) local populations. An understanding of the life history habitat requirements and interactions of resident and fluvial fish will assist with identification of recovery of bull trout in the Clearwater River basin.

6 Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitat.

6.1 Use partnerships and collaborative processes to protect, maintain, and restore functioning core areas for bull trout.

6.1.1 Provide long-term protection of perennial stream reaches. Work cooperatively with private landowners and the Natural Resource Conservation Service to provide voluntary incentives for long-term habitat protection. Some habitat important for bull trout recovery, especially migratory, foraging, and overwintering habitat, occurs on private lands and may need protection to maintain conditions conducive to bull trout recovery. A variety of cooperative arrangements could be made with landowners to protect and restore habitat on their land. Where possible combine efforts for bull trout with anadromous fish recovery efforts. Initial emphasis should be placed on identified bull trout spawning and rearing streams. Priority areas include Red and American Rivers and Newsome Creek (South Fork Clearwater River core area); Brushy Fork, Spruce, Twin, Crooked Fork, Legendary Bear, and Colt Killed creeks; Floodwood Creek; Beaver Creek (North Fork Clearwater River core area); and Clear and Lolo creeks (Middle/Lower Clearwater River core area).

6.1.2 Work collaboratively with county and city land use planners to minimize urbanization impacts on bull trout recovery. County and city land use planning provides an opportunity to minimize urbanization and development impacts and help mitigate development to sustain existing aquatic species.

6.1.3 Identify opportunities for habitat restoration and provide assistance to landowners. Some important bull trout habitat occurring on private land may require restoration to re-establish adequate conditions. Expand current efforts to work with landowners to identify opportunities for restoration and provide increased technical assistance; use existing Federal, State, and Tribal cost-share programs and Farm Bill programs such as the Conservation Reserve Program and Wetland Reserve Program to implement actions.

6.1.4 Integrate watershed restoration efforts on public and private lands. Integrate watershed analyses and restoration activities on public lands in the headwaters and private lands, which occur primarily lower in the watershed, to ensure that activities maximize benefits and are complementary to bull trout restoration (*e.g.*, upper Lochsa River checkerboard ownership areas, and Red, American, and Crooked Fork Rivers).

6.1.5 Encourage floodplain protection. Encourage local and State governments to develop, implement, and promote floodplain and lakeshore protection regulations in Clearwater and Idaho counties to mitigate habitat loss and stream encroachment from rural residential development throughout the Clearwater River drainage. Development is of particular concern in watersheds that support bull trout spawning and rearing as it exacerbates temperature problems, increases nutrient loads, decreases bank stability, and alters instream and riparian habitat.

6.2 Use existing Federal authorities to conserve and restore bull trout.

6.2.1 Implement the Plum Creek Habitat Conservation Plan. Carry out compliance monitoring and U.S. Fish and Wildlife Service commitment to adaptive management planning under the Plum Creek Native Fish Habitat Conservation Plan; primarily applicable to waters of the upper Lochsa River.

6.2.2 Coordinate bull trout recovery with listed anadromous fish species recovery. The Clearwater River Recovery Unit team will coordinate the implementation of bull trout recovery actions with salmon and steelhead measures to avoid duplication and maximize the use of available resources. Coordination would occur initially with National Marine Fisheries Service since they are responsible to salmon and steelhead recovery. Coordination with other agencies responsible for implementation of recovery actions would follow.

6.3 Enforce existing Federal, State, and Tribal habitat protection standards and regulations and evaluate their effectiveness for bull trout conservation.

6.3.1 Ensure restrictions on suction dredge mining in bull trout habitat are effective. Evaluate compliance with and effectiveness of restrictions in protecting bull trout habitat and modify to improve effectiveness as necessary. Priority areas include Moose and Chamberlain creeks, and other active suction dredge permits that overlap occupied bull trout habitat in the North Fork and South Fork Clearwater core areas.

6.3.2 Ensure current mining regulations are effective. Evaluate compliance with and effectiveness of regulations in protecting bull trout habitat and modify to improve effectiveness as necessary. Priority areas include occupied bull trout habitat in the South and North Fork Clearwater core areas.

7 Assess the implementation of bull trout recovery by recovery units, and revise recovery unit plans based on evaluations.

7.1 Convene annual meetings of each recovery unit team to review progress and generate a report on recovery plan implementation for the Fish and Wildlife Service.

7.1.1 Develop a Participation Plan. Develop a Participation Plan for all State, Federal, Tribal, industry, and private stakeholder involvement to support implementation in the Clearwater River Recovery Unit. Invite current Clearwater Watershed Advisory Group (WAG) to begin initial discussions on how to develop a Participation Plan. Expand the scope of participants and planning process based on the Watershed Advisory Group's recommendations.

7.2 *Assess effectiveness of recovery efforts.*

7.3 Revise scope of recovery as suggested by new information.

7.3.1 Periodically review progress toward recovery goals and assess recovery task priorities. Annually review progress toward population and adult abundance criteria and recommend changes, as needed, to the Clearwater River Recovery Unit chapter. In addition, review tasks, task priorities, completed tasks, budget, time frames, particular successes, and feasibility within the Clearwater River Recovery Unit.

IMPLEMENTATION SCHEDULE

The following implementation schedule describes recovery task priorities, task numbers, task descriptions, duration of tasks, potential or participating responsible parties, estimated costs, and cost estimates for the next five years, if available, and comments. These tasks, when accomplished, will lead to recovery of bull trout in the Clearwater River Recovery Unit, and ultimately to recovery of bull trout in the coterminous United States.

Parties with authority, responsibility, or expressed interest to implement a specific recovery task are identified in the implementation schedule. Listing a responsible party does not imply that prior approval has been given, nor does it require that party to participate or expend funds. However, willing participants will benefit by demonstrating that their budget submission or funding request is for a recovery task identified in an approved recovery plan, and is therefore part of a coordinated effort to recover bull trout. In addition, section 7 (a)(1) of the Endangered Species Act directs all Federal agencies to use their authorities to further the purposes of the Endangered Species Act by implementing programs for the conservation of threatened or endangered species.

Following are definitions to column headings and keys to abbreviations and acronyms used in the Implementation Schedule:

<u>Priority Number</u>: All priority 1 tasks are listed first, followed by priority 2 and priority 3 tasks.

Priority 1 - All actions that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.

Priority 2 - All actions that must be taken to prevent a significant decline in species population or habitat quality or to prevent some other significant negative effect short of extinction.

Priority 3 - All other actions necessary to provide for full recovery (or reclassification) of the species.

Task Number and Task Description: Recovery tasks as numbered in the recovery outline. Refer to the action narrative for task descriptions.

Task Duration: Expected number of years to complete the corresponding task. Study designs can incorporate more than one task, which when combined can reduce the time needed for task completion.

Responsible or Participating Parties: The following organizations are those with responsibility or capability to fund, authorize, or carry out the corresponding task. Bold type indicates the agency or agencies that have the lead role for task implementation and coordination, though not necessarily sole responsibility. Additional identified agencies or parties are considered cooperators in conservation efforts. Identified parties include the following.

BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BLM	Bureau of Land Management
COE	Corps of Engineers
EPA	Environmental Protection Agency
IBODS	Idaho Bureau of Disaster Service
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
ITD	Idaho Department of Transportation
IDWR	Idaho Department of Water Resources
ISCC	Idaho Soil Conservation Commission
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
NPT	Nez Perce Tribe
PCTC	Plum Creek Timber Company
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service

USFS U.S. Forest Service

Many of the tasks necessary for bull trout recovery are related to restoration of the watershed(s), and as such are currently being implemented to some degree through existing programs and mandates. These tasks are designated in the "comments" column as "ongoing." However, current implementation is typically being carried out at limited funding levels and/or in only a portion of the watershed, and will need to be expanded to result in measurable gains toward the bull trout recovery goal and objectives. Most of these restoration tasks are strongly interrelated, and separate cost estimates in the accompanying implementation schedule represent rough approximations.

Cost Estimates: Cost estimates are rough approximations and provided only for general guidance. Total costs are estimated for both the duration of the task, are itemized annually for the next five years, and includes estimates of expenditures by local, Tribal, State, and Federal governments and by private business and individuals.

An asterisk (*) in the total cost column indicates ongoing tasks that are currently being implemented as part of normal agency responsibilities under existing authorities. Because these tasks are not being done specifically or solely for bull trout conservation, they are not included in the cost estimates. Some of these efforts may be occurring at reduced funding levels and/or in only a small portion of the watershed.

Double asterisk (**) in the total cost column indicates that estimated costs for these tasks are not determinable at this time. Input is requested to help develop reasonable cost estimates for these tasks.

Triple asterisk (***) indicates costs are combined with or embedded within other related tasks.

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1.1.1	Reduce fine sediment production	25	**IDL, USFS**, BLM, County, COE, IDEQ, ISCC, ITD, IDWAG, PCTC, NRCS, USFWS	*						
1	1.1.2	Address forest road maintenance and areas with high sediment loading	25	**IDL, USFS**, BLM, NPT, PCTC, USFWS	*						
1	1.1.1	Eliminate or reduce the number and length of stream segments with impaired water quality	25	**IDEQ,** Counties, EPA, USFS, USFWS	*						
1	1.2.1	Identify culverts and other man-made barriers inhibiting fish passage	5	**IDL, ITD, USFS**, BLM, County, IDFG, PCTC, USFWS	400	80	80	80	80	80	Increase ongoing surveys
1	1.2.2	Eliminate known culvert and other passage barriers (including those identified by task 1.2.1)	25	**IDL, ITD, USFS,** County, IDFG, PCTC, USFWS	**						Cost depends on results of Task 1.2.1
1	1.3.1	Conduct watershed assessments in the North Fork, South Fork, and Middle/Lower Clearwater River, and Lochsa Core Areas	25	**IDFG, NPT, USFS**, IDL, IDEQ, NRCS, PCTC, USFWS	*						
1	1.3.3	Restore stream reaches degraded by dredge and placer mining	25	**USFS, IDEQ,** IDL, BLM, NPT, USFWS	*						

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
1	1.3.13	Evaluate overwintering habitat in the mainstem rivers	5	**BLM, IDFG, NPT, USFS**, COE, IDL, IDEQ, USFWS	200	40	40	40	40	40	
1	1.3.14	Implement restoration of overwintering habitat in the mainstem rivers, if needed	15	**BLM, IDFG, NPT, USFS**, COE, IDL, IDEQ, USFWS	**						Total cost depends on restoration needs
1	3.2.3	Continue enforcement of current fishing regulations. Consider regulation changes such as tributary closures to protect bull trout	25	**IDFG,** NPT, USFS	*						
1	3.2.4	Increase enforcement activities relating to the no bull trout harvest regulations	25	**IDFG, USFS,** BLM, NPT, USFWS	750	30	30	30	30	30	
1	4.2.1	Investigate additional opportunities to improve passage	25	**IDL, USFS**, BLM, County, COE, IDEQ, ISCC, ITD, NPT, PCTC, NRCS, USFWS	500	20	20	20	20	20	
2	1.1.3	Identify areas of excess fine sediment delivery due to trail use and implement actions to reduce or eliminate fine sediment delivery	25	**IDL, USFS**, BLM, NPT, USFWS	*						

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1.1.4	Improve maintenance along transportation corridors	25	**ITD, USDOT,** County, IDL, USFS	500	20	20	20	20	20	
2	1.1.5	Decrease the potential of, and improve quick response capability for, dealing with potential hazardous material spills	5	**ITD, USDOT, IDEQ**, County, USFS	50	10	10	10	10	10	
2	1.1.6	Restore areas degraded by historic timber harvest	25	**IDL, USFS**, BLM, NPT, PCTC, USFWS	*						See associated Task 1.5.3
2	1.1.7	Identify problem mine sites and remediate tailings, ponds, and other associated waste	25	**IDL, USFS**, IDEQ, USFWS	*						
2	1.1.8	Assess and mitigate point and nonpoint thermal pollution	25	**EPA**, IDEQ, ISCC, NRCS	*						
2	1.1.9	Reduce nutrient input	25	**EPA, IDEQ,** BLM, ISCC, NPT, NRCS, PCTC, USFS, USFWS	*						
2	1.3.2	Revegetate denuded riparian areas	25	**BLM, IDL, NRCS, PCTC, USFS**, IDOT, NPT, USFWS	375	15	15	15	15	15	Increase ongoing restoration activities

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1.3.4	Improve instream habitat	25	**IDL, USFS**, **PCTC**, BLM, IDFG, NPT, NRCS, USFWS	*						
2	1.3.5	Evaluate and implement actions to restore areas of Fish Lake Creek (Lochsa River) degraded by channelization and excessive bank erosion associated with the Fish Lake airstrip and campsites	10	**USFS, IDFG,** USFWS	*						
2	1.3.7	Identify and restore riparian areas where livestock grazing is impacting bull trout habitat	25	**BLM, IDL, USFS**, ISCC, NPT, NRCS, USFWS	*						
2	1.3.8	Identify riparian areas threatened by nonnative plant invasion, and evaluate and implement actions to restore native vegetation.	25	**BLM, IDL, IDOT, USFS,** County, NPT, NRCS, PCTC, USFWS	500	20	20	20	20	20	
2	1.3.9	Improve stream channels near transportation corridors	25	**ITD, USDOT,** County, IDFG, USFS	**						
2	1.3.10	Identify areas in which secondary roads have been constructed in floodplain and implement restoration actions	25	**ITD, County, IDFG, USFS**, BLM, IDL, NPT, PCTC, USFWS	**						

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	1.4.1	Evaluate direct losses of bull trout through Dworshak Dam	5	**COE, IDFG, IDWR**, USFWS	100	20	20	20	20	20	
2	1.4.2	Operate Dworshak Dam to reduce losses of kokanee salmon	25	**COE, IDFG**, IDWR, USFWS	*						
2	1.4.3	Evaluate the impact of summer drawdowns of Dworshak reservoir on upstream migration of bull trout	5	**COE, IDFG, IDWR**, USFWS	50	10	10	10	10	10	
2	1.5.1	Monitor and mitigate fire effects, where necessary	25	**IDL, USFS**, BLM, NPT	*						
2	1.5.2	Compensate for legacy timber harvest and associated roading practices	25	**BLM,IDL, USFS,** NPT, PCTC, USFWS	1,000	40	40	40	40	40	Some funding covered by another program or agency
2	2.3.2	Develop a bull trout education program	15	**IDFG,USFWS**, BLM, NPT, USFS	375	15	15	15	15	15	Continue ongoing efforts; develop new programs
2	2.4.1	Identify overlap in bull trout and nonnative fish (brook trout) distribution in all core areas	10	**IDFG, USFS, USFWS,** BLM, NPT	300	30	30	30	30	30	Cost could increase if extensive surveys required

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	2.4.2	Develop protocols for suppressing nonnative fish and monitor impacts of ongoing actions	10	**IDFG, USFS USFWS**, NPT	150	15	15	15	15	15	Continue ongoing efforts
2	2.5.2	Experimentally remove established brook trout populations from priority streams	10	**IDFG, USFS,** BLM, NPT, USFWS	200	20	20	20	20	20	Some funding covered by another program or agency(s)
2	2.5.3	Monitor brook trout expansion and prevent brook trout from entering areas that overlap with occupied and unoccupied bull trout habitat, wherever possible	25	**IDFG, USFS,** BLM, NPT, USFWS	250	10	10	10	10	10	Some costs covered by another program or agency, and/or other tasks (2.4.3, 2.5.1, 2.5.2)
2	3.1.1	Develop a comprehensive fishery management plan for the Clearwater River Recovery Unit incorporating bull trout recovery and utilizing adaptive management	25	**IDFG,** NPT, USFWS	250	10	10	10	10	10	Costs partially covered by ongoing agency funding for existing programs
2	3.2.1	Evaluate the amount and relative threat of illegal bull trout harvest and incidental fishing mortality	5	**IDFG,** NPT, USFWS	***						Cost covered under Task 5.2.1 and 5.2.2

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	3.3.1	Evaluate the potential for release of excess hatchery stock of anadromous fish into occupied bull trout habitat	10	**IDFG, NPT, USFWS**	100	10	10	10	10	10	Some funding covered by other programs
2	3.4.1	Evaluate effects of existing and proposed angling regulations on bull trout	10+	**IDFG,** NPT	100	10	10	10	10	10	Some funding covered by another program or agency
2	3.4.2	Evaluate the impact of the sport fishing season in the two Fish Lake core areas on the adfluvial bull trout populations	5	**IDFG, USFS**	50	10	10	10	10	10	Ongoing in North Fork Fish Lake
2	4.1.1	Conduct a genetic inventory	10	**IDFG**, **NPT**, USFS, USFWS	250	25	25	25	25	25	Ongoing
2	4.1.2	Describe and monitor genetic and phenotypic characteristics of bull trout, and incorporate information into management strategies	25	**IDFG, NPT, USFWS,** USFS	375	15	15	15	15	15	Funding covered by other programs and other Tasks (see 4.1.1)
2	4.3.1	Evaluate the need for re-establishing genetic connectivity between the North Fork Clearwater River and the remainder of the recovery unit	10	**IDFG**, **NPT**, USFS, USFWS	100	10	10	10	10	10	Some funding covered under other programs and Tasks (see 4.1.1)

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	5.1.1	Develop coordination infrastructure to facilitate restoration	25	**IDWAG, USFWS,** BLM, Counties, COE, IDL, IDEQ, IDFG, ITD, NPT, NRCS, PCTC, USFS	125	5	5	5	5	5	Some funding covered by another program or agency
2	5.2.1	Determine the abundance of fluvial, adfluvial, and resident bull trout and habitat used in the Clearwater River Recovery Unit	25	**IDFG, NPT, USFS,** BLM, USFWS	1,250	50	50	50	50	50	Ongoing. Some funding covered under other programs, agencies, and Tasks
2	5.2.2	Develop and implement protocol to estimate the mortality factors for local populations	25	**IDFG, NPT, USFS,** BLM, USFWS	625	25	25	25	25	25	Funding partially covered by Task 5.2.1
2	5.2.4	Conduct presence/absence surveys in previously uninventoried areas	25	**IDFG, NPT, USFS,** BLM, USFWS	625	25	25	25	25	25	Ongoing. Some funding covered by other programs, and Tasks
2	5.2.5	Evaluate water temperature as a limiting factor	10	**IDFG**, EPA, IDEQ, BLM, USFS, USFWS	50	5	5	5	5	5	Ongoing. Some funding covered by other programs and/or Tasks
2	5.2.6	Identify suitable unoccupied habitat	10	**IDFG, NPT, USFS,** BLM, USFWS	*						

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE												
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
2	5.6.1	Determine the life history requirements of resident and migratory bull trout populations	10	**IDFG**, NPT, USFS, USFWS	200	20	20	20	20	20	Some funding covered by other programs and other Tasks
2	6.1.2	Work collaboratively with county and city land use planners to minimize urbanization impacts on bull trout recovery	25	**IDFG, USFWS, IDWAG, County**	*						
2	6.1.3	Identify opportunities for habitat restoration and provide assistance to landowners	25	**NRCS, IDFG**, BLM, Counties, ISCC, UFS, USFWS	*						
2	6.1.5	Encourage floodplain protection	25	**County**, COE, EPA, IDFG, IDEQ, IDL	*						
2	6.2.1	Implement the Plum Creek Habitat Conservation Plan	25	**PCTC, USFWS**,	*						
2	6.3.1	Ensure restrictions on suction dredge mining in bull trout habitat are effective	25	**BLM, IDWR, USFS,** IDFG, USFWS	*						
2	6.3.2	Ensure current mining regulations are effective	25	**BLM,IDEQ, IDWR, USFS,** IDFG, USFWS	*						

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	1.1.10	Minimize recreational development in bull trout spawning and rearing habitat	25	**County, IDL, USFS,** IDFG, USFWS	*						
3	1.2.3	Consider providing passage around natural barriers	10	**IDFG**, **USFWS**, USFS	***						See related task 1.3.1
3	1.3.6	Evaluate and implement actions to restore degraded riparian habitat at Fish Lake (North Fork core area)	5	**USFS**, IDFG	10	2	2	2	2	2	
3	1.3.11	Reduce campsite impacts	10	**IDL, USFS**, County, IDFG, NPT	50	5	5	5	5	5	
3	1.3.12	Minimize potential stream channel degradation from flood control and response actions	25	**County, IBODS,** COE, IDEQ	*						
3	2.5.1	Reduce brook trout competition with bull trout where they are known to coexist, and where brook trout numbers are relatively low	10	**IDFG, USFS,** BLM, NPT, USFWS	200	20	20	20	20	20	Some funding covered by another program or agency(s)
3	2.3.1	Discourage unauthorized fish introductions	25	**IDFG, USFWS, USFS,** NPT	***						Funding covered under Task 2.3.2

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	2.5.4	Evaluate extent of hybridization between bull and brook trout in areas where brook trout are firmly established and eradication is not possible.	25	**IDFG, USFS,** BLM, NPT , USFWS	125	5	5	5	5	5	Some costs covered by another program or agency, and/or other tasks (2.4.3, 2.5.1, 2.5.2, 2.5.3).
3	3.2.2	Continue public outreach about fishing regulations, bull trout identification, and proper handling / release techniques	25	**IDFG, USFWS, USFS**, BLM, NPT	*						
3	3.2.5	Inform the public about bull trout issues and general fisheries biology and management issues	10	**IDFG, USFWS,** USFS, NPT	***						Funding covered under Task 2.3.2
3	3.4.3	Evaluate the impact of the bonus brook trout limit in the Clearwater River Recovery Unit and increase the limit, if possible	10	**IDFG,** USFS, BLM	*						
3	5.1.2	Develop standardized population monitoring techniques and procedures	25	**IDFG, NPT, USFWS**, BLM, USFS	250	10	10	10	10	10	Some funding covered by other programs and other Tasks
3	5.2.3	Map spawning habitat	5	**IDFG**, NPT, USFS, USFWS	25	5	5	5	5	5	Ongoing

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	5.2.7	Evaluate importance of contributing waters	15	**IDFG**, USFS, USFWS	150	10	10	10	10	10	Funding covered by other programs and/or Tasks
3	5.3.1	Evaluate existing Best Management Practices to determine if they provide for conditions necessary for bull trout recovery	25	**IDL,** ISCC	*						
3	5.4.1	Maintain fish health screening and transplant protocols to reduce risk of disease transmission.	25	**IDFG, NPT**, USFWS	*						
3	5.5.2	Conduct migrational studies for the Clearwater River Recovery Unit and coordinate with the Hells Canyon Complex, Grande Ronde, Imnaha, and Salmon River recovery units	25	**IDFG, NPT, USFWS,** USFS	250	10	10	10	10	10	Costs partially covered under other research tasks
3	6.1.1	Provide long-term protection of perennial stream reaches	25	**BLM, IDFG, USFS, USFWS**	*						

CLEARWATER RIVER RECOVERY UNIT - IMPLEMENTATION SCHEDULE											
Task priority	Task number	Task description	Task duration (years)	Responsible parties (Alphabetical)	Cost estimates ($1,000)						Comments
					Total cost	Year 1	Year 2	Year 3	Year 4	Year 5	
3	6.1.4	Integrate watershed restoration efforts on public and private lands	25	**IDWAG, BLM,, Counties, USFS,** COE, IDL, IDEQ, IDFG, ISCC, PCTC, NPT, NRCS, USFWS	*						
3	6.2.2	Coordinate bull trout recovery with listed anadromous fish species recovery.	25	**IDFG, NMFS, USFS, USFWS**, BLM, IDL, NPT	*						
3	7.1.1	Develop a participation plan	2	**IDWAG, USFWS**, BLM, Counties, IDEQ, IDFG, EPA, NPT, NRCS, USFS, PCTC	15	10	5				Coordinated with Task 5.1.1
3	7.3.1	Periodically review progress toward recovery goals and assess recovery task priorities	25	**IDWAG, USFWS**, BLM, Counties, IDEQ, IDFG, EPA, NPT, NRCS, USFS, PCTC	*						

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APPENDIX A. State of Idaho's 303(d) List for the Clearwater River Recovery Unit. (Recreated from the Idaho Department of Environmental Quality 303(d) List website: http://www2.state.id.us/deq/water and the Clearwater Basin Bull Trout Technical Advisory Team Assessments (1998).) Streams with an (*) are located within the watershed of a local population or potential local population; streams with an (@) have Total Maximum Daily Load developed for them.

Core Area	Stream Name	Pollutant(s)	Miles of Stream
North Fork Clearwater River Core Area			
	N.F. Clearwater River mainstem (below Dworshak Dam to confluence of the Clearwater River)	Total dissolved gases	1.91
* @	China Creek (Headwaters to Osier Creek)	Sediment	4.89
* @	Deception Creek (Headwaters to N.F.)	Sediment	4.74
* @	Gravey Creek (Headwaters to Cayuse Creek)	Sediment	8.96
* @	Laundry Creek (Headwaters to Osier Creek)	Sediment	4.39
* @	Marten Creek (Headwaters to Gravey Creek)	Sediment	4.47
* @	Osier Creek (Headwaters to Moose Creek)	Sediment, temperature, habitat alteration, flow	8.09
* @	Sugar Creek (Headwaters to Dworshak Reservoir)	Sediment	3.99
* @	Swamp Creek (Headwaters to Osier Creek)	Sediment	5.39
* @	Cold Springs Creek (Headwaters to N.F.)	Sediment	4.84
* @	Cool Creek (Headwaters to Cold Springs Creek)	Sediment	3.32
* @	Cougar Creek (Headwaters to Quartz Creek)	Sediment	3.69

Core Area	Stream Name	Pollutant(s)	Miles of Stream
* @	Grizzly Creek (Headwaters to Quartz Creek)	Sediment	4.53
* @	Hem Creek (Headwaters to Sylvan Creek)	Sediment	4.96
* @	Middle Creek (Headwaters to Weitas Creek)	Sediment	13.32
* @	Orogrande Creek (Headwaters to N.F.)	Sediment	19.51
* @	Sylvan Creek (Headwaters to French Creek)	Sediment	4.31
* @	Tamarack Creek (Headwaters to Orogrande Creek)	Sediment	3.92
* @	Tumble Creek (Headwaters to Washington Creek)	Sediment	4.60
*	Beaver Creek (Headwaters to N.F. Clearwater)	Sediment	15.97
*	Bertha Creek (Headwaters to Beaver Creek)	Sediment	2.72
*	Bingo Creek (Headwaters to Beaver Creek)	Sediment	2.77
*	Breakfast Creek (Headwaters to Clearwater River)	Sediment, dissolved oxygen, flow, habitat alteration	8.84
	Sneak Creek (Headwaters to N.F.)	Channel alteration	3.49
*	S.F. Beaver Creek (Headwaters to Beaver Creek)	Sediment	4.75
	Cranberry Creek (Headwaters to Dworshak Reservoir)	Sediment, flow, nutrients, temperature, habitat alteration, bacteria	6.79
*	Dog Creek (Headwaters to Isabella Creek)	Sediment	3.88
	Elk Creek (Headwaters to Dworshak Reservoir)	Sediment, flow, nutrients, temperature, habitat alteration, bacteria	20.85
	Elk Creek Reservoir	Sediment, flow, nutrients, temperature, habitat alteration, bacteria, dissolved oxygen	

Core Area	Stream Name	Pollutant(s)	Miles of Stream
*	Floodwood Creek (Headwaters to Breakfast Creek)	Sediment, dissolved oxygen, flow, habitat alteration	13.59
*	Isabella Creek (Headwaters to N.F.)	Sediment	8.54
	Johnson Creek (Tributary to Elk Creek)	Sediment	3.27
	Long Meadow Creek (Headwaters to Dworshak Reservoir)	Sediment, flow, nutrients, temperature, habitat alteration, bacteria	12.15
	Partridge Creek (Headwaters to Elk Creek)	Sediment	4.85
	Reeds Creek (Headwaters to Dworshak Reservoir)	Sediment	15.95
*	Sourdough Creek (Headwaters to Beaver Creek)	Sediment	3.12
	Stoney Creek (Headwaters to Breakfast Creek)	Sediment, dissolved oxygen, flow, habitat alteration	12.23
	Swamp Creek (Headwaters to Swamp Creek)	Sediment, nutrients, temperature, habitat alteration, bacteria, flow	7.36
	W.F. Elk Creek (Headwaters to Elk Creek)	Sediment	3.50
South Fork Clearwater River Core Area			
@	S.F. Clearwater River mainstem (Red River to Clearwater River)	Habitat alteration, sediment, temperature	63.79
* @	Dawson Creek (Headwaters to Red River)	Sediment	2.29
* @	Buffalo Gulch Creek (Headwaters to American River)	Sediment	6.49
* @	Beaver Creek (Headwaters to Newsome Creek)	Sediment	4.95
* @	Nuggett Creek (Headwaters to Newsome Creek)	Sediment	2.72
* @	Sing Lee Creek (Headwaters to Newsome Creek)	Sediment	3.09

Core Area	Stream Name	Pollutant(s)	Miles of Stream
* @	Newsome Creek (Beaver Creek to S.F.)	Sediment	6.91
@	Lucas Lake	Sediment	
@	Red Rock Creek (Headwaters to Cottonwood Creek)	Sediment	11.04
	Shebank Creek (Headwaters to Cottonwood Creek)	Unknown	14.56
@	Stockney Creek (Headwaters to Cottonwood Creek)	Bacteria, sediment	11.95
@	Threemile Creek (Headwaters to S.F)	Bacteria, dissolved oxygen, flow, habitat alteration, ammonia, nutrients, sediment, temperature	18.18
@	Butcher Creek (Headwaters to S.F.)	Bacteria, dissolved oxygen, flow, habitat alteration, sediment, temperature	12.37
@	Cottonwood Creek (Headwaters to S.F.)	Bacteria, dissolved oxygen, habitat alteration, ammonia, nutrients, sediment, temperature	31.19
@	S.F. Cottonwood Creek (Headwaters to Cottonwood Creek)	Bacteria, habitat alteration, nutrients, temperature	6.96
@	Cougar Creek (Headwaters to S.F.)	Sediment	6.37
	Long Haul Creek (Headwaters to S.F. Cottonwood Creek)	Unknown	1.64
	Big Elk Creek (Headwaters to mouth)[1]	Temperature	not available
	Little Elk Creek (Headwaters to mouth)[1]	Temperature	not available

Core Area	Stream Name	Pollutant(s)	Miles of Stream
Lochsa River Core Area			
@	Lochsa River mainstem (Crooked Fork/Walton confluence to Selway River)	Temperature	68.74
	Boulder Creek (Headwaters to Lochsa River)[1]	Temperature	not available
	Canyon Creek (Headwaters to mouth)[1]	Temperature	not available
*	Fish Creek (Headwaters to mouth)[1]	Temperature	not available
	Glade Creek (Headwaters to mouth)[1]	Temperature	not available
	Nut Creek (Headwaters to mouth)[1]	Temperature	not available
	Placer Creek (Headwaters to mouth)[1]	Temperature	not available
	Polar Creek (Headwaters to mouth)[1]	Temperature	not available
	S. F. Canyon Creek (Headwaters to mouth)[1]	Temperature	not available
	Storm Creek (Headwaters to mouth)[1]	Temperature	not available
*	W.F. Deadman Creek (Headwaters to mouth)[1]	Temperature	not available
	Walde Creek (Headwaters to mouth)[1]	Temperature	not available
Selway River Core Area			
@	Island Creek (Headwaters to Selway River)	Sediment	3.97
@	O'Hara Creek (Hamby Fork to Selway River)	Sediment	4.42
@	Slide Creek (Headwaters to Selway River	Sediment	4.17
Lower / Middle Fork Clearwater River Core Area			
	Clearwater River (Confluence of N.F. below the dam to Washington State line)	Total dissolved gas	40.03
	W.Fk. Potlatch River (Cougar Creek to Potlatch River)	Sediment	3.07

Core Area	Stream Name	Pollutant(s)	Miles of Stream
	Potlatch River (Headwaters to Bear Creek)	Bacteria, flow, habitat alteration, nutrients, sediment, temperature	40.47
	Potlatch River (Bear Creek to Clearwater River)	Sediment, flow, nutrients, habitat alteration, bacteria, temperature, organics, pesticides, oil/gas, dissolved oxygen, ammonia	14.13
	Middle Potlatch Creek (Headwaters to Potlatch River)	Sediment, flow, nutrients, habitat alteration, bacteria, temperature	16.42
	Sixmile Creek (Headwaters to Clearwater River)	bacteria, dissolved oxygen, flow, habitat alteration, ammonia, nutrients, oil/gas, organics, pesticides, sediment, temperature	8.10
	Pine Creek (Headwaters to Potlatch River)	Sediment, flow, nutrients, habitat alteration, bacteria, temperature	12.97
	Pine Creek (Indian Reservation Boundary to Clearwater River)	Ammonia, nutrients, oil/gas, sediment	1.95
	Pine Creek (Headwaters to Indian Reservation Boundary)	Bacteria, dissolved oxygen, flow, habitat alteration, nutrients, sediment, temperature	10.01
	Cedar Creek (Leopold Creek to Potlatch River)	Channel alteration	5.17
	E.F. Potlatch River (Ruby Creek to Potlatch River)	Sediment, flow, nutrients, habitat alteration, bacteria, temperature	4.73
	Ruby Creek (Unnamed tributary 3.4 kilometers upstream to E.F. Potlatch River)	Sediment, flow, nutrients, habitat alteration, bacteria, temperature	2.14
	Moose Creek (Headwaters to Potlatch River)	Sediment, flow, pH nutrients, habitat alteration, bacteria, temperature	5.76
	Corral Creek (Headwaters to Potlatch River)	Sediment	9.94
*	Yakus Creek (Molly Creek to Lolo Creek)	Sediment	2.94
*	Mud Creek (Headwaters to Lolo Creek)	Sediment	3.83

Core Area	Stream Name	Pollutant(s)	Miles of Stream
	Long Hollow Creek (Headwaters to Little Canyon)	Sediment, nutrients, dissolved oxygen, flow, bacteria, habitat alteration	16.03
	Lindsay Creek (Indian Reservation Boundary to Clearwater River)	Nutrients, dissolved oxygen, flow, temperature, habitat alteration, bacteria, sediment	7.35
	Hatwai Creek (Headwaters to Clearwater River)	Nutrients, temperature, habitat alteration, bacteria	7.93
	Lapwai Creek (Unnamed tributary to 26.2 kilometers upstream to Clearwater River)	Nutrients, dissolved oxygen, flow, habitat alteration, bacteria, temperature, sediment	16.32
@	Winchester Lake	Nutrients, flow, sediments, dissolved oxygen, temperature, habitat alteration, bacteria, pesticides	NA
	Webb Creek (Headwaters to Indian Reservation Boundary)	Nutrients, sediments, dissolved oxygen, temperature, habitat alteration, bacteria, flow	5.58
@	Jim Ford Creek (Headwaters to Clearwater River)	oil/gas, ammonia, temperature, bacteria, nutrients, sediments, dissolved oxygen, temperature, flow, habitat alteration	27
	Grasshopper Creek (Headwaters to Jim Ford Creek)	Nutrients, sediments, temperature, flow, habitat alteration, bacteria	8.25
*	Schmidt Creek (Headwaters to Lolo Creek)	unknown	4.48
*	Texas Creek (Headwaters to Lolo Creek)	unknown	5.71
*	Lolo Creek (Eldorado Creek to Clearwater River)	Bacteria, oil/gas, nutrients, sediments, dissolved oxygen, flow, habitat alteration, temperature	28.44
*	Jim Brown Creek (Headwaters to Musselshell)	Nutrients, sediment, temperature, habitat alteration, flow, bacteria	13.33
	W.F. Sweetwater Creek (Headwaters to Indian Reservation Boundary)	Nutrients, sediment, temperature, flow, habitat alteration, bacteria, pesticides, organics, dissolved oxygen	19.53
	Lawyer Creek (Headwaters to Indian Reservation Boundary)	Nutrients, sediment, dissolved oxygen, temperature, flow, habitat alteration, bacteria, oil/gas, ammonia	7.30

Core Area	Stream Name	Pollutant(s)	Miles of Stream
	Sevenmile Creek (Headwaters to Lawyer Creek)	Sediment, habitat alteration	7.25
	Catholic Creek (Headwaters to Clearwater River)	Nutrients, sediment, dissolved oxygen, temperature, flow, habitat alteration, bacteria, organics, ammonia	9.60
	Big Canyon Creek (Sixmile Canyon to Clearwater River)	Nutrients, sediment, temperature, flow, habitat alteration, bacteria	13.77
	Big Canyon Creek (Headwaters to Sixmile Canyon)	Bacteria, dissolved oxygen, flow, habitat alteration, ammonia, organics, pesticides, temperature	19.45
	Bedrock Creek (Headwaters to Indian Reservation Boundary	Nutrients, sediment	6.08
	Bedrock Creek (Indian Reservation Boundary to Clearwater River)	Nutrients, sediment	3.46
	Boulder Creek (Pig Creek to Potlatch River)	unknown	2.83
	Holes Creek (Headwaters to Little Canyon)	Bacteria, dissolved oxygen, flow, habitat alteration, ammonia, metals, nutrients, oil/gas, organics, pesticides, sediment	9.08
	Big Bear Creek (W. Fk. Big Bear to Potlatch River) [1]	Temperature	not available

[1] Waterbodies added to Idaho DEQ's 1998 Section 303(d) list by the U.S. Environmental Protection Agency in January 2001. Source: (U.S. EPA, *in litt*. 2001).

APPENDIX B. Limiting Factors Defined for Bull Trout During Previous Research or Assessments in the Clearwater Subbasin. (Adapted from Table 45 in the Clearwater Subbasin Summary(CSS 2001).)

Limiting Factors	North Fork Clearwater River Core Area	South Fork Clearwater River Core Area	Lochsa River Core Area	Selway River Core Area	Lower / Middle Fork Clearwater River Core Area
Temperature	X	X	X	X (Only Lower Selway: Moose Creek to Lowell)	X
Base Flow					X (Only Lower Clearwater below North Fork)
Flow Variation					X (Only Lower Clearwater below North Fork)
Sediment	X	X	X		X (Only Middle Fork and Lolo Cr. watershed)
Instream Cover		X	X		X (Only Middle Fork and Lolo Cr. watershed)
Watershed Disturbances [1]	X	X	X		X (Only Middle Fork and Lolo Cr. watershed)
Habitat Degradation [2]	X (Only Lower North Fork: Aquarius to mainstem Clearwater)	X	X	X	X (Only Middle Fork and Lolo Cr. watershed)
Exotics / Introgression	X	X	X	X	
Harvest [3]	X	X	X	X	X
Connectivity / Passage [4]	X (Only Lower North Fork: Aquarius to mainstem Clearwater)	X			X (Only Lower Clearwater below North Fork confluence)

[1] Includes upland disturbances such as mining, timber harvest, and roading.

[2] Includes riparian and instream habitat loss and disturbance.

[3] Sport harvest of bull trout is not permitted in the subbasin, although poaching and some tribal harvest of the species may occur.

[4] Includes passage barriers or other forms of population fragmentation.

APPENDIX C: List of Chapters