Management Plan for the Conservation of Westslope Cutthroat Trout in Idaho

Idaho Department of Fish and Game
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EXECUTIVE SUMMARY

The goals of the *Management Plan for the Conservation of Westslope Cutthroat Trout in Idaho* are to: 1) ensure the long-term persistence of the subspecies within the current range in Idaho; 2) manage populations at levels capable of providing angling opportunities; and 3) restore westslope cutthroat trout to those parts of its historical range where feasible. Westslope cutthroat trout populations are native to drainages in the Panhandle, Clearwater, Southwest, and Salmon administrative regions of the Idaho Department of Fish and Game (IDFG). This plan summarizes historical and current information on westslope cutthroat trout throughout its range in Idaho including the documented status of populations within 20 geographic management units (GMUs) based on 4^{th} Code hydrologic unit (HUC) boundaries. This information includes population abundance and trends, genetic status where available, and an evaluation of existing threats to population viability. The plan presents management strategies and conservation actions proposed for all 20 GMUs based on existing habitat conditions and threats, genetic status, and population trends.

The IDFG was a participant in a 2009 range-wide effort to update the known status of westslope cutthroat trout involving state and federal agencies, tribes, and private conservation partners. In the 2009 status update, the total amount of stream habitat identified as historical habitat was about 93,370 km (58,030 mi) range-wide. The estimated amount of historical range in Idaho was 34,661 km (21,542 mi) or 37% of the total occupied range. Westslope cutthroat trout are estimated to currently occupy 54,075 km (33,608 mi) or 58% of the historically occupied habitats. They are estimated to currently occupy 27,784 km (17,268 mi) in Idaho (51% of total current stream miles occupied range-wide). Westslope cutthroat trout are estimated to currently occupy 80% of their historical range in Idaho. It is suspected this is the case because much of the core habitat in Idaho is contained within federally protected lands designated as wilderness, roadless areas, or national forests.

Declines in populations of native salmonids including westslope cutthroat trout can result from combined effects of habitat degradation and fragmentation, blocked migration corridors, degraded water quality or quantity, angler harvest and poaching, entrainment into diversion canals and dams, non-native fish species interactions, and other factors. Examples of land and water management activities that could degrade habitat and depress salmonid populations include dams and other diversion structures, forestry management, livestock grazing, intensive agriculture, road construction and maintenance, mining, and urban/rural landscape development. Additionally, climate change may play an important role in restricting the distribution of westslope cutthroat trout populations in the future.

Across the range of westslope cutthroat trout, a high percentage (59%) of habitats were judged to be in either excellent (18%) or good condition (41%). Fair habitat conditions were assigned to 24% of the currently occupied habitats and only 4% of habitats were judged to be in poor condition. Habitat quality for 13% of the occupied habitat was judged to be unknown. Habitat conditions in Idaho overall were similar to the range-wide estimates. While habitat conditions vary widely across the range in Idaho, in general, stream reaches in the upper parts of river drainages are in better overall condition than stream reaches in the lower parts. This is a function in part of cooler conditions as a result of higher elevations and more shade, partly because of being farther removed from agricultural lands, and partly because much of the higher-elevation land is in federal ownership.

The presence of non-native fish species is viewed as a potential significant threat to the existence of westslope cutthroat trout throughout their range. Non-native rainbow trout occupy approximately

6,196 km (3,851 mi) of stream (36% of currently occupied) within the range of westslope cutthroat trout in Idaho. Where non-native rainbow trout stocks have been introduced across the range of westslope cutthroat trout in Idaho, introgressive hybridization has generally been documented. Brook trout are present in a high proportion of streams across the range of westslope cutthroat trout and have replaced cutthroat trout in many streams across their historical range in Idaho. Brook trout occupy an estimated 9,065 km (5,634 mi) of stream (>50% of currently occupied) in Idaho within the range of westslope cutthroat trout. Other non-native species present in Idaho that potentially compete with or prey upon westslope cutthroat trout include lake trout, walleye, northern pike, and smallmouth bass.

Since westslope cutthroat trout populations are highly susceptible to exploitation by angling, special rules are the norm in Idaho. The IDFG has progressively taken steps to conserve and manage native cutthroat trout populations. Pioneering research in the late 1960s and early 1970s in north Idaho on Kelly Creek, the St. Joe River, and the Lochsa River documented significant benefits to cutthroat trout populations from either catch-and-release or restrictive bag and size limits. In general, fishing rules are designed to allow cutthroat trout populations to be healthy and productive within the confines of the habitat carrying capacity. The IDFG believes that the widespread implementation of special rules across the range of westslope cutthroat trout has been very successful in protecting and conserving populations for the long-term enjoyment of our constituents.

The 2009 range-wide status assessment for westslope cutthroat trout served as a catalyst in providing the necessary updated "baseline" information for completing this management plan. The long-term assessment of many populations of cutthroat trout over large landscapes in Idaho is difficult to sustain. However, the IDFG will continue collaborating with its partners to assess the status of the subspecies by conducting monitoring of occupied river basins. We will focus our efforts on assessing habitat quality, population status, habitat connectivity, and genetic status.

General statewide management actions proposed by the IDFG to meet the goals and objectives for this management plan are:

1. Reestablish westslope cutthroat trout in historically occupied habitats where they are no longer supported.
2. Reduce negative impacts of non-native fish on westslope cutthroat trout populations.
3. Identify fish passage barriers.
4. Screen irrigation diversions.
5. Improve watershed habitat.
6. Promote recreational fishing opportunities.
7. Continue doing genetic analyses.
8. Continue monitoring of populations.
9. Maintain the existing range-wide database for westslope cutthroat trout and continue to update the IDFG internal database.
10. Public Outreach.

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INTRODUCTION

In 2009, the Idaho Department of Fish and Game (IDFG) collaborated with a number of partners to complete a range-wide status assessment for westslope cutthroat trout (WCT) *Oncorhynchus clarkii lewisi* (May 2009), which updated a previous assessment on the subspecies (Shepard et al. 2003; Shepard et al. 2005). Rieman and Apperson (1989) previously described the status of WCT in Idaho stating that "viable" populations existed in 36% of the historical range while "strong" populations were identified in 11% with most of the latter being located in roadless and wilderness areas. The purpose of the 2009 status assessment was to have available consistent and updated information on the population and genetic status of WCT. This is helpful in order to provide the best available scientific information to the U.S. Fish and Wildlife Service (Service) due to past Endangered Species Act (ESA) litigation, and to serve as an information base that can be used by individual states and other agencies to assess and prioritize conservation efforts. The updated status assessment found that WCT inhabit up to 80% of their historical range in Idaho, with the healthiest populations occupying the core of the distribution within federally protected lands. This plan for WCT will focus IDFG management and research efforts on protecting and expanding the range of the subspecies in Idaho based on habitat conditions, existing threats, and the genetic and population status.

GOALS AND OBJECTIVES

Goals

1. Ensure the long-term persistence of WCT within the current range in Idaho;
2. Manage WCT populations at levels capable of providing angling opportunities; and
3. Restore WCT to those parts of its historical range in Idaho where feasible.

Objectives

1. Describe the population and genetic status of WCT in Idaho by major river basin.
2. Identify and protect core populations of WCT.
3. Restore degraded habitats.
4. Reduce impacts of non-native fish species.
5. Prioritize management and conservation actions by basin.

Distribution

WCT is the most widely distributed subspecies of cutthroat trout (Allendorf and Leary 1988; Behnke 1992). It inhabits streams on both sides of the Continental Divide in the western United States. On the east side of the divide, they are distributed primarily in Montana but also occur in some headwaters in Wyoming and southern Alberta (Behnke 1992). They are present in the Missouri River Basin downstream to about 60 km below Great Falls, Montana and in the headwaters of the Judith, Milk, and

Marias rivers. On the west side of the divide, the subspecies occurs in the upper Kootenai River; the Clark Fork drainage in Montana and Idaho downstream to the falls of the Pend Oreille River; the Spokane River above Spokane Falls; the Coeur d'Alene and St. Joe river drainages; and the Clearwater and Salmon river basins. Several disjunct populations of WCT persist in the mid-Columbia River basin including the Methow, Entiat, and Wenatchee river basins in Washington and in the John Day River in Oregon (Behnke 1992). Figure 1 displays the general range-wide distribution of WCT within river basins of the northwestern United States.

In the 2009 status update, the total amount of stream habitat identified as historical habitat was about 93,370 km (58,030 mi) (May 2009). The estimated amount of historical range in each state was 47,534 km (29,543 mi) in Montana (51%), 34,661 km (21,542 mi) in Idaho (37%), over 1,609 km (1,000 mi) in Oregon (2%), 9,024 km (5,609 mi) in Washington (9%), and 392 km (244 mi) in Wyoming (Yellowstone National Park; <1%). WCT are estimated to currently occupy 54,075 km (33,608 mi) or 58% of the nearly 93,370 km (58,030 mi) of historically occupied habitats. They are estimated to occupy 27,784 km (17,268 mi) in Idaho (51% of current), 20,500 km (12,741 mi) in Montana (38% of current), 544 km (338 mi) in Oregon (1% of current), 5,222 km (3,246 mi) in Washington (10% of current), and a small portion of habitat (22.5 km or 14 miles; less than 1% of current) within Wyoming.

<u>Taxonomy</u>

Behnke (1992) characterized WCT primarily by its distinctive spotting, and grouped all cutthroat trout native to the upper and middle Columbia, South Saskatchewan, and upper Missouri basins, which share this spotting, as a single subspecies. The identification based on spotting is corroborated by a distinctive karyotype of 66 chromosomes and genetic data. The subspecies *lewisi* represents a major divergence in the phylogeny of the species.

Despite the wide distribution and long separation of WCT from other subspecies, the evolutionary line has not given rise to any other subspecies that have survived into the modern era (Behnke 1992). By comparison, the evolutionary line leading to Yellowstone cutthroat trout (YCT; *O. clarkii bouvieri*) (karyotype 64 chromosomes) has produced 12 subspecies, all by geographical isolation (Behnke 1988, 1992).

<u>Morphometrics</u>

Behnke (1992) described the typical taxonomy of WCT. They generally have small spots which are irregular in outline (non-rounded), similar in shape and size to the spots of coastal cutthroat trout (*O. clarkii clarkii*). There are few spots on the anterior body below the lateral line. The coloration of the subspecies is variable but generally is silvery with yellowish tints, but bright yellow, orange, and especially red colors can be expressed to a much greater extent than on coastal or YCT. Vertebrae typically number 60-61, and range between 59 and 63. Scales in the lateral line series typically number 150-200 or more with mean values generally 165-180. Specimens from the Salmon and Clearwater drainages of Idaho and some British Columbia populations have the highest lateral-series counts, averaging more than 200. Pyloric caeca typically number 25-50, with mean values of 30-40. Gill rakers typically number 17-21, mean values usually 18-19. The posterior gill rakers on first arch are absent or weakly developed.

Figure 1. General range-wide distribution of WCT within major river basins of the Pacific Northwest United States as of 2009.

WCT tend to have fewer meristic elements (vertebrae, pyloric caeca, and gill rakers) than YCT, but the variation in meristic counts within each subspecies are considerable. The two subspecies have distinctive spotting patterns and coloration differences.

Life History and Ecology

Three life history forms of WCT exist. These include the lacustrine-adfluvial stocks which migrate between lakes and streams; the fluvial-adfluvial stocks which move between mainstem rivers and tributaries; and fluvial or resident stocks which spend their entire lives in small headwater streams (Liknes and Graham 1988; Behnke 1992). All three life history forms may occur within a single basin (Averett and MacPhee 1971; Rieman and Apperson 1989). WCT are native to all of the large lakes of the upper Columbia River basin of Idaho and Montana (Coeur d'Alene, Pend Oreille, Priest, and Flathead lakes). Both lacustrine-adfluvial and fluvial-adfluvial fish will live from 2-3 years in tributary streams, but they may spend as little as one year or as long as four years in natal streams prior to migration (Liknes and Graham 1988).

WCT begin to mature at age 3 but usually first spawn at age 4 or 5 (McIntyre and Rieman 1995). Liknes (1984) reported that sexually maturing adfluvial fish move into the vicinity of tributaries in fall and winter where they remain until they begin to migrate upstream in the spring. They spawn from March to July at water temperatures near 10^{o}C (Roscoe 1974; Liknes 1984; Shepard et al. 1984). WCT are believed to spawn predominantly in small tributaries. Headwaters and upper reaches of large river basins like the Coeur d'Alene and St. Joe is typically dominated by resident and fluvial forms, but tributaries to lakes primarily support adfluvial fish (Averett and MacPhee 1971; Thurow and Bjornn 1978; Rieman and Apperson 1989).

Fry emerge from gravels after yolk sac absorption and at a length of about 20 mm (Shepard et al. 1984). After emergence, many fry disperse downstream.

Habitat Requirements

WCT inhabit streams that are cold and nutrient-poor (Liknes and Graham 1984; Rieman and Apperson 1989). Growth varies but is thought to be influenced by habitat productivity (McIntyre and Rieman 1995). Growth is generally higher for migratory forms of WCT that spend some time in larger rivers or lakes (Rieman and Apperson 1989).

Substrate composition, particularly the percentage of fine sediment, strongly influences survival of early life history phases of WCT. Elevated fine sediment levels reduce emergence success (Weaver and Fraley 1991), embryo survival (Irving and Bjornn 1984), and food and space for rearing juveniles (Bjornn et al. 1977). Highly embedded substrates may be harmful for juvenile cutthroat trout that typically enter the substrate for cover in winter.

WCT tend to be widely distributed in occupied basins (Shepard et al. 1984) and may occur in every stream with suitable habitat. Cutthroat trout microhabitats are associated with water velocities ranging from 0.1 to 0.3 m/s (Griffith 1970; Pratt 1984). WCT less than 100 mm long are found mostly in pools and runs. The distribution and abundance of larger WCT is strongly associated with well-developed pools (Shepard 1983; Pratt 1984; Peters 1988; Ireland 1993). In general, stream reaches with numerous pools support the highest densities of fish (Shepard 1983; Hoelscher and Bjornn 1989). Habitats that provide some form of cover also seem to be preferred by WCT (Griffith 1970; Pratt 1984; Lider 1985). Larger fish congregate in pools during winter (Peters 1988; Lewynsky 1986).

Feeding Habits

WCT are opportunistic in their feeding habits and are not highly piscivorous (Liknes and Graham 1988; Behnke 1992). They specialize as invertebrate feeders (Roscoe 1974; Behnke 1979). Dipterans and ephemeropterans are the most important dietary components for WCT, with trichopterans becoming increasingly important for fish larger than 110 mm (Shepard et al. 1984). Diversity of food items consumed increases as fish become larger.

Biotic Interactions

WCT coevolved with mountain whitefish (*Prosopium williamsoni*) and pygmy whitefish (*P. coulteri*), several sculpins, cyprinids, and catostomids. In Columbia River tributaries, WCT is most commonly associated with bull trout (*Salvelinus confluentus*), resident and anadromous redband/rainbow trout or steelhead (*Oncorhynchus mykiss gairdneri*), and Chinook salmon (*Oncorhynchus tschawytscha*). WCT coevolved with steelhead in the Clearwater and Salmon River basins without significant introgressive hybridization (Kozfkay et al. 2007). In Idaho, the distribution of the two species overlaps in an estimated 9,764 km (6,066 mi).

Where non-native rainbow trout stocks have been introduced across the range of WCT in Idaho, introgressive hybridization has been documented (Rieman and Apperson 1989; Allendorf and Leary 1988). YCT have also been widely introduced into the range of WCT in Idaho (Liknes 1984; Rieman and Apperson 1989), and hybridization between these two subspecies has been documented. Non-native rainbow trout occupy approximately 6,199 km (3,851 mi) (36% of currently occupied) of stream within the range of WCT in Idaho, while YCT are documented in about 118 km (73 mi) or less than 1% of currently occupied habitat (May 2009).

In Idaho, millions of juvenile salmon and steelhead are stocked annually in the Salmon and Clearwater river basins to bolster anadromous fish returns by seeding available habitats and to support recreational fisheries. The effects of these high density stocking events on native populations of WCT are unknown and studies documenting such interactions are lacking in the scientific literature. However, researchers have documented declines in resident salmonid stocks (numbers and biomass) probably associated with the cumulative impacts from multiple stockings of Chinook salmon smolts (Pearsons and Temple 2010).

Brook trout are present in a high proportion of streams across the range of WCT and have replaced cutthroat trout in many streams across their historical range in Idaho (Rieman and Apperson 1989). Brook trout occupy an estimated 9,069 km (5,634 mi) (over half of currently occupied) of stream in Idaho within the range of WCT (May 2009).

Other non-native species present in Idaho that potentially compete with or prey upon WCT include lake trout (*Salvelinus namaycush*), walleye (*Sander vitreum*), northern pike (*Esox lucius*), and smallmouth bass (*Micropterus dolomieui*).

Population Viability

Within each WCT management unit, local populations and core population areas can be identified. Local populations generally spend their entire lives in tributaries, exhibit relatively small amounts of genetic diversity within a particular local population, and have higher levels of genetic diversity between stream populations, and high levels of genetic diversity between tributaries. Core populations are partially isolated but have some degree of gene flow among them, most noticeably in the form of larger migratory fish. Core populations meet the definition of Meffe and Carroll (1994) and function as a metapopulation (Dunham and Rieman 1999).

The viability of WCT populations depends upon the number of local populations, adult abundance (number of spawning fish), the reproductive rate of the populations (measured by population trend and variability), and connectivity (presence of migratory life history form and functional habitat). The management actions advocated later in this management plan are intended to benefit these elements.

Management Status

The Service administers the ESA to conserve native fauna deemed at risk of extinction. In 1997, the Service received a formal petition to list WCT as "threatened throughout its range" under the ESA. Following a status review conducted by the Service, they determined that a "threatened" listing was "not warranted" for WCT because of the currently wide distribution of this subspecies and ongoing conservation measures (USFWS 1999; U.S. Office of the Federal Register 2000). Afterwards, a lawsuit was brought against the Service by a group of plaintiffs arguing that there were numerous flaws in the rationale they used for their determination. The Court rejected some of the arguments made by plaintiff's; however, the Court found that the Service's inclusion of hybridized WCT in the taxon considered for listing, while at the same time considering hybridization as a threat to the subspecies, was arbitrary and capricious. The Court also suggested that the Service failed to adequately consider threats from disease and remanded the "not warranted" listing decision back to the Service (U.S. Office of the Federal Register 2002). For a second time in 2003, the Service decided the listing of WCT was "not warranted." Post 2003, the plaintiffs continued to seek additional relief in the federal courts, but to date, there has been no change in the status of the species.

The Idaho Fish and Game Commission is authorized under Idaho Code Sections 36-104(b) and 36-201 to adopt rules concerning the taking of wildlife species (including fishes) and the classification of all wildlife in the state of Idaho. These rules are cited in full as IDAPA 13.01.06.000 et seq., Rules of the Idaho Fish and Game Commission, IDAPA 13.01.06, Rules Governing Classification and Protection of Wildlife. These rules were last updated in 2012. The IDFG previously classified certain native fishes as "Species of Special Concern." The IDFG no longer uses this classification. Currently, the IDFG classifies species as Game Species, Protected Nongame, Threatened or Endangered, or Unprotected and Predatory Wildlife. The WCT is officially classified as a Game Species in Idaho. The Idaho Comprehensive Wildlife Conservation Strategy (Wildlife Action Plan) lists WCT as a Species of Greatest Conservation Need (IDFG 2006). Both the U.S. Forest Service (USFS) and Bureau of Land Management (BLM) consider WCT to be a sensitive species.

Regulatory Mechanisms

There are numerous federal and state regulatory mechanisms in place, that if appropriately administered and implemented, provide a reasonable degree of protection to WCT and their habitats in

Idaho. Federal land management agencies such as the USFS and BLM must adhere to federal laws such as the National Environmental Policy Act and Clean Water Act, and federal rules and regulations and agency policies contained within Forest Plans and Land and Resource Management Plans. Since WCT are considered a sensitive species by both of these agencies, considerable attention is given to analyzing any actions that are proposed to occur within their occupied range on federally administered lands. As part of regulating, permitting, or implementing actions on public lands, federal land management agencies routinely interact with the IDFG, federal regulatory agencies such as the Service, and Indian tribes regarding potential effects on fish and fish habitat. The state of Idaho has laws dealing with forest practices, stream channel and wetland protection, water quality, water rights, instream flows, fishing rules, stocking of private waters, and scientific collecting permits. The IDFG, acting under the direction of the Idaho Fish and Game Commission, has policies in place to protect, conserve, and manage native fish such as WCT that are contained within the 2013-2018 Fisheries Management Plan (IDFG 2013). In Idaho, protective fishing rules (e.g., catch and release) are in place in waters occupied by WCT. These rules have demonstrated a high degree of effectiveness in maintaining viable recreational fisheries for WCT.

GEOGRAPHIC MANAGEMENT UNITS

To facilitate the summary of the available information and to provide geographic focus to conservation efforts, the IDFG subdivided the Idaho portion of the range of WCT into geographic management units (GMUs) based on 4th Code hydrologic unit (HUC) boundaries. In some cases, adjacent 4th Code HUCs were combined into a single GMU. This was done where cutthroat trout life histories or management programs spanned a single 4th Code HUC. On a larger scale, GMUs are rolled up into major river basin complexes to facilitate presentation of information in this management plan. These include North Idaho River Basins, Clearwater River Basins, and Salmon River Basins (Figures 2-4).

North Idaho River Basins

Moyie River GMU

The Moyie River GMU consists of the Idaho portion of the Moyie River and several tributaries, the largest of which are Deer and Meadow creeks (Figure 5). For the purpose of this plan, the Moyie River GMU also includes Canuck Creek, which is a tributary to the Moyie River in British Columbia, Canada. The Moyie River originates at the outlet of Moyie Lake in British Columbia and flows 93 km (58 mi) through Canada and 42 km (26 mi) through Idaho before it enters the Kootenai River. Moyie Falls (25 m high), located about 3.0 km (2.0 mi) upstream from its mouth, is a natural barrier to fish migration. Moyie Falls Dam is located at the top of Moyie Falls and impounds about 2 km (1.2 mi) of the river.

The Moyie River has two distinctly different morphologies. From the U.S.-Canada border downstream to around Meadow Creek (16 km or 10 mi from mouth), the river can typically be categorized as a B3 stream type, which is characterized as having a gradient ranging from 2-4% and predominately cobble substrate with moderately steep valleys and gentle side slopes (Rosgen 1996). Downstream of Meadow Creek, the river typically can be categorized as an A2 stream type, which is characterized as having a gradient ranging from 4-10% and predominately boulder substrate with steep side slopes and confined valleys (Rosgen 1996). This reach of river is often referred to as the canyon section.

Figure 2. North Idaho River Basins and delineated GMUs with WCT distribution as of 2009.

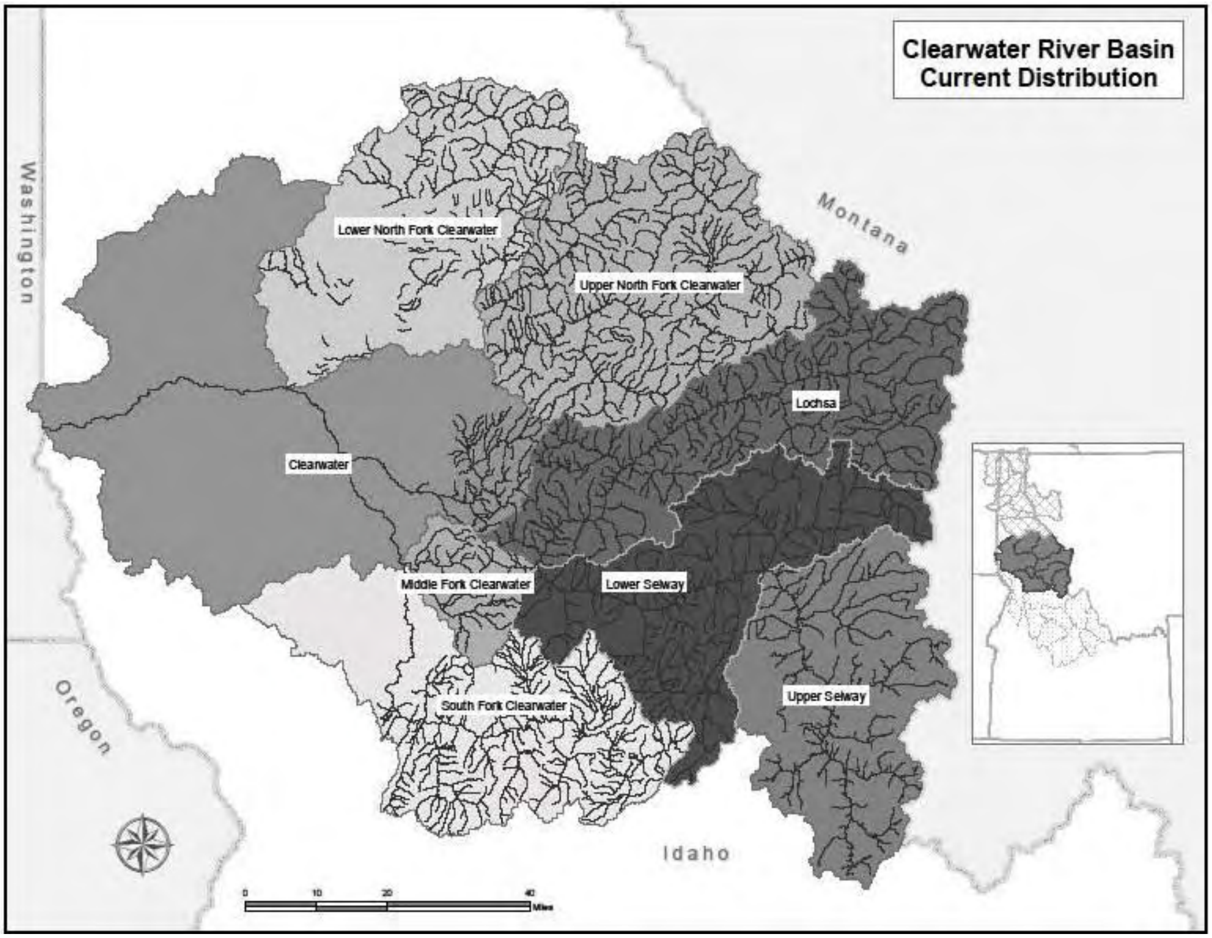

Figure 3. Clearwater River Basin and delineated GMUs with WCT distribution as of 2009.

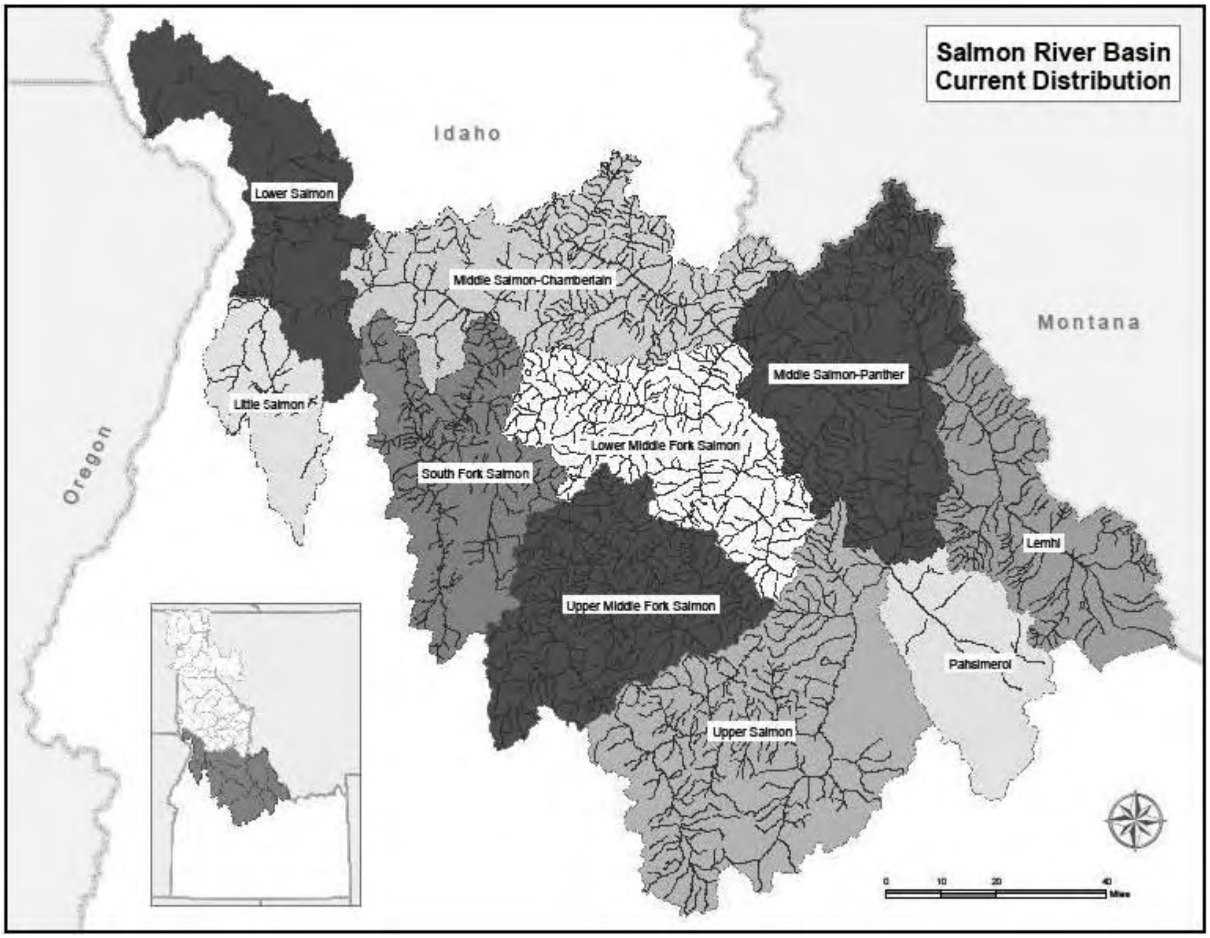

Figure 4. Salmon River Basin and delineated GMUs with WCT distribution as of 2009.

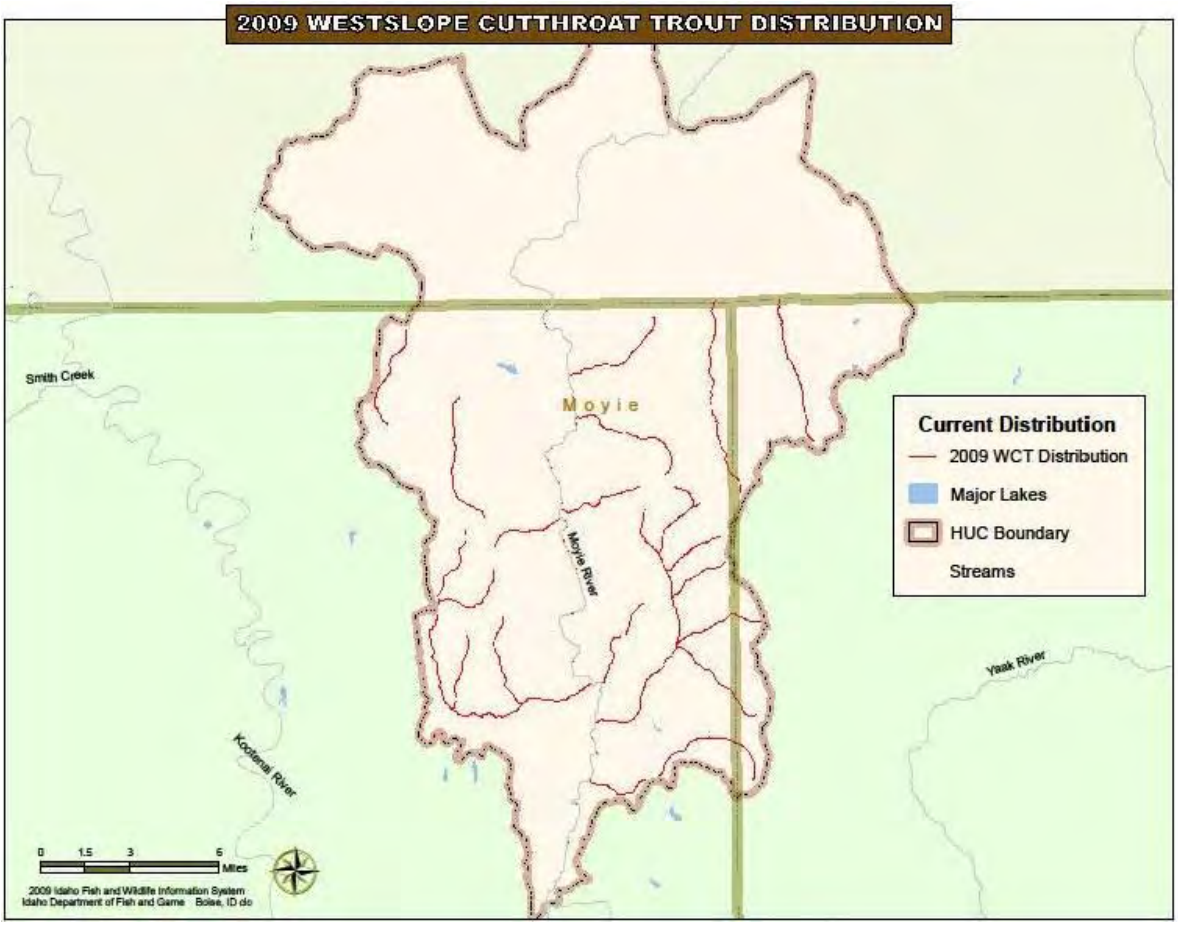

Figure 5. Moyie River GMU with WCT distribution as of 2009.

Large woody debris is scarce in the entire river and is likely related to the intense logging that historically occurred throughout the river valley. Long stretches of riffle habitat are common throughout the river although bedrock pools are more common in the lower reach. In 1990, the Pacific Gas and Electric Company installed a parallel natural gas line that crossed the Moyie River eight times. To stabilize these crossings, they constructed boulder drop structures across the river. For mitigation of this project, the utility also constructed approximately 20 rock bank barbs incorporating large woody debris along the river (Chip Corsi, IDFG, personal communication). These structures have successfully created more complexity and pool habitat.

It is unclear what the native trout species were in the Moyie River. Goodnight (1977) stated that WCT are the only indigenous trout species on the Moyie River. Moyie Falls on the lower river was believed to have blocked all access to rainbow trout. Goodnight (1977) suggested the wild rainbow trout population developed after planting hundreds of thousands of rainbow trout in the river and its tributaries over the past 80-100 years. Rainbow trout are uncommon in most tributaries (Horner and Rieman 1984; Walters et al. 2007) where either brook trout or WCT are the dominant species. These findings tend to support the belief that rainbow trout are not native to the Moyie River. Despite the presence of Moyie Falls, some still believe rainbow trout may be native to the Moyie River drainage. This stems from findings on the Yaak River, another tributary of the Kootenai River in Montana similar in characteristics to the Moyie, where native redband trout are found upstream of large impassible falls (Muhlfeld et al. 1999). In the Yaak River, native redband trout are found throughout the watershed, and are the only species that occur in some of the tributaries (Muhlfeld et al. 1999). Additionally, mountain whitefish and burbot (*Lota lota*) occur naturally above Moyie River Falls. Bull trout are native to the Moyie River, but no spawning populations are known to occur in Idaho.

Regardless of the origin of rainbow trout, cutthroat trout are uncommon in the mainstem Moyie River. As early as 1975, cutthroat trout represented less than 1% of the trout species in the river (Goodnight and Watkins 1979). Goodnight (1977) believed loss of access to spawning tributaries in the 1950s associated with the Spokane International Railroad and competition with introduced species (rainbow trout and brook trout) were responsible for the demise of WCT in the Moyie River mainstem. More recent fishery surveys have not shown a viable cutthroat trout population in the mainstem Moyie River. In 2006, IDFG collected 4,302 fish through electrofishing and only four were cutthroat trout, while snorkeling observers found 1,047 different fish and only one was a cutthroat trout. WCT abundance has been low as far back as 1975 when, out of 280 fish observed through snorkeling, only one was a cutthroat trout. Densities of cutthroat trout observed through snorkeling were one fish/km in 1975 (Goodnight and Watkins 1979), three fish/km in 1984 (Horner and Rieman 1984), and <1 fish/km in 2006 (Walters 2006). In all likelihood, the cutthroat trout sampled or observed were flushed from tributary streams, alpine lakes, or from Canada.

WCT populations exist in many of the tributaries of the Moyie River, where they are often the most abundant species (Walters 2006). A cutthroat trout genetic assessment was conducted in 2005 to evaluate distribution and introgression throughout the Moyie and Kootenai River GMUs. Fourteen streams in the Moyie and Kootenai river drainages were surveyed. Eleven of them contained cutthroat trout phenotypes (Table 1). Four streams surveyed contained pure populations of cutthroat trout. Seven streams contained rainbow x cutthroat hybrids; however, none of the streams had rainbow trout introgression levels >2.34% (Table 1). Seven streams contained brook trout. Samples from Spruce Creek included three fish with both westslope and YCT alleles; one with westslope, Yellowstone, and rainbow trout alleles; and eight with westslope and rainbow trout alleles. No individual fish with genotypes indicative of rainbow trout or F1 hybrids were detected from streams sampled in the Moyie River.

Table 1. Sample Location, sample size, number of genotypes indicative of WCT, rainbow trout (RBT), >F1 hybrids, and F1 hybrids detected among the 15 sampled creeks in the Moyie River and Kootenai river drainages, Idaho (Walters 2006).

Sample location	Sample size	WCT	RBT	>F1 Hybrid	F1 Hybrid	% RBT introgression
Bussard Creek	36	31	0	5	0	0.77%
Cannuck Creek	50	50	0	0	0	None
Copper Creek	50	50	0	0	0	None
Davis Creek	50	50	0	0	0	None
Faro Creek	41	37	0	4	0	0.85%
Keno Creek	50	47	0	3	0	1.25%
Kreist Creek	35	31	0	4	0	0.63%
Mill Creek	50	50	0	0	0	None
Hell Roaring Creek	50	46	0	4	0	0.79%
Skin Creek	50	49	0	1	0	None[a]
Spruce Creek	50	38	0	12[b]	0	2.34%
Mission Creek	50	50	0	0	0	None
EF Mission Creek	50	49	0	1	0	0.14%
MF Boulder Creek	50	2	11	35	2	N/A
Mainstem Kootenai R.	79	5	54	16	4	N/A

[a] One individual was identified as a hybrid with mtDNA of RBT.

[b] Of the 12 >F1 hybrids identified, three were identified with both WCT and YCT alleles; one was identified with WCT, YCT, and RBT alleles; and the remaining eight individuals were identified with WCT and RBT alleles.

Populations of pure WCT were found in the Moyie River drainage. Keno and Spruce creeks, identified as pure cutthroat trout in previous studies (Sage 1995; Leary 1997), now contain hybrids, while Copper Creek, reported to have westslope x Yellowstone hybrids in 1995 (Leary 1997), now has pure WCT. Canuck Creek still has a pure population of cutthroat trout as Sage (1995) found in samples from 1994. A detailed summary of the 2005 genetic assessment can be found in Walters (2006).

The Moyie River has been managed as a wild trout fishery since 2000. Anglers fishing the mainstem are allowed a harvest of two trout, with no minimum size restrictions. Tributaries are managed with general rules, which allow anglers to harvest six trout with no minimum size restrictions. Fishing pressure is believed to have been much higher in the Moyie River historically. Much of the pressure was created by the heavy stocking of rainbow trout (20,000 to 50,000 fish annually). It seems likely that indiscriminate cutthroat trout harvest occurred incidental to the rainbow trout fishery.

Lower Kootenai River GMU

The lower Kootenai GMU consists of that portion of mainstem reach of the Kootenai River and tributaries from the Idaho-Montana border to the U.S.-Canada border (Figure 6). Major tributary drainages include Boulder Creek, Deep Creek, Myrtle Creek, Ball Creek, Trout Creek, Canyon Creek, Smith Creek, and Boundary Creek.

There are approximately 105 km (65 mi) of mainstem Kootenai River in Idaho with the following three distinct reaches based on habitat types: 1) the canyon reach (22 km; 14 mi) from the Montana border to the Moyie River, 2) the braided reach (10 km; 6 mi) from the Moyie River to Bonners Ferry, Idaho, and 3) the meandering reach (73 km; 45 mi) from Bonners Ferry to the Canadian border. The “meandering reach” has a relatively slow velocity and substrates consisting mainly of sand, silt, and clays. Dikes on either side of the river in this reach reduce flooding of the adjacent agricultural lands. The “braided” and “canyon” reaches upstream of Bonners Ferry are higher gradient, consisting of riffles, runs and pools, and gravel and cobble substrates.

Both WCT and redband trout are native to the Kootenai River drainage. Although cutthroat trout are found in the mainstem Kootenai River, their abundance is low relative to redband trout. For example, 2012 electrofishing surveys in the canyon reach estimated 68 redband trout/km and only 1.2 cutthroat trout/km. Fluvial life history is limited by impassable natural barriers in the lower reaches of many Kootenai River tributaries, and what habitat is available is dominated by redband trout. Most *Oncorhynchus* spp. collected either by electrofishing or outmigrant traps in the lower reaches of tributaries are redband trout. In the upper reaches, however, cutthroat trout are the dominant species. Introduced brook trout are present throughout the drainage.

Libby Dam was constructed in Montana in 1972, and its operation for flood control and power production changed the natural seasonal and daily flow, temperature, and productivity regimes in the Kootenai River. Sediments trapped behind Libby Dam have dramatically reduced turbidity and the availability of important nutrients in the river and lake. To improve river productivity, a nutrient replacement program was implemented in 2005. This involved adding liquid nitrogen and phosphorus to the Kootenai River near the Idaho-Montana border. The project was implemented to improve survival and growth of native sportfish, including WCT.

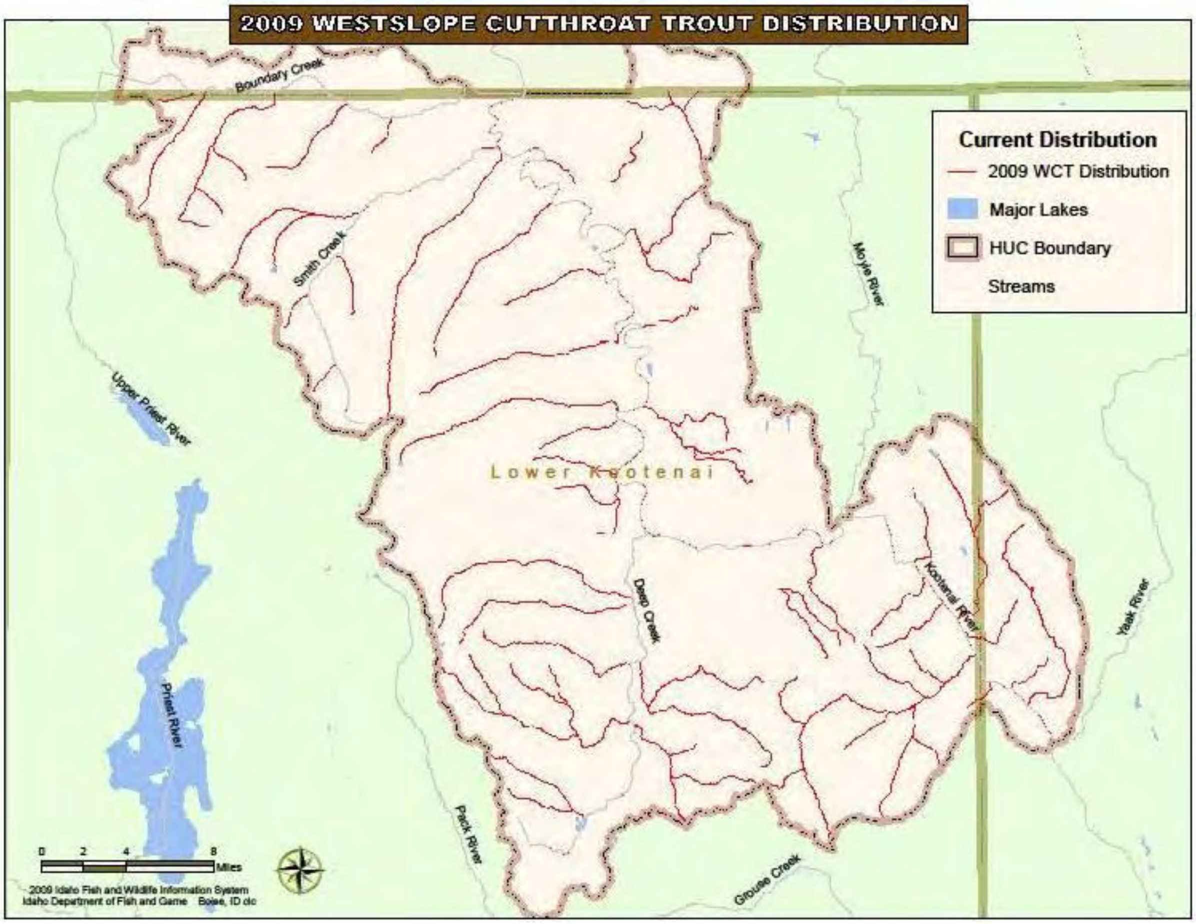

Figure 6. Lower Kootenai River GMU with WCT distribution as of 2009.

Numerous tributaries drain the Selkirk and Purcell mountain ranges and enter the Kootenai River directly or through larger tributaries. Due to past glaciation, most Kootenai River tributaries are blocked by falls near their mouths, and recruitment of fish from tributaries is limited. Habitat alteration and degradation have reduced trout production in naturally accessible portions of tributaries. Sedimentation from logging, road placement, agriculture, and wildfires has degraded former spawning and rearing areas. Manmade obstructions, diversions, and channelization have eliminated and isolated former trout habitat completely, especially in tributaries draining the west side. Historical mining activity has also impaired habitat in some watersheds, notably Boulder Creek and upper Boundary Creek. The Deep Creek, Boundary Creek, and Callahan Creek drainages are the largest accessible tributaries of the Kootenai River.

In 2006, IDFG research biologists sampled 105 sites in the Kootenai and Moyie river GMUs using electrofishing or snorkeling gear to determine trout distribution and estimate trout abundance in first- through fourth-order streams throughout the Idaho portion of the Kootenai River basin (Walters et al. 2007). Sample sites were selected based on the Environmental Protection Agency's (EPA) Environmental Monitoring and Assessment Program (or EMAP) protocol using spatially distributed random sites.

WCT were present at 17 (65%) of the sites thought to be within historic range (Table 2) and brook trout were present at 16 (62%) streams within the native historic range of WCT. Brook trout were observed at seven of the nine streams where WCT were no longer present. Redband trout were present at 11 (42%) streams within the historic WCT range, and were present at six of the nine sites that no longer contained WCT. Eight streams (31%) within the historic cutthroat trout range contained only WCT. Presence of cutthroat trout and sympatry with non-native species was related to stream order. WCT were the primary trout species found at sample sites in first-order streams; however, they were not as widely distributed at third- and fourth-order streams as were redband trout and brook trout (Table 3).

As part of a genetic assessment throughout the Kootenai drainage in 2005 (including the Moyie GMU), *Oncorhynchus* spp. samples were collected in the Kootenai River and in four tributary drainages including Boulder, Callahan, and Mission creeks (Walters 2006). The Mission Creek drainage, a tributary to the mainstem Kootenai River, exhibited low levels of non-native rainbow trout hybridization/ introgression. No hybrids were observed in Mission Creek, and only one hybrid (>F1) was identified in East Fork Mission Creek. In contrast, the other two sites examined exhibited much higher levels of introgression. In the mainstem Kootenai River, of 79 samples, 54 were rainbow trout and only five were WCT. The remaining 20 exhibited both rainbow trout and WCT mtDNA. Observed introgression levels in the Middle Fork Boulder Creek were even higher than those observed in the mainstem Kootenai River. Of the 50 samples screened, 35 possessed genotypes indicative of >F1 hybrids, two of F1 hybrids, two of WCT, and 11 of rainbow trout. Hatchery rainbow trout have been widely introduced throughout the drainage. Because these fish are primarily of a coastal origin, interbreeding with native stocks may have altered the natural asynchrony in spawn timing and distribution between native redband trout and cutthroat trout and leading to higher rates of introgression in some portions of the drainage (Matt Campbell, IDFG, unpublished memo).

Table 2. Historic and current study locations of WCT and study locations of rainbow trout (RBT), brook trout (BRK), and bull trout (BLT) (Walters et al. 2007).

Stream	WCT (Historic)	WCT (Study)	RBT	BRK	BLT
Ball Creek	√	√	√		
Beaver Creek	√	√		√	
Boulder Creek	√	√	√	√	
Boundary Creek		√	√		
Brush Creek	√	√			
Canuck Creek	√	√			
Caribou Creek	√	√	√	√	
Cone Creek				√	
Cow Creek			√	√	
Curley Creek	√			√	
Cutoff Creek	√	√			
Deep Creek			√	√	
Deer Creek	√	√	√	√	
Fall Creek	√	√	√	√	
Fisher Creek			√		
Grass Creek	√			√	
Hall Creek	√			√	
Long Canyon			√	√	√
Mission Creek	√	√		√	
Moyie River	√		√	√	
Myrtle Creek	√		√	√	
North Callahan			√		√
Ruby Creek	√		√	√	
Sand Creek	√		√	√	
Skin Creek	√	√		√	
Smith Creek	√	√	√		
Snow Creek	√	√		√	
South Callahan			√		√
Trout Creek	√	√			
Wall Creek	√	√			

Table 3. Distribution of rainbow trout (RBT), WCT, bull trout (BLT), and brook trout (BKT) by stream order (Walters et al. 2007).

Stream and sample site characteristics	Stream order				
	1	2	3	4	Total
Total km of stream	1112	358	211	68	1749
km of Target stream	1112	316	211	63	1702
Total number of sites sampled	20	37	35	13	105
Sites containing trout	5	33	31	10	79
Sites containing RBT	0	14	19	10	43
Sites containing WCT	5	16	12	3	36
Sites containing BLT	0	1	2	0	3
Sites containing BKT	1	19	21	6	47
WCT Sites containing RBT	0	2	3	3	8
WCT Sites containing BKT	1	8	9	3	21
RBT Sites containing BKT	0	7	12	6	25

Priest River/Lakes GMU

The Priest River/Lakes GMU is comprised of the Upper Priest River and tributaries (above Upper Priest Lake), Upper Priest Lake, the Thorofare, Priest Lake, and the lower Priest River (below the Priest Lake outlet dam). The Priest River Basin is about 253,000 ha (976 mi^2) in size. Approximately 6,200 ha (24 mi^2) or 2.5% of the basin are in British Columbia, where the headwaters of the Upper Priest River originate, and headwaters of major tributaries on the western side of the basin are located in Washington and cover about 50,000 ha (193 mi^2) (20% of Priest River watershed) (Figure 7).

Priest Lake and Upper Priest Lake are glacial lakes located in the northwest corner of Idaho in the Selkirk Mountains amid a coniferous forest watershed. Upper Priest Lake is connected to Priest Lake by a river channel known as the Thorofare. The Thorofare is about 3.2 km (2 mi) long, about 70 m wide and generally 1.5-3.0 m deep. At its outlet into Priest Lake, the Thorofare is about 0.9 m deep at summer pool level. When the lake levels reach low pool level, depth of the Thorofare at its outlet is <0.2 m deep, impeding nearly all boat traffic. During summer months, the Thorofare receives heavy boat traffic. Below Priest Lake, the Priest River (originating at the outlet dam) flows a distance of 71 km (44 mi) to its confluence with the Pend Oreille River at Priest River, Idaho. The average annual flow of Priest River (6.1 river km up from its confluence) has been 47 m^3/sec (1,661 ft^3/sec) since 1930.

Figure 7. Priest River/Lakes GMU with WCT distribution as of 2009.

The Priest River basin is surrounded by the Selkirk Mountain Range with elevations ranging from 632 m at the mouth of Priest River to 2,316 m at Twin Peaks located on the east side of Priest Lake in the headwaters of Indian Creek. The mountains on the east side of Priest River and the lakes tend to be dominated by granitic geology, are higher in elevation, and steeper than what occurs on the west side. The mountains on the west side tend to be a mixture of granitic geology (southern half of basin) and belt series geology (metamorphosed sedimentary rocks), and have lower elevations and flatter gradients than what occurs on the east side. The higher elevations on the east side resulted in more recent and complete glaciation than what occurred on the west side. As a result, much of the loose highly erosive rock, often associated with weathered granitic geology, has been scraped off the east side making it more stable and less erosive. Glaciation and its retreat left extensive unconsolidated surface deposits overlying bedrock in the Priest Lake Basin, and had great influence on soil development in the drainage. These deposits include mixes of boulders, gravels, sands, silts, and clays called glacial till. Extensive glacial-till deposits exist in the lowlands surrounding Priest Lake, especially on the west side. Much of this material is coarse-grained and deep, and supports unconfined aquifers. Within these outwash deposits are pockets of lacustrine fine-grained silts and clays, and organic soils. These glacial till deposits produced soils that can be unstable especially when coupled with ground water. The combination of the flatter terrain, more erosive nature of the land, and abundance of glacial till that occurs on the west side of Priest River and the lakes, helps explain why the streams on the west side tend to have more fine sediments than streams on the east side.

The majority of the land on the west side of the basin is managed by the USFS. The northern boundary extends to, and includes, the Upper Priest River watershed to the Canadian border. The Upper Priest River headwater lands are administered by the British Columbia Ministry of Forests. Private property comprises approximately 10% of the west side land total. There are some blocks of commercial timber lands and a few large private holdings, in agricultural use, in the Nordman and Lamb creek areas. More than 90% of the land on the east side of the basin is owned by the State of Idaho, within the northern boundary incorporating the Trapper Creek watershed. Most of this land is administered by Idaho Department of Lands under the State Endowment Trust. Some state land is managed by Idaho Parks and Recreation as Priest Lake State Park. Around the 116 km (72 mi) of Priest Lake shoreline, approximately 26% of the property is privately owned (Bonner County 1989), and it is there that the most concentrated residential and business development has occurred. Within the federal and state owned lands, there has been considerable waterfront development through lease lot programs. On the east side, blocks of private shoreline property exist at Coolin, Steamboat Bay east to Cavanaugh Bay, and from Bear Creek north to Canoe Point. On the west side, privately owned shoreline property is primarily around the Granite Creek area and Kalispell Bay.

Native salmonids in the Priest River/Lakes GMU are WCT and bull trout, as well as mountain and pygmy whitefish. Several non-native salmonids, most notably brook trout and lake trout, have been introduced to the detriment of cutthroat trout. Kokanee were introduced in 1942, and were soon prolific in both lakes. Most recently, smallmouth bass were either illegally introduced or migrated upstream from the Pend Oreille River.

WCT are still widely distributed throughout the Priest River drainage. An estimated 1,879 km (1,168 mi) of flowing water are in this drainage, of which 1,369 km (851 mi) or 72% of the total stream km is occupied by cutthroat trout. Still, overall abundance is much lower than it was historically. The most significant change to the cutthroat trout population in the GMU is the loss of much of the adfluvial component in Priest Lake. Historically, the cutthroat trout fishery was very popular and 15-fish limits of 305 mm to 381 mm cutthroat trout were common (Bjornn 1957). Factors contributing to the initial decline included excessive harvest by anglers, mining of adult spawners for hatchery take, competition with brook trout in tributaries, and degradation of spawning habitat. Efforts to restore cutthroat trout with supplementation and restrictive bag limits in the 1980s were not successful.

By the late 1980s, lake trout (*S. namaycush*) predation was believed to be the major factor suppressing the cutthroat trout fishery. Though lake trout have been present in the system since 1925, angler catch remained relatively low through the early 1970s with annual harvest being around 200 fish. Mysis shrimp (*Mysis diluviana*) were introduced into Priest Lake in 1965 to provide a supplemental food item for kokanee; however, their primary effect was to increase lake trout recruitment. By 1978, lake trout harvest increased to around 5,700 fish annually and to nearly 30,000 lake trout by 2003, indicating an exponential population increase. Lake trout were not known to be present in Upper Priest Lake until the mid-1980s, but were common by the late 1990s.

Angler opinions about management direction for Priest Lake are polarized. The progress made on Lake Pend Oreille has many anglers interested in seeing a similar effort at Priest Lake. Many anglers would like to see restoration of a native cutthroat trout and bull trout fishery and a kokanee sport fishery. Other anglers prefer managing the fishery for lake trout. Angler opinion surveys conducted in 2006 and 2012 both show a divided public. When asked whether they favor a lake trout suppression effort to restore a more diverse kokanee/cutthroat/bull trout fishery or managing for lake trout, anglers are almost evenly split. The divided public, the high cost of removing lake trout from Priest Lake (and the current lack of an identified funding source), and the reduced productive capacity of tributary streams for adfluvial fish production are all challenges to restoration of robust native fish populations.

Further confounding WCT management alternatives in the Priest Lake drainage are smallmouth bass which were first evident in Priest Lake in about 2003. Although smallmouth bass could conceivably have migrated upstream from the Pend Oreille River, they were still uncommon at that time, and it seems more likely that they were illegally introduced. In recent years, smallmouth bass have expanded in the Priest River, presumably moving downstream from Priest Lake and upstream from the Pend Oreille River simultaneously. Smallmouth bass will likely expand their distribution in the drainage and pose an additional threat to juvenile fluvial and adfluvial cutthroat trout.

In the short term, the Upper Priest Lake basin provides the best opportunity to save native fish, although lake trout still pose the greatest risk to success. Lake trout removal efforts (gillnetting) have been ongoing in Upper Priest Lake since 1998. Lake trout migration into Upper Priest Lake through the Thorofare and reproduction was replacing lake trout as fast as they could be removed. For this reason, gillnet efforts in Upper Priest Lake have only held numbers of lake trout steady over the last few years. For gillnetting efforts to be successful in Upper Priest Lake, lake trout migration through the Thorofare must be controlled. Since 2009, a project funded in part by the Service and the Kalispel Tribe has been implemented to identify netting strategies that can minimize immigration of lake trout through the Thorofare.

In streams throughout the basin, habitat loss, temperatures, and competition from brook trout in tributary streams pose additional obstacles to cutthroat trout recovery in the Priest system. Legacy effects of logging activity have reduced quantities of large woody debris and increased fine sediment. Twenty different stream segments within the Priest River Basin were listed as Clean Water Act Section 303(d) water quality limited segments in 2002. Most of these streams were listed either because of sediment or temperature exceedences. Those water quality limited stream segments due to excess sediment were mostly tributaries located on the east side of Priest Lake or tributaries of Priest River.

Brook trout, which are known to out-compete cutthroat trout and bull trout in lower gradient streams or streams with high quantities of fine sediment, occur throughout the Priest Lake and Upper Priest Lake basins.

Despite the poor conditions for adfluvial WCT and the habitat limitations in many of the streams throughout the GMU, many tributaries to the two lakes and the Priest River support apparently stable populations of fluvial and/or resident cutthroat trout. In a 2003-2004 survey, 199 different sample sites were electrofished on 38 different streams throughout the GMU to evaluate cutthroat trout populations (DuPont et al. 2008). WCT were the most abundant species sampled and were collected in 36 of the 38 streams and 190 of the 199 sites surveyed (Table 4). The highest densities of cutthroat trout on average were found in tributaries on the east side of Priest Lake (5.72 fish/100 m^2), whereas the lowest average densities of cutthroat trout were found in tributaries on the west side of Priest Lake (4.48 fish/100 m^2). Brook trout were the second most abundant salmonid sampled (1,642) and were collected from 26 of the 38 streams and 85 of the 199 sites that were surveyed (Table 4). The highest average density of brook trout was found in tributaries on the west side of Priest Lake (7.48 fish/100 m^2) with the lowest average density being found in tributaries in the Upper Priest Lake basin (0.71 fish/100 m^2).

Unfortunately, the survey depicted an overall declining trend in cutthroat trout abundance since 1982 in the Priest Lake basin (Table 5). The largest declines in density of cutthroat trout were in the upper Priest Lake basin. Brook trout densities on the other hand have been increasing in this basin over the same period, whereas they have been declining in tributaries around Priest Lake.

Pend Oreille/Clark Fork GMU

The Pend Oreille/Clark Fork GMU is comprised of Pend Oreille Lake and its tributaries (including the Pack River drainage) and the Pend Oreille River and tributaries to Albeni Falls Dam. For the purposes of this management plan, the GMU includes the Idaho portion of the Lower Clark Fork River (mainstem and tributaries below Cabinet Gorge Dam) and the short section of the mainstem Pend Oreille River and tributaries below Albeni Falls Dam (Figures 8-10). Although not connected by any surface flows, the Blanchard and the Spirit Lake/Brickel Creek drainages are also covered by this GMU.

Prior to the 1940s, WCT were the most frequently caught fish in the Pend Oreille system. Accounts of good fishing, long stringers of 305 mm to 406 mm fish, and tributaries full of spawners were common in the late 1800s and into the early 1900s. Several distinct events and other ongoing activities have significantly diminished available habitat for resident and adfluvial cutthroat trout in the GMU. In 1952, construction of both Albeni Falls (U.S. Army Corps of Engineers) and Cabinet Gorge (Avista) dams inundated fluvial habitat and blocked access to migratory adfluvial fish. The Sundance Fire burned an estimated 22,658 ha (56,000 ac), much of it in the upper Pack River drainage in 1967. Extensive logging and associated road construction in the belt series geology of the Lightning Creek and Pack River drainages has resulted in mass wasting of bedload material degrading stream habitat. Railroad and highway construction blocked access to many streams, especially along the Pend Oreille River. The highly erodible granitic soils combined with the deforested hillsides contributed to a tremendous volume of fine sediment input to the Pack River.

Table 4. Population and density estimates (fish/100 m^2) of cutthroat trout, bull trout, and brook trout in stream reaches electrofished in the Priest River watershed, Idaho, during 2003 and 2004 (DuPont et al. 2008).

			Reach estimate			density (fish/100 m^2)		
Major Tributary	Stream surveyed	Area (m^2) sampled	cutthroat trout	bull trout	brook trout	cutthroat trout	bull trout	brook trout
Upper Priest Lake Basin								
	Malcolm Creek	2044	113.5	3.3	0.0	5.56	0.16	0.00
	Rock Creek	729	88.7	0.0	1.9	12.17	0.00	0.27
	Lime	1481	46.1	0.0	3.9	3.11	0.00	0.26
	Cedar	5381	101.1	0.0	0.0	1.88	0.00	0.00
	Ruby Creek	1275	117.1	0.0	60.1	9.19	0.00	4.71
	Hughes Fork	10407	88.7	4.9	54.3	0.85	0.05	0.52
	Bench	1260	115.3	0.0	33.0	9.15	0.00	2.62
	Jackson	1653	88.7	0.0	3.9	5.37	0.00	0.23
	Gold Creek	9407	95.8	82.3	1.9	1.02	0.87	0.02
	Boulder Creek	1457	88.7	0.0	7.8	6.09	0.00	0.53
	Upper Priest River	14600	95.8	28.0	0.0	0.66	0.19	0.00
	Deadman Creek	200	12.4	0.0	0.0	6.21	0.00	0.00
	Trapper Creek	7163	94.0	0.0	0.0	1.31	0.00	0.00
Priest Lake – East Side								
	Caribou Creek	9390	97.7	1.6	68.1	1.04	0.02	0.73
	Bugle Creek	800	52.0	0.0	53.0	6.50	0.00	6.63
	Lion Creek	10044	159.7	3.3	15.5	1.59	0.03	0.15
	Two Mouth Creek	5668	129.5	0.0	3.9	2.28	0.00	0.07
	Bear Creek	250	0.0	0.0	56.2	0.00	0.00	22.49
	Indian	1486	129.5	16.5	0.0	8.71	1.11	0.00
	North Indian Creek	1992	93.0	23.0	0.0	4.67	1.15	0.00
	South Indian Creek	500	88.0	0.0	0.0	17.60	0.00	0.00
	Horton Creek	231	12.0	0.0	0.0	5.19	0.00	0.00
	Hunt Creek	1284	99.4	0.0	0.0	7.74	0.00	0.00
	SF Hunt Creek	839	88.7	0.0	0.0	10.58	0.00	0.00
	Soldier	3639	99.4	0.0	286.9	2.73	0.00	7.88
Priest Lake – West Side								
	Beaver Creek	2039	115.3	0.0	54.3	5.66	0.00	2.66
	Tango	525	111.8	0.0	5.8	21.31	0.00	1.11
	Granite	13018	53.2	1.6	102.8	0.41	0.01	0.79
	NF Granite	12837	92.3	6.6	290.8	0.72	0.05	2.27
	SF Granite	7062	120.6	0.0	174.5	1.71	0.00	2.47
	Kalispell Creek	6581	100.7	0.0	232.1	1.53	0.00	3.53
	Lamb Creek	751	0.0	0.0	296.6	0.00	0.00	39.51
Priest River								
	Branch Creek	1454	86.9	1.6	102.8	5.98	0.11	7.07
	Upper West Branch	2595	92.3	0.0	122.1	3.56	0.00	4.71
	Lost Creek	1907	88.7	0.0	104.7	4.65	0.00	5.49
	NF East River	7101	186.3	0.0	162.9	2.62	0.00	2.29
	Uleda Creek	674	12.4	34.6	0.0	1.84	5.13	0.00
	Tarlac Creek	640	74.5	0.0	31.0	11.64	0.00	4.85
Summary by drainage area								
Upper Priest Lake Basin		57056	1146.1	118.5	166.7	4.81	0.10	0.71
Priest Lake – East Side		36124	1048.8	44.4	483.6	5.72	0.19	3.16
Priest Lake - West Side		42812	593.9	8.2	1156.8	4.48	0.01	7.48
Priest River		14371	541.1	36.2	523.5	5.05	0.87	4.07

Table 5. The number of tributaries in four different drainage areas of the Priest River watershed, Idaho, that experienced increasing (>) trends, decreasing (<) trends, or no change (=) in the density of cutthroat trout, bull trout, and brook trout between 1982 and 2004 (DuPont et al. 2008).

	Trends in abundance								
	Cutthroat trout			Bull trout			Brook trout		
Drainage area	>	<	=	>	<	=	>	<	=
Upper Priest Lake Basin	3	10	0	2	11	0	8	1	4
East Side Tributaries	5	3	1	0	6	3	2	4	3
West Side Tributaries	0	5	0	0	5	1	3	2	0
Priest River	4	1	0	1	2	2	1	1	1

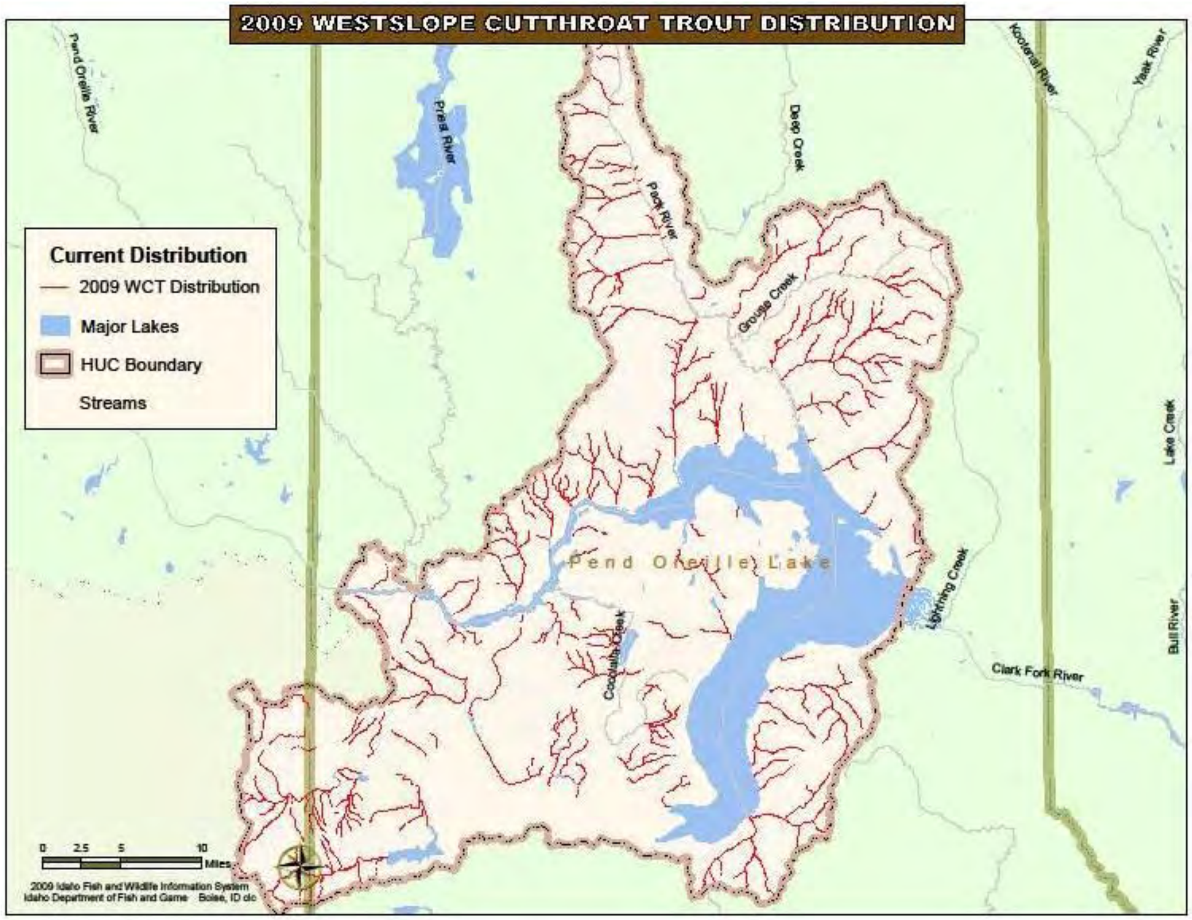

Figure 8. Pend Oreille/Clark Fork GMU with WCT distribution as of 2009.

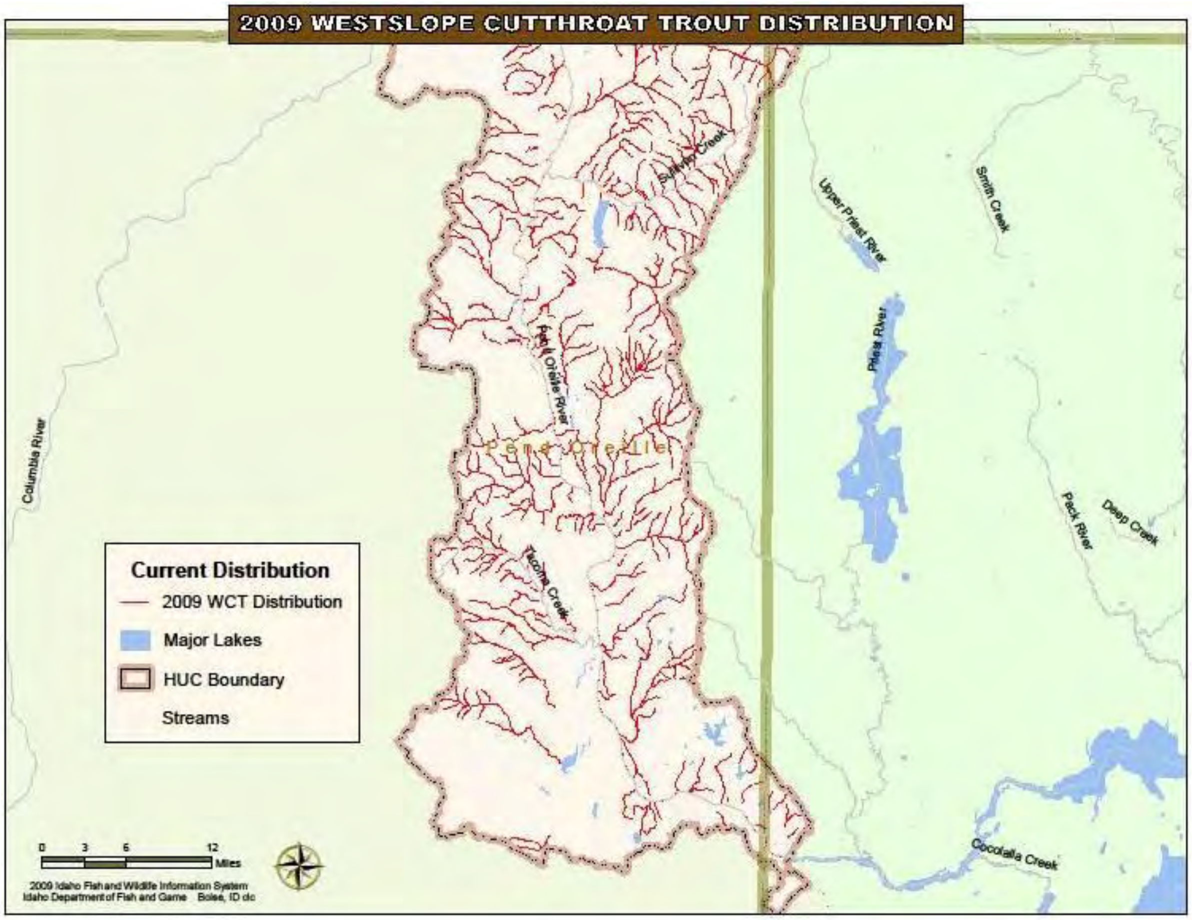

Figure 9. Pend Oreille/Clark Fork GMU with WCT distribution as of 2009.

Figure 10. Pend Oreille/Clark Fork GMU with WCT distribution as of 2009.

Albeni Falls Dam greatly influenced the 42 km (26 mi) of the Pend Oreille River by impoundment and annual winter drawdown. The Pend Oreille River is now a warm slack water reservoir from June through September and a cold free-flowing, but relatively featureless river, from October through May. Vegetation removal for agriculture and timber harvest, and subsequently to prepare the area for impoundment, along with 60 years of artificially high water, have eliminated the natural vegetative cover along the shoreline, causing severe erosion and additional impacts to fish habitat. Habitat conditions have limited establishment of either a good trout or warmwater fishery. Salmonids use the river seasonally. In an extensive electrofishing survey of systematically selected transects in June 2010, 29 WCT were collected, which was about 1% of the total number of fish sampled (Liter and Fredericks 2011). Brown trout, which comprised about 3% of the total sample, are the only salmonid consistently found in the Pend Oreille River on a year-round basis.

The impoundment created by Albeni Falls Dam also affected the lower Clark Fork River. There is approximately 17 km (10.5 mi) of river habitat between Cabinet Gorge Dam and Lake Pend Oreille during winter lake draw downs. Approximately 6 km (4.0 mi) of the lower river is impacted by elevated lake water levels during late spring through early fall. In population surveys from 1999 to 2007, cutthroat trout have generally been the least abundant salmonid, with densities ranging from 13 to 26 fish/km. A number of factors acting in combination likely regulate salmonid abundance and condition in the lower Clark Fork River below Cabinet Gorge Dam. Limiting factors include large daily flow fluctuations, low habitat diversity, availability of spawning and early rearing habitat, high summer water temperatures, and elevated total dissolved gas (TDG) below Cabinet Gorge Dam (Ryan and Jakubowski 2012a).

Currently, neither Albeni Falls, nor Cabinet Gorge dams have fish passage facilities. Recently, an agreement has been reached for design and construction of fish passage facilities at both Cabinet Gorge and Noxon Rapids dams to restore access for bull trout to spawning and rearing habitat in Montana.

Though adfluvial cutthroat trout would likely benefit as well, the state of Montana has resisted passage of cutthroat trout, citing concerns about diseases and introgression. IDFG supports passage of both cutthroat and bull trout to historical habitat and will attempt to address the concerns expressed by the State of Montana. Additionally, consideration is being given to providing fish passage at both the Albeni Falls Dam and the Pend Oreille County Public Utility District #1's Box Canyon Dam on the Pend Oreille River. While IDFG supports the efforts to enhance native fish connectivity throughout the basin, considering the potential for upstream movement of undesirable species, the IDFG does not support facilities that offer volitional passage.

In addition to fish passage facilities, Avista has been implementing mitigation measures to address high levels of TDGs. Levels exceeding state standards are common during spring runoff below Cabinet Gorge Dam. Fish exposed to high TDG (in excess of 110% of saturation) can suffer gas bubble disease and high mortality. During the record flood of 1997, TDG levels in excess of 130% were measured in the Clark Fork River, through the north end of Lake Pend Oreille, and were in the range of 120-130% in the Pend Oreille River down to Albeni Falls Dam. Avista has reached an agreement with the State of Idaho to mitigate for TDG by making modifications to the dam and by funding projects aimed at improving native salmonid populations. Other impacts to cutthroat trout from Cabinet Gorge Dam are being mitigated through the "Idaho Tributary Acquisition and Fishery Enhancement Program" and the "Native Salmonid Restoration Program" as part of the Clark Fork Settlement Agreement (CFSA) and Federal Energy Regulatory Commission license for the project.

Native salmonids in the Pend Oreille/Clark Fork GMU are WCT and bull trout, as well as mountain and pygmy whitefish. Brook trout and lake trout were introduced early in the Twentieth Century. Kokanee salmon emigrated from Flathead Lake in the 1930s and were soon prolific in Lake Pend Oreille. Gerrard rainbow trout, which are naturally sympatric with cutthroat trout in Kootenay Lake, B.C., were introduced in 1941, and soon created a world renowned trophy fishery. Several warm and coolwater species, including largemouth and smallmouth bass, northern pike, and walleye, have been illegally introduced and/or immigrated from the Clark Fork River system upstream in Montana.

Data describing adfluvial cutthroat trout abundance are limited due to the difficulty in collecting meaningful sample sizes of fish. Creel survey data, limited tributary trapping, and fish community assessments of tributaries suggest the population is a small fraction of what it historically was. Liberal bag limits and ongoing negative impacts to spawning tributaries from land use practices also likely contributed to declines; rainbow trout have also become abundant in some larger tributaries (e.g., mainstem Lightning, mainstem Grouse, mainstem Pack) where cutthroat trout were once the dominant salmonid. Interestingly, the most significant declines were in the 1950s and 1960s, possibly associated with the construction of Cabinet Gorge Dam. As indexed by angler catch, the population has been relatively stable since the 1970s (Figure 11). Fishery sampling efforts in Pend Oreille tributaries indicate cutthroat trout are widely distributed with densities stable over the past three decades (Table 6) (Ryan and Jakubowski 2012b). Nevertheless, harvest has been progressively restricted in an effort to restore the population to historical levels. Catch-and-release rules were applied to cutthroat trout throughout the drainage (with the exception of lowland lakes and alpine lakes) in 2011.

The relicensing of Avista's Cabinet Gorge and Noxon Rapids dams on the Clark Fork River in 1999 provides 45 years of mitigation funding through the CFSA for habitat acquisition and enhancement in Idaho tributaries to Lake Pend Oreille. The mitigation program is a key component to maintaining and improving fishery resources in the drainage. In addition to habitat conservation and restoration activities, the CFSA mitigation program provides partial funding for the large-scale lake trout suppression program that has been underway since 2006 in Lake Pend Oreille. The expansion of the lake trout population in the late 1990s was recognized as perhaps the most significant threat to the adfluvial cutthroat trout population in recent years. Successful lake trout suppression is critical to conservation of the native cutthroat and bull trout populations. After seven years of aggressive lake trout suppression, lake trout are showing every indication of being over-exploited. The lake trout population response in the next few years will dictate the necessary level of active suppression efforts into the future.

Though Blanchard and Brickel creeks historically contained cutthroat trout populations, both of these drainages have been highly altered through road construction, timber harvest, and agriculture. An electrofishing survey that was conducted by IDFG in 1975 documented WCT in Brickel Creek, along with rainbow and brook trout. More recently, fishery surveys conducted by the Idaho Department of Environmental Quality (IDEQ) documented abundant cutthroat trout in Brickel Creek in 2005, though brook trout and rainbow trout were also abundant. No surveys of Blanchard Creek have been completed recently, but anecdotal accounts suggest brook trout are the dominant salmonid. WCT are currently stocked in Spirit Lake, and it is likely that some of these fish of hatchery origin spawn in Brickel Creek.

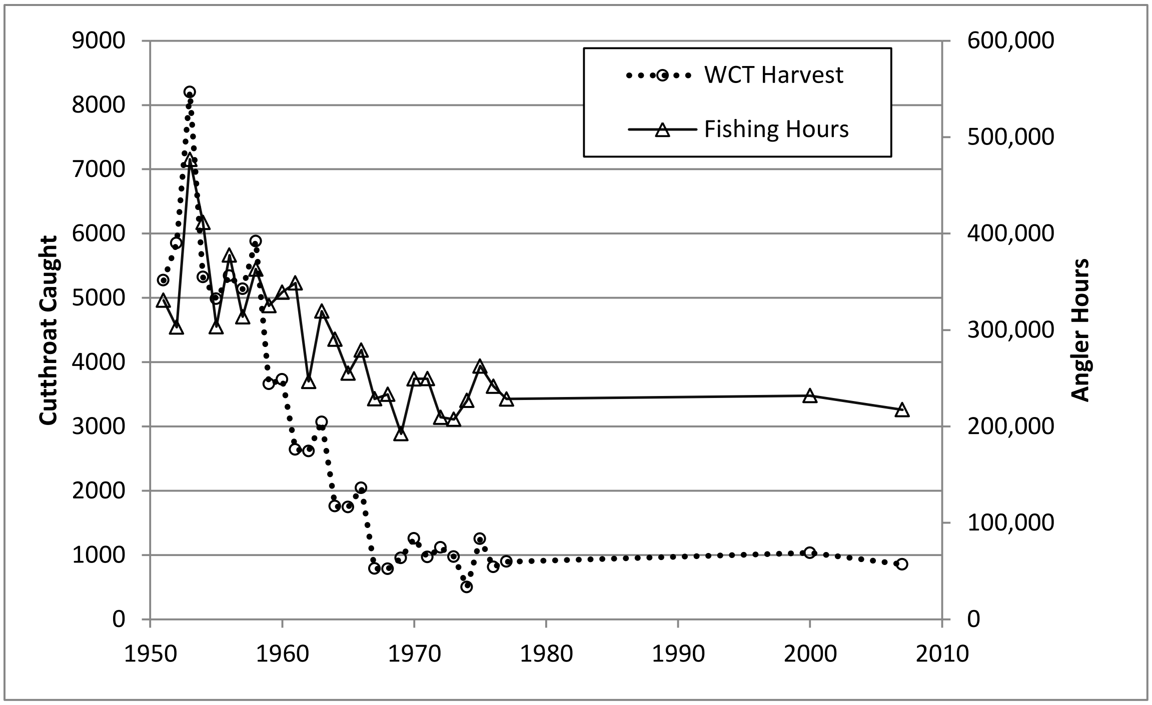

Figure 11. Historical angler effort and WCT harvest on Lake Pend Oreille based on creel surveys.

Table 6. Density estimates (fish/100 m^2) of salmonids in Lake Pend Oreille tributaries, Idaho, sampled from 2009 to 2012 (Ryan and Jakubowski 2012b). BLT-bull trout; BRK-brook trout; MWF-mountain whitefish; RBT-rainbow trout; WCT-WCT; WRHY-westslope x rainbow hybrid.

	Fish Species (average fish/100 m^2)					
Stream	BLT	BRK	MWF	RBT	WCT	WRHY
Grouse Creek	3.5	0.4	0.6	8.2	3.6	0.3
NF Grouse Creek	0.0	4.1	0.0	5.0	5.9	0.3
Rapid Lightning	<0.10	3.2	1.2	1.0	5.2	0.3
Gold Creek	4.4	0.0	0.0	0.0	23.6	<0.10
Granite Creek	4.6	0.0	0.2	0.0	6.7	<0.10
Johnson Creek	1.4	0.0	0.0	0.0	5.1	0.0
Strong Creek	<0.10	0.0	0.0	<0.10	7.1	<0.10
Twin Creek	0.0	2.7	0.0	2.0	3.8	0.0
West Gold Creek	0.1	0.0	0.0	0.0	43.7	0.0
Caribou Creek	3.1	0.3	0.0	1.2	6.1	0.7
Morris Creek	5.8	0.0	0.0	0.0	7.0	1.8
Trestle Creek	1.8	0.0	0.1	<0.10	4.5	1.0
EF Lightning Creek	3.1	0.1	0.0	2.8	4.5	0.4
Hellroaring Creek	0.2	<0.10	0.0	4.0	0.0	0.2
McCormick Creek	0.0	0.0	0.0	0.5	1.7	0.3
Porcupine Creek	1.0	5.4	0.0	0.0	10.5	0.9
Rattle Creek	4.6	0.0	0.0	0.6	5.8	0.1
Savage Creek	5.1	0.0	0.0	<0.10	3.9	0.7
Wellington Creek	1.3	0.1	0.0	0.5	10.4	0.4

Upper Spokane River GMU

The Upper Spokane River GMU consists of those isolated "sink" drainages adjacent to, but not connected by surface flow, to the Spokane River (Figure 12). These include the Lewellen, Sage, and Lost creeks, as well as the Hauser, Twin, and Hayden lake drainages. All of these drainages eventually discharge directly into the Rathdrum Aquifer.

The upper reaches of each of these drainages are primarily managed for timber harvest and under the ownership/management of the USFS, Idaho Department of Lands, or private timber companies. Road density in each of the drainages is high. Land adjacent to the lower reaches, including Hauser, Hayden, and Twin lakes, is primarily private and used for recreation, agriculture, or residential purposes. With the exception of Hayden Creek, most streams in the GMU are characterized by poor riparian condition, channelization, and high levels of fine sediments.

All streams in this GMU are relatively small systems, consisting mostly of first and second order streams, and adult fish populations were likely limited by flow. Brook trout are currently the dominant species in most of the GMU. In those streams not connected to lakes (Lewellen, Sage, Lost creeks), historically, cutthroat trout populations were likely limited by stream size and availability of overwintering habitat. No cutthroat trout were documented in 2004 surveys conducted by IDEQ. In the case of Hauser, Twin, and Hayden lake drainages, these drainages were likely primarily spawning and rearing habitat for adfluvial cutthroat trout populations. Hauser and Twin lakes are small (<400 ha or 1,000 ac) eutrophic lakes. Coldwater fish habitat is limited in mid-summer by an anoxic hypolimnion. Warmwater fish populations and degraded tributary habitat and brook trout greatly limit the capacity to rebuild adfluvial cutthroat trout populations in these lakes.

Hayden Lake is the largest lake in the GMU at approximately 1,537 ha (3,800 ac). It is a meso-oligotrophic lake with a maximum depth at approximately 65 m. At about 11.5 km (7 mi) from its headwaters to the mouth, Hayden Creek is the largest tributary. Other smaller tributary streams include Mokins, Yellowbanks, Jim, Windy, Colburn, and Harrison creeks, along with several small unnamed tributaries. The shoreline of Hayden Lake has been extensively developed for recreational and luxury homes and the accompanying docks. As a result of shoreline development, degradation of tributary habitat, and abundance of non-native piscivorous fish now in Hayden Lake, the adfluvial population of cutthroat trout is a small remnant of what it historically was in the early 1900s to 1950s. At that time, Hayden Lake was well known for the size and number of cutthroat trout. Subsequent decades were marked by extensive stocking of both WCT and rainbow trout fingerlings, and a shift of angling focus toward warmwater species. Though cutthroat trout stocking was discontinued in 2009, an adfluvial cutthroat trout population still exists, though rainbow and hybrid trout are equally or more abundant. In a 2010 genetic survey, seven spawning *Oncorhynchus spp*. were sampled in Hayden Creek. Of these, two were genotyped to be rainbow trout, two to be WCT, and three were genotyped to be rainbow/WCT F1 hybrids. Of the trout samples collected from anglers in the creel survey, 55% were either hybrids or >F1 hybrids, and the remaining fish were genotyped as rainbow trout. No cutthroat trout were observed in the creel survey, though angler reports of cutthroat trout in the catch are not uncommon.

Figure 12. Upper Spokane River GMU with WCT distribution as of 2009.

Coeur d’Alene Basin GMU

For the purposes of this management plan, the Coeur d’Alene Basin GMU includes Coeur d’Alene Lake and tributaries, as well as the entire Coeur d’Alene and the St. Joe River drainages (Figures 13-16). Though distinct in some aspects such as geology, there are many similarities across drainages, including cutthroat trout monitoring efforts and management strategies. Adfluvial WCT migrate between Coeur d’Alene Lake and the St. Joe, St. Maries, and Coeur d’Alene rivers, so populations are not independent of each other. Coeur d’Alene Lake and the lower reaches of both river drainages are all affected by Post Falls Dam. Finally, mitigation responsibilities associated with hydropower and mining have created opportunities to acquire and restore habitat throughout the basin. The entire Coeur d’Alene basin is approximately 9,942 km^2 (3,840 mi^2) and extends from Post Falls Dam upstream to the Bitterroot Divide along the Idaho-Montana border. Elevations range from 646 m at the lake to over 2,134 m along the divide.

Coeur d’Alene Lake is 42 km (26 mi) long and from 1.6 to 10 km (1 to 6 mi) wide. Mean depth is 22 m with a maximum depth of 64 m. The outlet of Coeur d’Alene Lake is the present day headwater point of the Spokane River, which flows westerly to its confluence with the Columbia River. Coeur d’Alene Lake elevation is largely controlled by Post Falls Dam, privately owned and operated by Avista Corporation. During summer and early fall, Post Falls Dam is operated to hold the lake level at higher elevations than would occur under natural conditions, creating a backwater effect in the lower reaches of the tributaries. At full pool, the lake covers 12,897 ha (31,876 ac).

The two principle tributaries of Coeur d’Alene Lake are the Coeur d’Alene and St. Joe rivers. The St. Joe River basin drains an area of approximately 4,470 km^2 (1,726 mi^2) and contains more than 1,189 km (739 mi) of streams with over 78 principle tributaries. The Coeur d’Alene River basin drains an area of approximately 3,858 km^2 (1,489 mi^2) and contains an estimated 1,052 km (654 mi) of stream with over 78 tributaries. In addition, over 27 tributaries encompassing more than 321 km (over 200 mi) of streams feed directly into Coeur d’Alene Lake (NPCC 2001).

Land ownership in the subbasin is a checkerboard of private, federal, state, and Tribal lands. A portion of the subbasin (approximately 760 km^2) lies within the boundaries of the Coeur d’Alene Indian Reservation. The USFS is the primary land manager in the Coeur d’Alene subbasin. Major land uses that have occurred historically and continue today include mining, forest management, road construction, and agriculture.

The Coeur d’ Alene River drainage has an extensive history of mining. Development of the Silver Valley Mining District in the South Fork Coeur d’Alene River Valley began in the 1880s and has brought significant and essentially permanent changes to the South Fork watershed. Mining and smelting activity resulted in high levels of toxic heavy metals in stream courses and floodplains, and historically preclude the use of the South Fork Coeur d’Alene and lower Coeur d’Alene rivers by any fish during much of the Twentieth Century (Ellis 1940). Placer and hardrock mining in the Prichard and Beaver Creek drainages flowing into the North Fork Coeur d’Alene River also created toxicity problems, and resulted in miles of streambed and floodplain being turned over by dredging operations. Portions of the St. Maries River drainage are currently being placer-mined for garnets, resulting in significant disturbance and in many cases complete stripping of floodplains and relocation of stream channels.

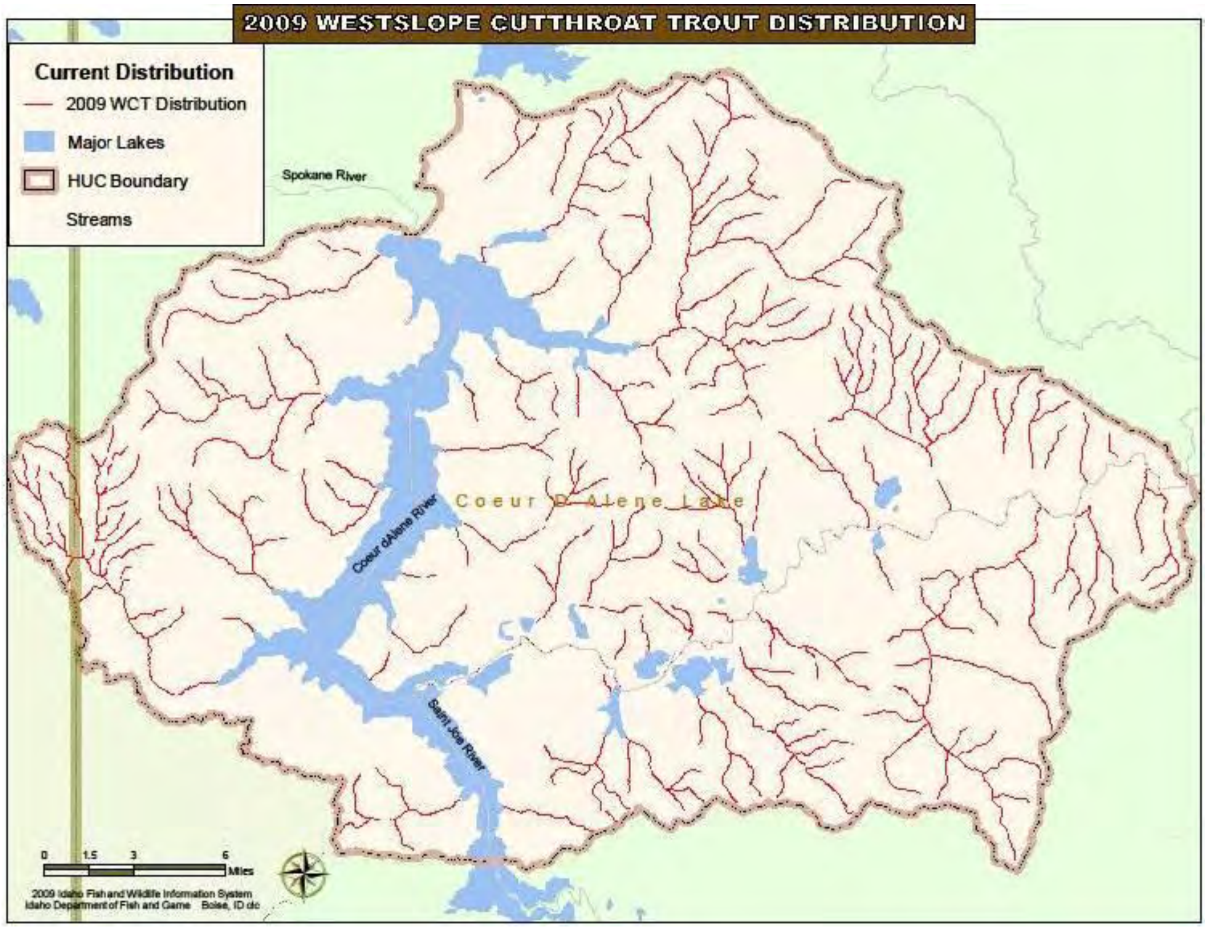

Figure 13. Coeur d’Alene Basin GMU with WCT distribution as of 2009.

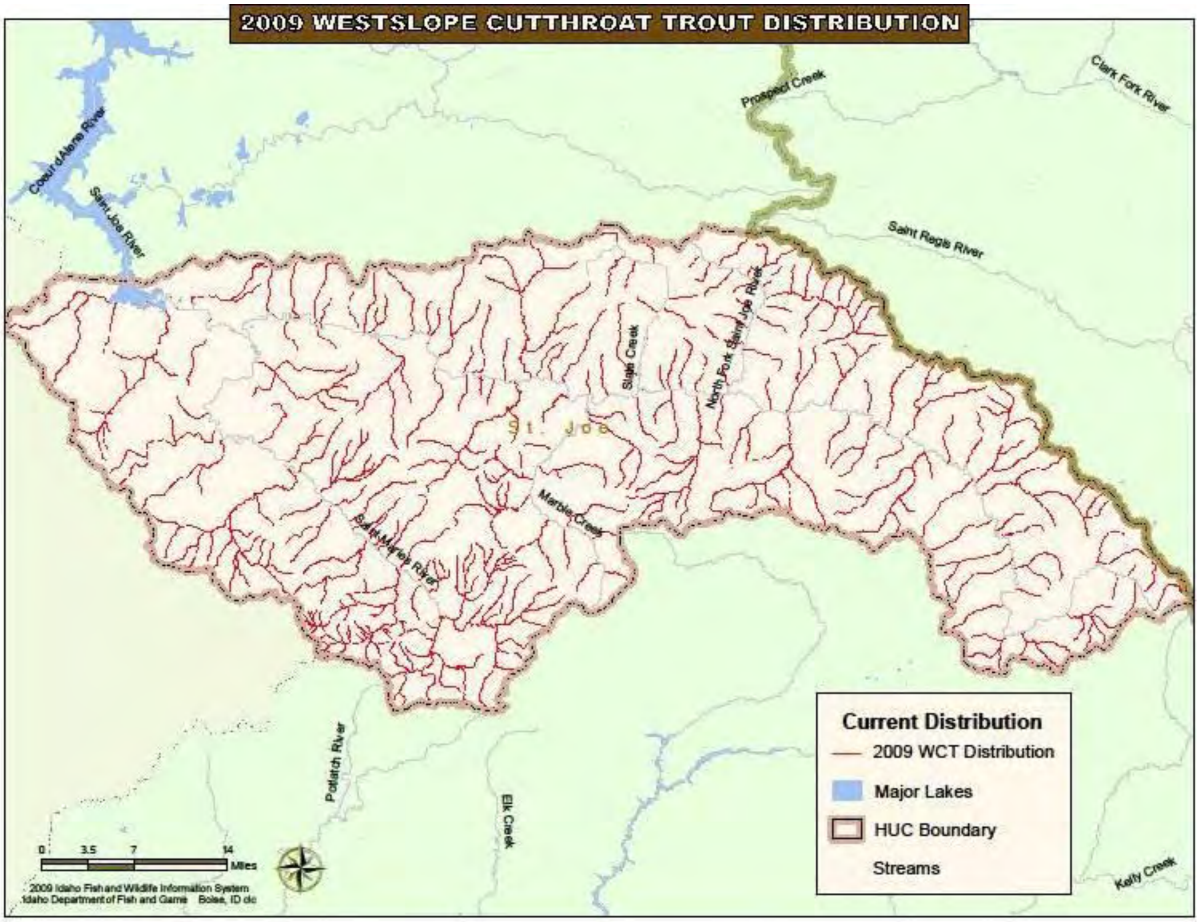

Figure 14. Coeur d'Alene Basin GMU with WCT distribution as of 2009.

Figure 15. Coeur d’Alene Basin GMU with WCT distribution as of 2009.

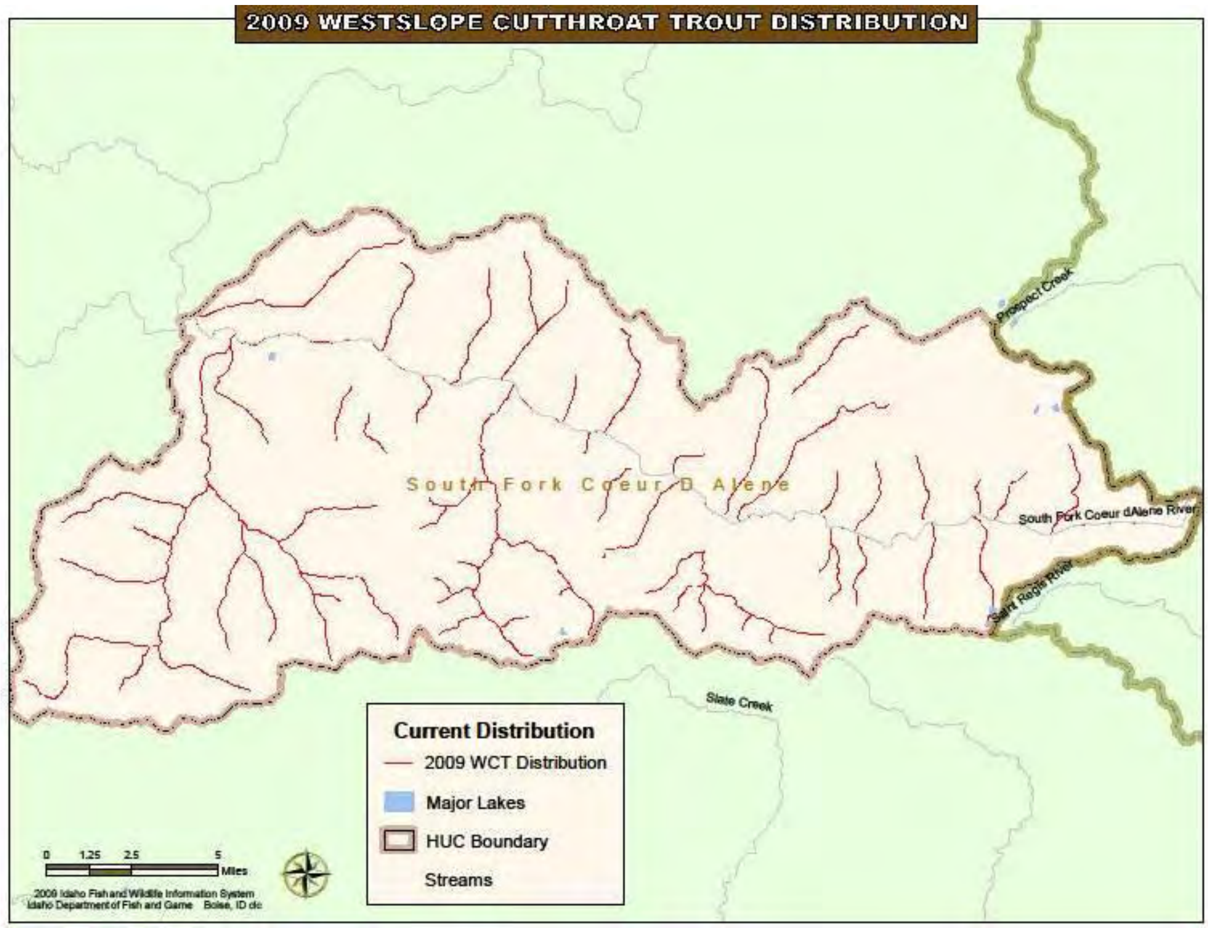

Figure 16. Coeur d'Alene Basin GMU with WCT distribution as of 2009.

Forest management activities occur on National Forest System lands, BLM, State of Idaho lands, the Coeur d'Alene Indian Reservation, and private timberland. These activities include road building, harvesting, thinning, fertilizing, and fire suppression. Early logging in the Coeur d'Alene River drainage was largely centered on the river valley bottoms where logs could be easily skidded or transported by flume to the river and ultimately floated to downstream mills. Historically, many splash dams were present throughout the Coeur d'Alene River drainage. Splash dams were used in the North and Little North Forks of the Coeur d'Alene River and tributaries to the St. Joe River, and in particular on Marble Creek. Although splash dams are no longer a part of forestry practices in the drainage, Marble Creek is still influenced by the remnants of an old splash dam, which may be a barrier or partial barrier for upstream fish migration. In addition to increases in peak discharge, past forestry practices substantially reduced the riparian flora, which in turn led to increased summer water temperatures and unnatural rates of fine sediment inputs into tributary streams (USFWS 2002). The direct and indirect effects of historical practices on native fish populations were not well documented, but loss of old growth cedar riparian areas, use of stream channels for log transport, constructing flumes in riparian areas and stream corridors, and use of slash based road construction, likely created substantial impacts to stream channel integrity and loss of riparian vegetation. Construction of haul roads and logging railroads in riparian areas and encroaching into stream channels and flood plains affected stream channel morphology, cut off stream meanders, and altered floodplain hydrology. Extensive upslope road networks and clear-cutting in the lower elevation and southerly aspect portions of the basin have contributed significantly to the hydrologic response of watersheds. Under those conditions, watershed runoff becomes flashier, with shorter duration but higher intensity peak flow events. Although forest management practices now take into account the possible impacts to the whole stream ecosystem, the legacy of these activities still affects fish habitats in some areas of the Coeur d'Alene River drainage.

Fire has also played a major role in shaping the Coeur d'Alene River drainage. The 1910 fire resulted in the loss of old growth cedar riparian corridors that will not be replaced for several hundred years, and at least temporarily affected occupancy of some streams by cutthroat trout. As a result of that and large fires in the 1930s, along with white pine blister rust, the upland vegetation community has been substantially altered, and contributed to altered hydrologic responses and effects to stream channels.

The development of major transportation systems, primarily highways and major railroads, has also significantly altered the major river corridors in the drainage. In the North Fork Coeur d'Alene River alone, construction of Forest Highway 9 and county roads has eliminated numerous meanders and effectively reduced stream channel length by an estimated 5 km. Likely the loss of floodplain has affected water temperatures and availability of thermal refugia in the lower North Fork Coeur d'Alene River. With construction of two railroads and subsequently an interstate through the South Fork Coeur d'Alene Valley, the South Fork Coeur d'Alene River is largely in a confined, straightened channel with very little access to its floodplain. Several South Fork tributaries have lower reaches placed in concrete flumes to accommodate transportation and other infrastructure. Accounts of the construction of the Milwaukee railroad in the St. Joe River corridor describe the St. Joe River running a slurry of mud during some construction activities, and the railroad corridor includes many stream crossings that are migration barriers. Although the railroad is no longer present, legacy effects still occur when large fills fail and inundate stream bottoms with soil and debris. Subsequent road construction has also created migration barriers. Highway and railroad construction in the St. Maries Valley have had similar effects as described for the other river valleys.

The construction and operation of Post Falls Dam in the early Twentieth Century resulted in the summer-time impoundment of portions of the lower Coeur d'Alene and St. Joe rivers, the lower reaches of numerous tributaries, and yearlong inundation of the Spokane River between the lake and the falls, negatively impacting their suitability for salmonids. Post Falls Dam was relicensed in 2009, which included mitigation for these impacts.

Native salmonids in the Coeur d'Alene River drainage are WCT and bull trout, as well as mountain and pygmy whitefish. A wide range of non-native species have been introduced to the Coeur d'Alene and St. Joe river drainages. Brook trout are established in several tributaries, lakes, and reaches of the South Fork Coeur d'Alene River. Brook trout are also present in the North Fork Coeur d'Alene River drainage, but generally they are not abundant or widely distributed. Brook trout have been sampled at numerous sites throughout the North Fork St. Joe River drainage and are common in several tributaries of the lower St. Joe River (Apperson et al. 1987). Brook trout occur in most tributaries in the St. Maries River drainage.

Catchable-size rainbow trout were stocked in the St. Joe, Coeur d'Alene, and St. Maries rivers for several decades. Rainbow trout stocking ceased entirely in 2002. Despite the stocking history, rainbow and hybrid trout are only occasionally observed in the St. Joe and St. Maries river drainages; however, both rainbow trout and hybrid trout are common in the Coeur d'Alene and lower North Fork Coeur d'Alene rivers. Despite the presence of rainbow trout, the cutthroat trout population in the drainage shows little overall introgression. In a 2011 genetic assessment of the Coeur d'Alene River, IDFG examined a sample of 170 trout collected throughout the North Fork Coeur d'Alene River that were analyzed at seven diagnostic nuclear DNA markers. Of these specimens, 79% were pure cutthroat trout, 11% were pure rainbow trout, and 9% were cutthroat x rainbow hybrids. Of the hybrid trout, 15 out of 16 were >F1 hybrids (Maiolie and Fredericks, in press). These data will serve as a baseline to determine future changes in hybrid composition.

IDFG has estimated cutthroat trout densities in the St. Joe River and Coeur d'Alene rivers since 1969 and 1973, respectively, creating a valuable long-term trend dataset. Densities are estimated by snorkeling a series of 35 transects in the St. Joe River and 43 in the North Fork Coeur d'Alene River. Additional transects have recently been established in the South Fork Coeur d'Alene River and the St. Maries River.

Cutthroat trout densities in the St. Joe and Coeur d'Alene rivers have increased steadily since snorkel counts were first initiated (Figure 17). Early research indicated the depressed cutthroat trout fishery was a result of over-fishing. Changes in fishing rules over the past three decades in combination with improving habitat throughout the basin have provided what are now two of Idaho's premier trout fisheries. For most of this time, cutthroat trout densities have been much lower (approximately a third to half) in the Coeur d'Alene River than in the St. Joe River. This difference was attributed to a combination of non-compliance with the fishing rules and degraded habitat. The shift to catch-and-release of all cutthroat trout in the drainage, along with increased enforcement, education, and habitat restoration have all helped to improve the cutthroat trout population in recent years. The Coeur d'Alene River, on average, now supports cutthroat densities about two thirds those present in the St. Joe River. The improved quality of the fishery, combined with elimination of season restrictions have led to a significant (but unmeasured) increase in angler use of the river.

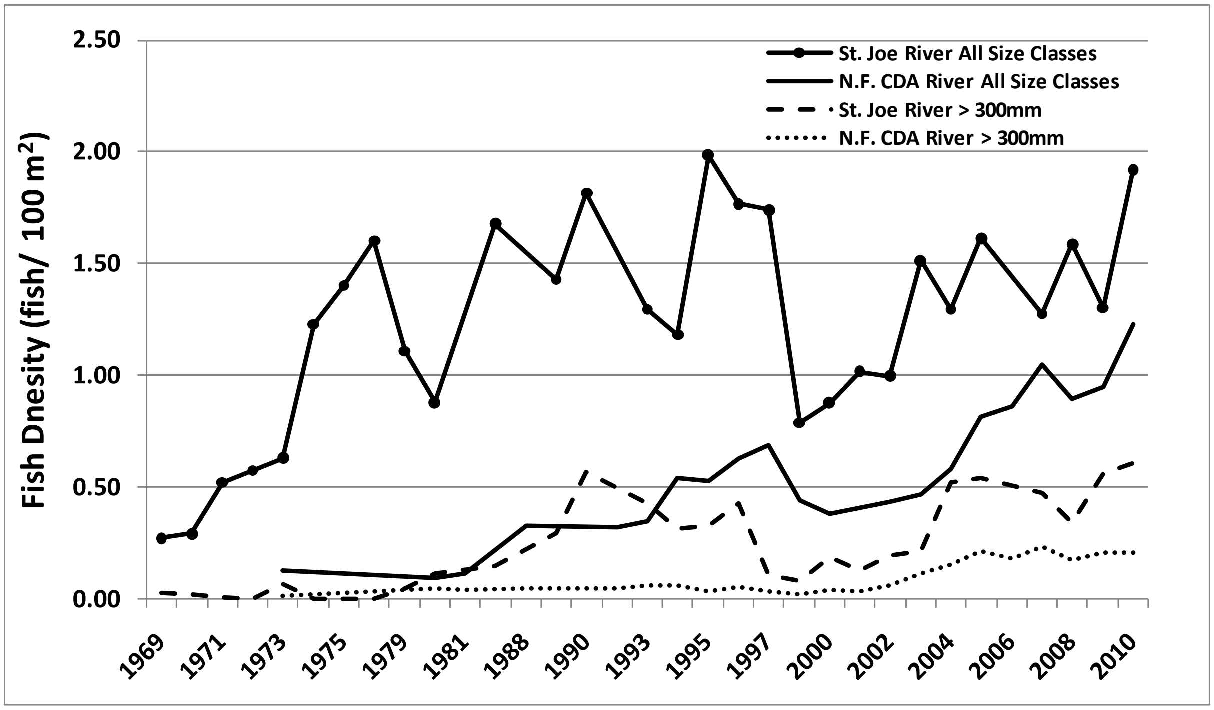

Figure 17. Average density (fish/100 m^2) of all size classes of cutthroat trout and those over 300 mm observed while snorkeling transects in the St. Joe River and North Fork Coeur d'Alene River (N.F. CDA), Idaho, from 1973 to 2010.

Snorkel transects in the South Fork Coeur d'Alene River were only established in 2006 and subsequently surveyed again in 2010, so data are limited. WCT were widely distributed in 2006, suggesting the improving quality of habitat was allowing a modest recovery. Although cutthroat trout were located throughout the river in 2010, densities were extremely low, even upstream of Canyon Creek where densities were considerably higher in 2006. In both surveys, a relative absence of larger cutthroat trout throughout the South Fork Coeur d'Alene River was noted. In the 28 transects snorkeled, IDFG staff observed only two cutthroat trout >300 mm in length. Considering the extensive history of mining, logging, road development, highway construction, and other land use impacts in the South Fork drainage, the lower densities are not unexpected. Historically, poor water quality related to mining has eliminated aquatic life in portions of the drainage. Prior to 1971, heavy metal concentrations (cadmium and zinc) were so high that no life existed in the South Fork Coeur d'Alene River downstream of Canyon Creek. As heavy metals were reduced through intense habitat mitigation, fish began to reappear and survive in the river by the 1990s. In addition to heavy metal pollution, stream channelization, excessive bedload, and migration barriers related to the extensive mining history have severely impacted cutthroat trout.

WCT distribution and abundance in many of the tributaries to the South Fork Coeur d'Alene River have been less affected by degradation and loss of habitat. In a project funded by the BLM in 2010, IDFG evaluated cutthroat trout densities in the Pine Creek drainage as compared with earlier surveys (Table 7). Overall, densities of both cutthroat and brook trout were higher than during surveys conducted by the BLM in 2002 and 2003 (Table 8).

While fluvial cutthroat trout populations in the drainage (the South Fork Coeur d'Alene River notwithstanding) are generally in good health, adfluvial stocks in Coeur d'Alene Lake are a fraction of historical levels. Shoreline development, loss of quality spawning and rearing habitat in tributary streams, and the introduction of competing or predatory species have all played a role in the decline of cutthroat trout. Northern pike and smallmouth bass were illegally introduced and are now widespread throughout the lake and lower seasonally impounded reaches of the tributaries. Currently, the Coeur d'Alene Tribe is engaged in a large scale effort to restore adfluvial cutthroat trout populations. IDFG has been supportive of the efforts, which entail habitat restoration in key tributaries, estimating in-lake survival of juvenile cutthroat trout, and evaluating impacts of non-native predators.

Available funding has recently enhanced opportunities for improving habitat throughout the drainage. In 2009, the EPA announced a superfund settlement with Asarco that provides nearly $500 million for clean-up of contaminants in the Coeur d'Alene River drainage. In 2011, the last of a series of settlements with mining companies was reached, resulting in over $140 million for restoring fish and wildlife habitat and water quality in the basin. IDFG and the IDEQ represent the state in implementation of the program. Other trustees include the Coeur d'Alene Tribe, U.S. Department of the Interior, and the USFS. Additional funds (approximately $150,000/year) are available for restoration and protection of fish habitat through the Avista Post Falls Settlement Agreement, which resulted from the relicensing of the Post Falls Dam on the outlet of Coeur d'Alene Lake. These funds provide tremendous potential to improve aquatic habitat and associated fish populations throughout the drainage.

Table 7. Mean density of brook (BKT) and WCT sampled in nine tributaries of Pine Creek from July 12th-23rd, 2010.

	Fish/100 m^2	
Stream	BKT	WCT
Calusa Creek	2.42	1.61
Douglas Creek	4.95	0.26
EF Pine Creek	9.18	2.41
Highland Creek	8.31	54.62
Hunter Creek		2.23
Langlois Creek	2.79	8.15
MF Pine Creek		4.97
Trapper Creek		4.64
WF Pine Creek	0.58	3.06

Table 8. Mean density of brook (BKT) and WCT sampled in five tributaries of Pine Creek in 2003 and 2010. Density is based on actual numbers of fish sampled on the first pass and not expanded to density based on total estimated population.

Stream	Transect	Species	2003 fish/100 m^2	2010 fish/100 m^2
EF Pine Creek	EFPC 2.2	BKT	1.28	1.32
		WCT	0.64	0.00
EF Pine Creek	EFPC 3.0	BKT	0.43	1.53
		WCT	1.07	0.00
EF Pine Creek	EFPC 4.5	BKT	5.45	11.37
		WCT	1.01	1.49
EF Pine Creek	EFPC 4.7	BKT	1.39	1.03
		WCT	0.00	0.52
Highland Creek	HC 0.8	BKT	0.72	3.11
Highland Creek	HC 2.0	BKT	0.00	6.12
Highland Creek	HC 2.9	BKT	0.00	0.33
		WCT	0.00	18.44
Highland Creek	HC 3.5	WCT	0.43	27.05
Douglas Creek	DC 0.2	BKT	1.39	2.36
		WCT	3.47	0.26
Hunter Creek	HTR 0.11	WCT	3.14	1.72

Clearwater River Basins

Lower and Upper North Fork Clearwater River GMU

We have combined the Lower and Upper North Fork Clearwater GMUs in this description for the following reasons:

- Cutthroat trout commonly move back and forth between these two GMUs
- Cutthroat trout have similar life histories and movement patterns in both GMUs
- These two GMUs encompass the entire North Fork Clearwater River watershed

The North Fork Clearwater River begins in the headwaters of the Bitterroot Mountain Range near the Idaho/Montana border and flows about 127 km (79 mi) until it enters Dworshak Reservoir (Figures 18-19). The North Fork Clearwater watershed has an area of over 6,300 km^2 (2,432 mi^2). Dworshak Reservoir was created in 1974 and impounds 83 km (52 mi) of the North Fork Clearwater River. During full pool, Dworshak Reservoir has a surface area of 6,670 ha (16,482 ac). Dworshak Dam, operated by the U.S. Army Corps of Engineers, controls water levels and outflow from Dworshak Reservoir and is located 3 km (1.8 mi) upstream of the Clearwater River. Major tributaries of the North Fork Clearwater River include Kelly Creek, Weitas Creek, and the Little North Fork Clearwater River and all have important cutthroat trout fisheries. Stream flow for the North Fork Clearwater River entering Dworshak Reservoir ranges from typical lows in September around 25 m^3/s (900 cfs) to peaks that typically occur in May and June and often exceed 570 m^3/s (20,000 cfs). Annual outflow from Dworshak Dam is largely dictated by flood control and ESA-listed fish reasons, but annually averages 142-170 m^3/s (5,000-6,000 cfs) and typically varies from 14 m^3/s to 566 m^3/s (500-20,000 cfs). Elevations in the North Fork Clearwater River watershed range from a low of 302 m at the mouth to over 2,130 m in the peaks of the Kelly Creek drainage. The majority of the watershed surrounding Dworshak Reservoir is less than 900 m elevation, making this area subject to rain-on-snow events. Upstream of Dworshak Reservoir, much of the drainage area is greater than 1,200 m elevation. Consequently, winter precipitation falls mainly as snow, although lower elevation canyons along mainstem tributaries may be susceptible to rain-on-snow events. Topography of the North Fork Clearwater River watershed is predominantly mountainous, with side slopes commonly exceeding 60% slope. The land cover in this watershed is almost entirely forested.

Land ownership surrounding Dworshak Reservoir is highly mixed and comprised of private, state, and federal holdings. Potlatch Corporation owns a substantial percentage of the land in this area, and the state of Idaho (managed by the Idaho Department of Lands) owns more property in this region than any other area in the entire Clearwater River watershed. The U.S. Army Corps of Engineers manages property directly bordering Dworshak Reservoir. To the west of the Dworshak Reservoir area and in much of the Little North Fork Clearwater River watershed, ownership is mostly federal (managed primarily by the USFS).

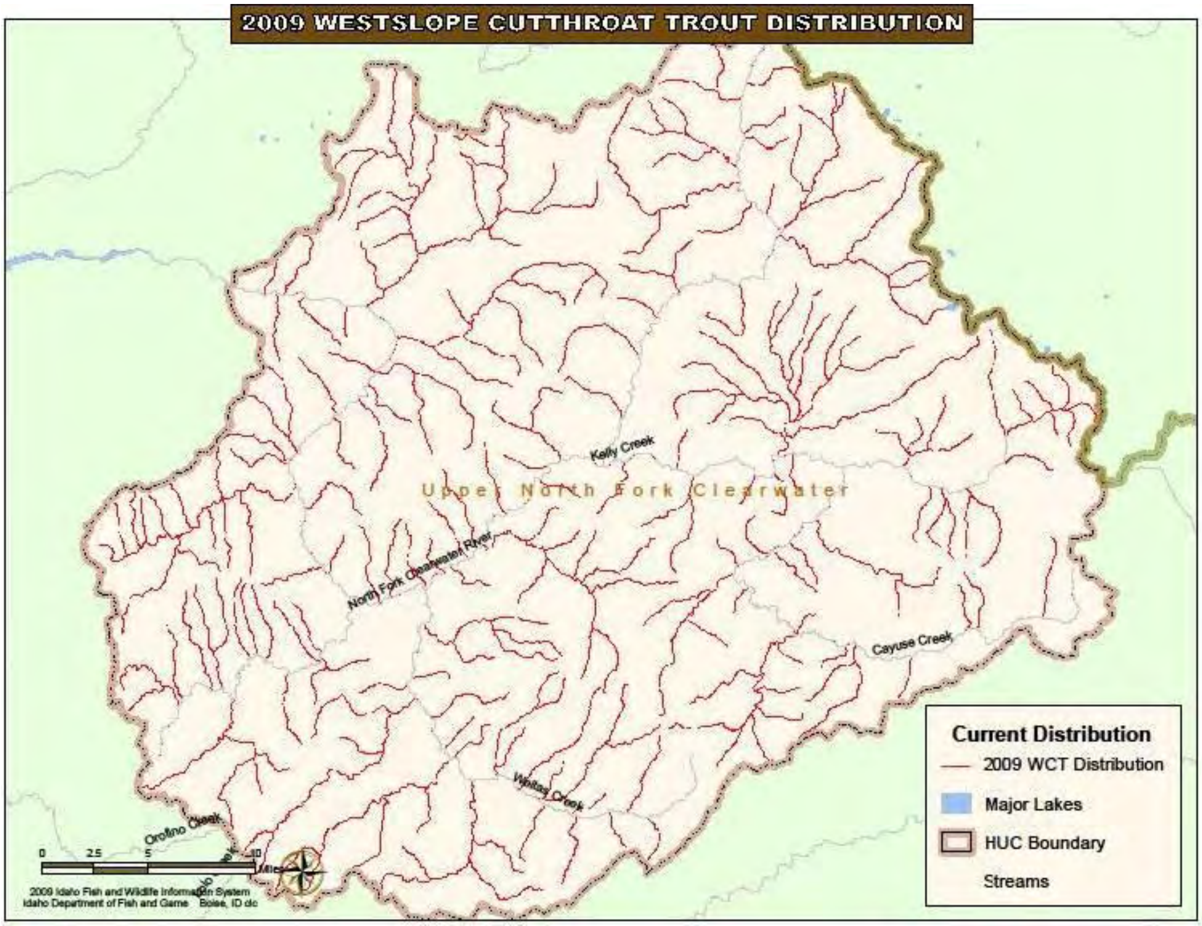

Figure 18. Lower and Upper Clearwater River GMU with WCT distribution as of 2009.

Figure 19. Lower and Upper Clearwater River GMU with WCT distribution as of 2009.

The Potlatch Corporation and Idaho Department of Lands have intensively managed their grounds for timber production, a fact reflected in the high densities of forest roads through much of this area. Road densities commonly exceed 5 km/km^2 and, in some areas, exceed 7.5 km/km^2. Grazing activities are dispersed throughout the state and private ownership. Much (70%) of the federally managed land is inventoried as roadless areas. Federally-owned portions of the Little North Fork Clearwater River drainage contain both inventoried roadless areas and a wild and scenic river corridor. Where roads do exist on federal ground, densities are relatively high for the Clearwater River watershed, ranging from 5 to 7.5 km/km^2. Historic mining activities occurred throughout the North Fork Clearwater drainage, although activities were widely dispersed. A variety of mining methods were historically employed including dredging, hydraulic, draglines, drag shovels, and hand operations, and legacy impacts of past mining is still noted today.

Due to flood control and ESA issues, outflow from Dworshak Dam does not follow the natural hydrograph. Typically Dworshak Reservoir reaches full pool around July 1 (elevation 488 m). Shortly after this date, outflow is increased to cool water temperatures in the Snake River for outmigrating fall Chinook salmon. These releases typically end by mid-September at which time water levels in Dworshak Reservoir have dropped to about 463 m. Water levels from then on are managed to reach full pool by July 1 and are dictated largely by precipitation and snowpack. These operations have led to a shoreline along Dworshak Reservoir that is devoid of vegetation, experiences significant erosion, and does not support stable populations of benthic invertebrates. Starting in 2007, an experimental nutrient supplementation project was implemented by IDFG in Dworshak Reservoir. Goals of the program are to evaluate whether additions of a nitrogen-based fertilizer can improve the reservoir ecosystem and ultimately increase kokanee growth and/or abundance.

Currently, the North Fork Clearwater River watershed supports native populations of WCT, bull trout, redband trout and mountain whitefish. Historically, anadromous runs of steelhead, Chinook salmon, and Pacific lamprey also ascended the North Fork Clearwater River and spawned and reared in many of its tributaries. The construction of Dworshak Dam blocked all upstream fish passage and anadromous fish no longer occur upstream of it. Historically, hatchery rainbow trout (many strains) were stocked in the North Fork Clearwater River, and a few tributaries. By 1975, almost all stocking ended in flowing waters in this watershed except for near a few towns. Currently, no stocking occurs in any flowing waters in this drainage upstream of Dworshak Dam. Rainbow trout have been stocked into Dworshak Reservoir since its construction. Starting in 2000, all stocked rainbow trout have been sterile fish. Weigel et al. (2003) evaluated WCT hybridization with rainbow trout in the North Fork Clearwater River watershed from 1997-1999. This study surveyed 58 different sites and found pure cutthroat trout occurring in 37% of them. Most of the pure populations were found in smaller streams at higher elevations. Although not reported in this manuscript, it is believed that at many of the sites, only low levels of rainbow trout introgression occurred. Weigel et al. (2003) assumed that hybridization occurred because of past stocking efforts of resident rainbow trout. No attempts were made to evaluate whether introgression was with native redband trout that occur in this watershed or from introduced rainbow trout. Kozfkay et al. (2007) found that where native populations of cutthroat trout and redband trout coexist, low levels of hybridization/introgression often occur between them. Brook trout are located in many of the lower elevation streams and high mountain lakes in this watershed. Brook trout are rarely observed in the North Fork Clearwater River. Smallmouth bass and kokanee have been stocked into Dworshak Reservoir and provide popular fisheries. Kokanee migrate upstream from the reservoir as far as 85 km (52 mi) to spawn. Smallmouth bass now occur 40 km (25 mi) up the North Fork Clearwater River.

Downstream of Silver Creek, a tributary of Dworshak Reservoir 52 km (32 mi) upstream from the dam, cutthroat trout spawning and rearing populations only occur in a few tributaries where elevation, aspect, and habitat provide suitable temperature requirements. It is believed that historically, cutthroat trout spawning and rearing populations were also not common in this area due to temperature limitations. Brook trout may have displaced cutthroat trout from some of these lower elevation streams where temperatures are suitable. Upstream from and including Silver Creek, cutthroat trout are believed to occur within the mainstem river corridor and all tributaries in the North Fork Clearwater River watershed where sufficient flow and gradient occurs. Densities in individual watersheds are influenced largely by flow, gradient, and elevation, although brook trout in some of the more downstream watersheds may have influenced cutthroat trout abundance and distribution.

Both resident and fluvial cutthroat trout occur in the tributaries. Fluvial cutthroat trout are believed to leave the tributaries at 2-4 years of age. Once fluvial cutthroat trout move to the North Fork Clearwater River or one of its major tributaries, these fish migrate up and downstream to maximize survival and growth. Fluvial cutthroat trout that utilize the North Fork Clearwater River watershed tend to reach a maximum size of about 450 mm. These fish go through similar migrations as we see in other Idaho rivers. They migrate downstream in the fall to overwinter areas (some migrate upwards of 100 km) and often remain in these areas until warming water temperatures push them upstream to areas with more desirable temperatures. During late fall/early winter, large numbers of cutthroat trout move out of the North Fork Clearwater and Little North Fork Clearwater drainages into Dworshak Reservoir to overwinter. Prior to the construction of Dworshak Dam, many of these fluvial fish would migrate into the Clearwater River to overwinter. Some cutthroat trout appear to have developed an adfluvial life cycle as subadult cutthroat trout have been sampled from the reservoir during the summer.

A number of studies using snorkel surveys were conducted on the North Fork Clearwater River since 1969 to evaluate changes in the fish community (Johnson 1977; Pettit 1976; Moffitt and Bjornn 1984; Hunt and Bjornn 1991; Hand et al. 2008; Dupont et al. 2011). These surveys show that cutthroat trout abundance has increased considerably since 1969 (Figure 20). During this same time period, redband trout abundance declined by about 90% and is believed largely due to the completion of Dworshak Dam in 1974 and the elimination of all steelhead runs into this watershed (Pettit 1976). Some have attributed the increase in cutthroat trout abundance to less competition with redband trout/steelhead, but it is important to realize that more restrictive rule changes for cutthroat trout occurred in 1970 in Kelly Creek (change from 15 fish daily limit to catch-and-release) and in 1972 in the North Fork Clearwater (change from 15 fish to 3 fish daily limit). Similar increases in cutthroat trout abundance were observed in other northern Idaho streams shortly after more restrictive rule changes were implemented.

More recent surveys in the mainstem North Fork Clearwater River (2011) and Kelly Creek (2010) show conflicting information. Snorkel data on the North Fork Clearwater River found counts were almost 10 times higher than those observed in 1989 (6.9 fish/transect versus 0.7 fish/transect, respectively); whereas in Kelly Creek, counts in 2010 (7.7 fish/transect) were about 40% of what was observed in 1989 (12.9 fish/transect) (Figure 20). An explanation for these differences in counts may be explained by the cooler water temperatures and higher flows that were experienced when snorkeling in 2010 and 2011. Past surveys have shown that as water temperatures warm, cutthroat trout in this system tend to move upstream. The cooler water temperatures in 2010 and 2011 may not have facilitated typical upstream movement patterns that cutthroat trout in this system normally display. More frequent surveys are needed to better understand these differences in counts.

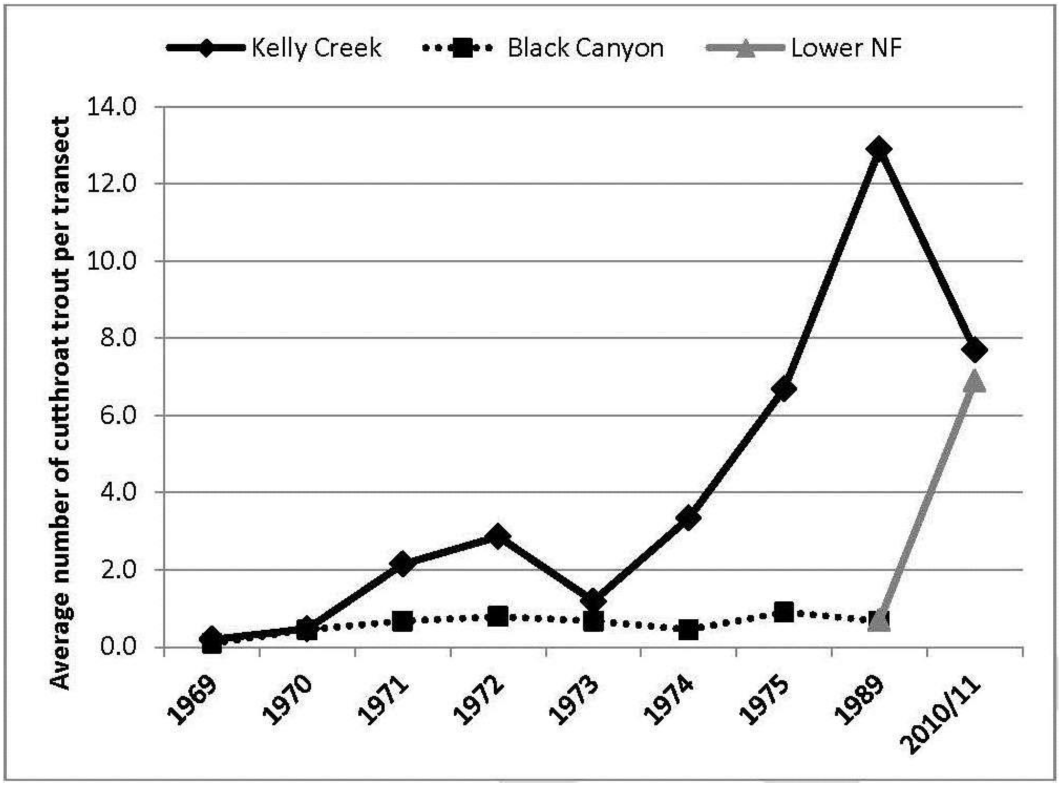

Figure 20. The average number of cutthroat trout counted in snorkel transects in different river reaches of the North Fork Clearwater River, Idaho, during August from 1969 to 2011. The Lower North Fork Clearwater (Lower NF) was last surveyed in 2011 and Kelly Creek was last surveyed in 2010.

Creel surveys conducted on the North Fork Clearwater River since 1969 show that after implementing more restrictive rules (1970 in Kelly Creek and 1972 in North Fork Clearwater), effort initially declined but steadily increased afterwards to the point where effort in the North Fork Clearwater is now likely over 10 times higher than it was in the early 1970s (Figure 21). Catch rates have also increased substantially after implementing more restrictive rules (Figure 22). Only one year has been surveyed after rules became more restrictive in 1992 and 1994 (Reduce daily limit to two fish in 1992 and then to two fish >356 mm in 1994), but this information suggests it has increased catch rates for cutthroat trout.

The Little North Fork Clearwater River is known for quality trout fishing in a backcountry setting. Since 1997, IDFG has conducted snorkel surveys to monitor trends in fish populations. The surveys are conducted every two to three years, and were most recently completed in 2012. Survey findings indicate this cutthroat trout population has been stable or increasing, with an apparent increase in larger sized (>300 mm) fish (Figure 23). The population surveys suggest little impact by anglers. This has been further corroborated periodically evaluating exploitation with the use of T-bar tags. Since 1997, corrected exploitation estimates have been, at most 15%, which would be two to three times less than a level that would be expected to alter size structure or abundance (Table 9).

Cutthroat trout from both the North Fork and Little North Fork drainage congregate at the head end of Dworshak Reservoir to overwinter. In 2011, fish were tagged to evaluate whether angler exploitation in the reservoir was a concern. Based on tag returns, angler exploitation was evaluated at around 5%.

Currently, the cutthroat trout fishery in the North Fork Clearwater River watershed upstream of Dworshak Dam is managed under three different fishing rules. For the North Fork Clearwater River including Dworshak Reservoir, the daily limit for cutthroat trout is two fish >356 mm with no harvest allowed from December 1 through Friday before Memorial Day in the river. In all tributaries except Kelly Creek, a daily limit of two cutthroat trout is allowed. Kelly Creek is catch and release year-round. Access to the mainstem North Fork Clearwater River is available for the majority of the reach above Dworshak Dam along USFS RD 250 which runs from Isabella Creek to Cedars Campground. There is also gravel road access along Kelly Creek from its mouth to Moose Creek along USFS RD 255. Road access in the Little North Fork Clearwater River drainage is limited to the upper portion of river, near Jungle Creek, with over 35 km (22 mi) of the river accessible only by trail. Access is limited to foot traffic and off road vehicles in most tributaries in the North Fork Clearwater River upstream of Dworshak Reservoir and the Little North Fork Clearwater River.

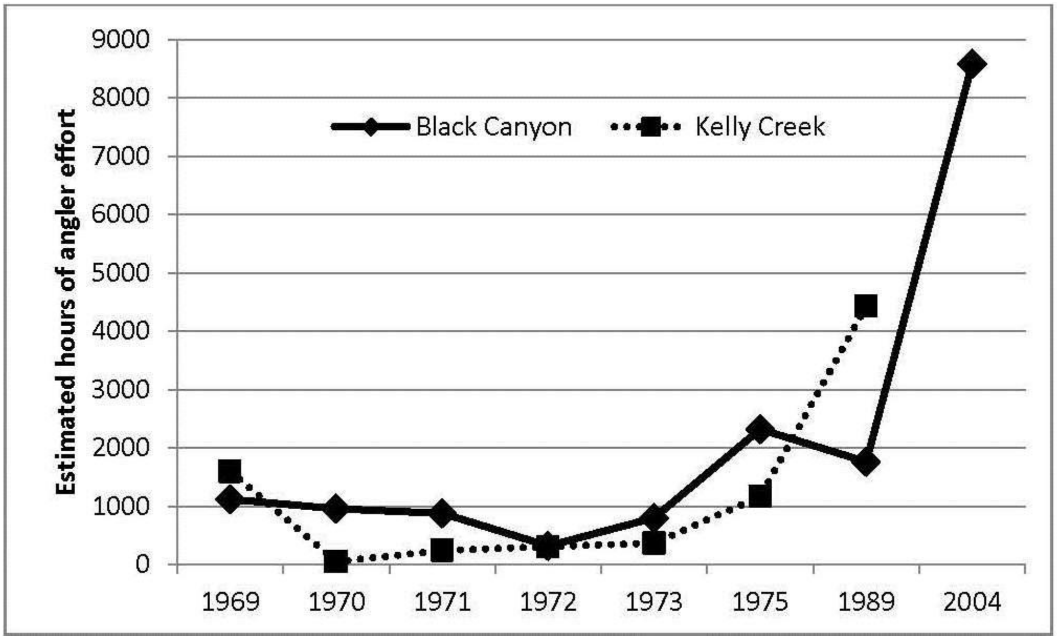

Figure 21. Estimated angler effort on cutthroat trout in different river reaches of the North Fork Clearwater River, Idaho, between 1969 and 2004.

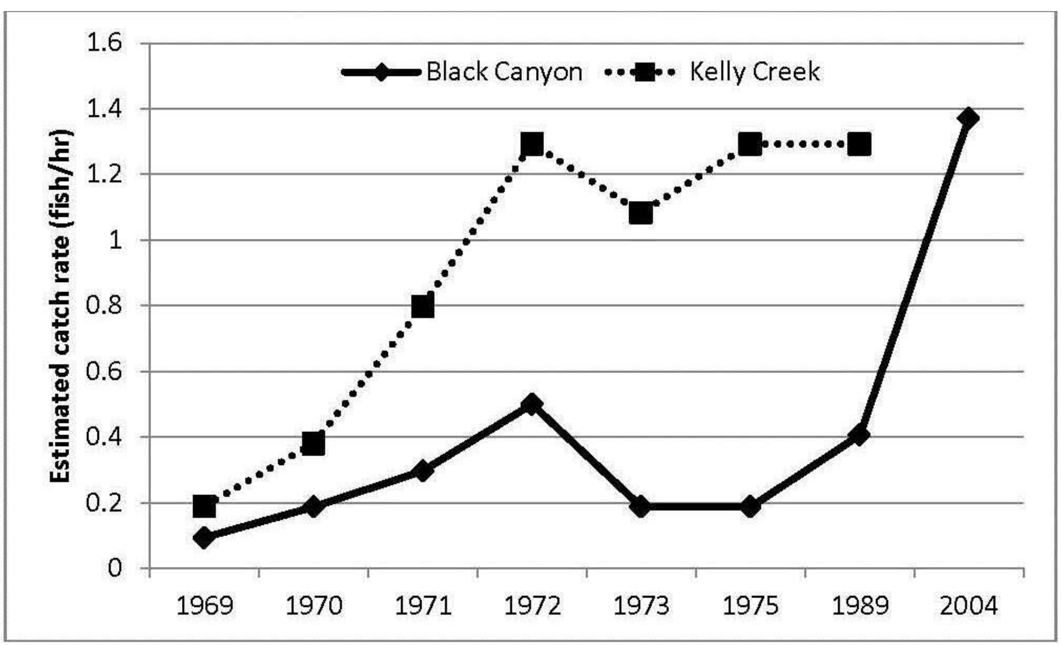

Figure 22. Estimated angler catch rates on cutthroat trout in different river reaches of the North Fork Clearwater River, Idaho, between 1969 and 2004.

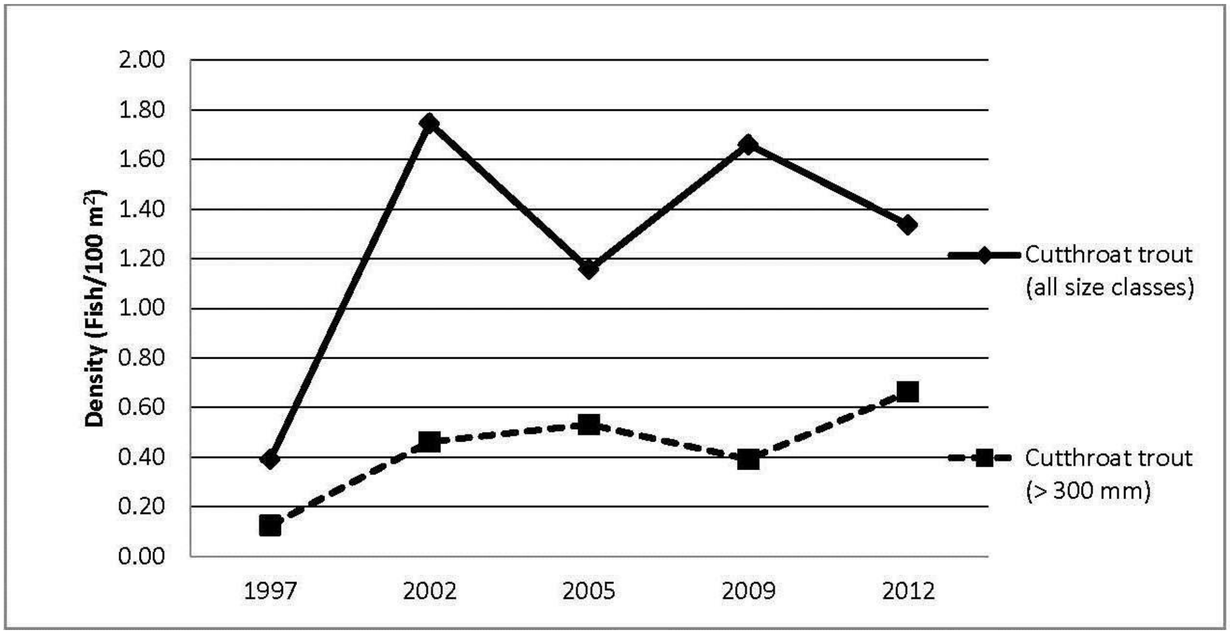

Figure 23. Densities of cutthroat trout >300 mm and cutthroat trout of all sizes in the Little North Fork Clearwater River, Idaho.

Table 9. Number of WCT tagged, recaptured, and harvested on the Little North Fork Clearwater River, Idaho, from 1997 through 2012. Percent recaptured and angler exploitation were calculated based on a 6% tag loss rate and a 45% and 55% reporting rate for non-reward (2009) and reward tags, respectively.

Date	Number tagged	Number recaptured	Percent recaptured	Number harvested	Annual exploitation
2012	63	3	11.0%	1	4.0%
2009	119	12	16.4%	2	4.0%
2005	142	20	22.9%	11	15.0%
2002	31	6	31.5%	2	12.5%
1997	75	--	--	6	15.5%

Clearwater and Middle Fork Clearwater GMU

We have combined the Clearwater and Middle Fork Clearwater GMUs in this description because WCT occur in both GMUs, the cutthroat trout have similar life histories and movement patterns, land management is similar, and threats to cutthroat trout are similar.

The Clearwater and Middle Fork Clearwater rivers flow through this GMU (Figures 24-25). No other major rivers occur in this GMU, although all the major tributaries in the Clearwater River basin directly contribute. The Middle Fork Clearwater River begins at the confluence of the Lochsa and Selway rivers and flows about 37 km (23 mi) where it joins with the South Fork Clearwater River to form the Clearwater River. The Clearwater River flows about 120 km (74 mi) where it enters the Snake River at the Washington/Idaho border. The North Fork Clearwater River joins the Clearwater River about 65 km (40 mi) upstream from the Snake River. The Clearwater and Middle Fork Clearwater GMU encompasses about 6,700 km^2 (2,586 mi^2) of land, although the Clearwater River receives flow from over 24,000 km^2 (9,266 mi^2) of land. As a result, flows in the Clearwater and Middle Fork Clearwater rivers are largely influenced from areas outside the GMU. Flows in the Clearwater River typically range from a low of around 71 m^3/sec (2,500 cfs) in late September to peak flows in the spring that typically exceed 1,700 m^3/sec (60,000 cfs). Elevations range from about 230 m at the mouth of the Clearwater River to over 1,830 m in the mountain peaks. The vast majority of the GMU is less than 1,200 m and as a result, is very susceptible to rain-on-snow events, extreme erosion events, and extreme variations in flow. The Clearwater and Middle Fork Clearwater rivers can be described as having a C3 channel stream type (<2% grade and dominated by cobbles) with steep canyon walls. Tributaries entering the Clearwater and Middle Fork Clearwater rivers flow through canyon break-lands and tend to have steeper A and B channel types. For those tributaries that extend past the canyon break-lands, their gradient tends to flatten and have less confined valley types.

Land ownership within this GMU is predominately private. The USFS manages land in the upstream reaches of the Potlatch River, Lolo Creek, and Clear Creek, and the Idaho Department of Lands manages scattered state ground on the north side of the Clearwater and Middle Fork Clearwater rivers. The Nez Perce Indian Reservation lies almost entirely in this GMU and encompasses about 40% of the area.

Downstream of the North Fork Clearwater River, dry-land farming is the major land use practice which has occurred since the early 1900s. Grazing activity is widely distributed throughout this area as well, occurring mainly in the uncultivated canyons and pockets of timberland. Moving upstream of the North Fork Clearwater River, the land becomes more timbered. The Potlatch Corporation, Idaho Department of Lands, USFS, and other private landowners have intensively managed this area for timber production, a fact reflected in the high densities of forest roads throughout much of this area. Road densities in these areas exceed 5 km/km^2 and in some areas exceed 7.5 km/km^2. This area also has a rich mining history, the impacts of which are still notable today. Substantial numbers of mines and mining claims are present on federal and state lands, and the headwaters of Orofino Creek contain numerous mines with relatively high ecological hazard ratings.

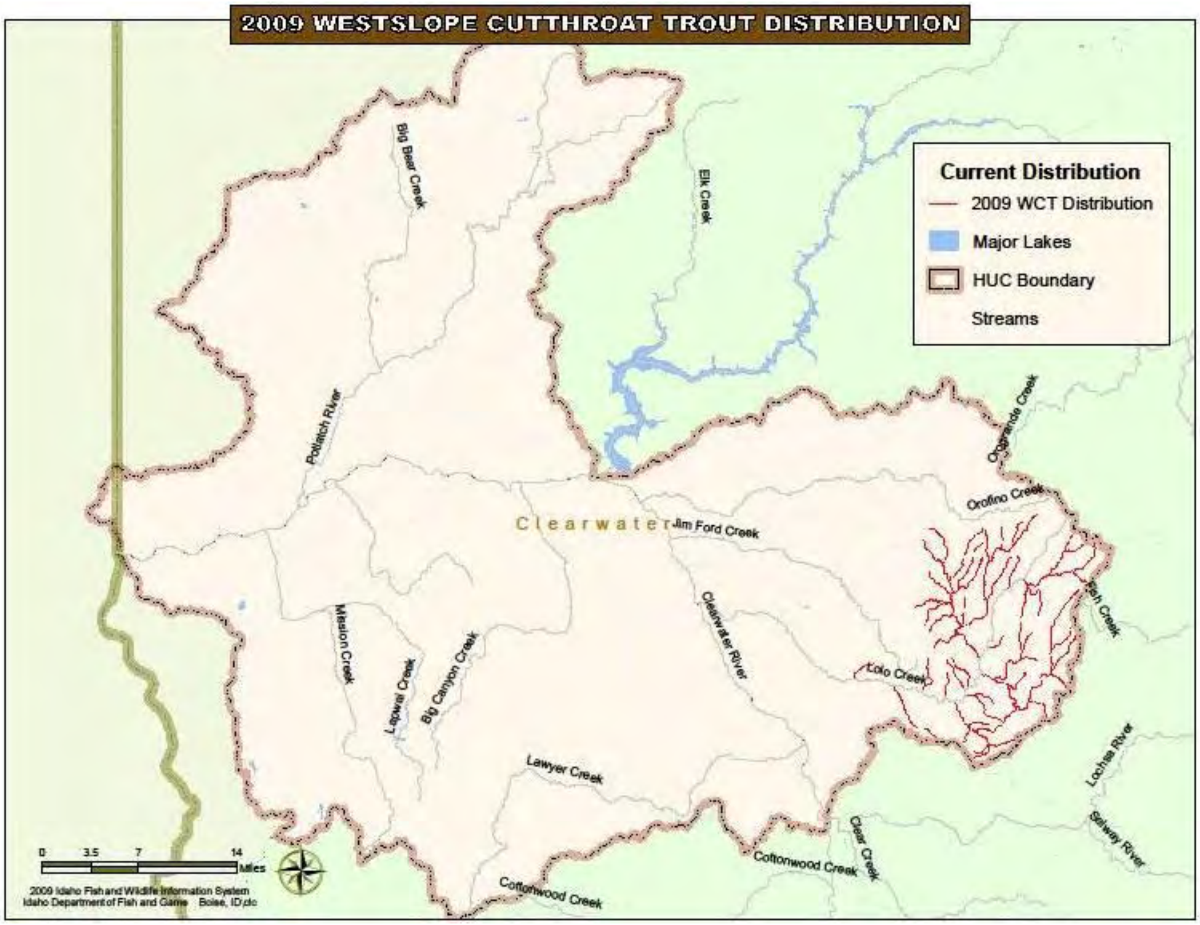

Figure 24. Clearwater and Middle Fork Clearwater GMU with WCT distribution as of 2009.

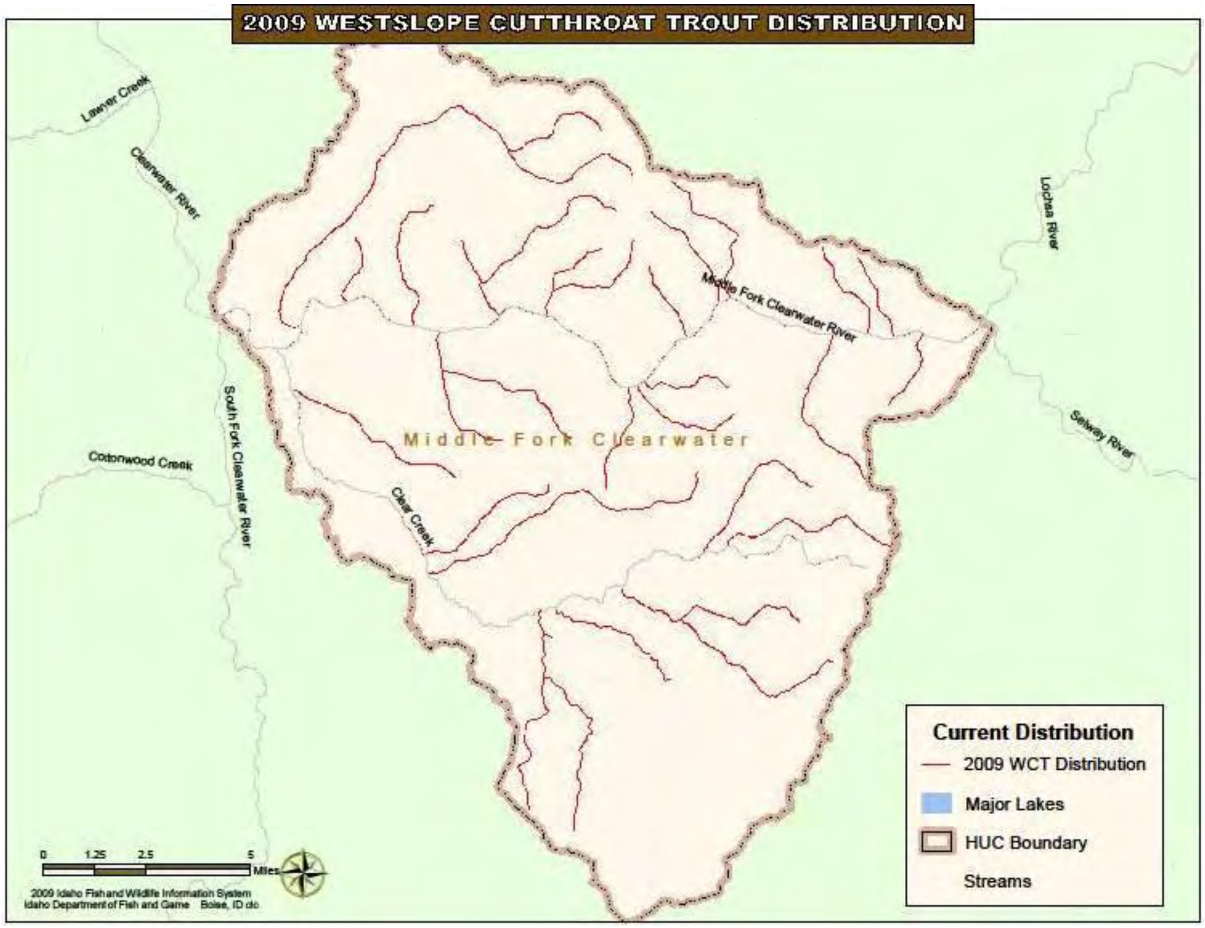

Figure 25. Clearwater and Middle Fork Clearwater GMU with WCT distribution as of 2009.

This GMU supports runs of spring and fall Chinook salmon, coho salmon, and summer steelhead. Hatchery releases account for the majority of these salmon and steelhead runs although wild steelhead inhabit most of the tributaries with perennial flow. Native WCT, resident redband trout, and bull trout all occur seasonally in the Clearwater and Middle Fork Clearwater rivers, although they tend to only use these rivers as overwintering and migratory habitat. Mountain whitefish are the most abundant salmonid that use these rivers and occur there on a year-round basis. Rainbow trout (Kamloops, Mt. Shasta, and unspecified rainbow) have been stocked in the Clearwater and Middle Fork Clearwater rivers since the 1970s to provide additional recreational opportunities. Stocking stopped in the Middle Fork Clearwater River in 1986, but continued until 2010 in the Clearwater River. Many of the larger tributaries in this GMU were stocked periodically with rainbow trout. Starting in 2000, all rainbow trout stocking that occurred in this GMU used sterile fish. Starting in 2010, stocking of rainbow trout into flowing waters in this GMU stopped. It is believed these stocking efforts have led to hybridization with cutthroat trout, as westslope x rainbow hybrids have shown up in the past in angler creels. Brook trout were introduced in the early 1900s and are located in many of the lower gradient sections of tributaries that occur in this GMU. Smallmouth bass occur in the mainstem Clearwater and Middle Fork Clearwater rivers and in the lower portion of the larger tributaries.

Cutthroat trout are found infrequently in the lower Clearwater River but become more abundant moving upstream towards the Lochsa and Selway rivers. Most of the cutthroat trout that utilize the Clearwater and Middle Fork Clearwater rivers are fluvial fish that move downstream from the Lochsa and Selway Rivers during late fall/early winter. These fish often remain in these rivers through June until warming water temperatures push them upstream. Historically, fluvial cutthroat trout also moved downstream into the Clearwater River from the South Fork Clearwater and North Fork Clearwater rivers to overwinter. Due to depressed numbers of cutthroat trout in the South Fork Clearwater River, few fluvial fish are believed to migrate from this system to overwinter downstream. Construction of Dworshak Dam in 1973, 3.1 km (2 mi) upstream from the mouth of the North Fork Clearwater River, impounded 85 km (52 mi) of this river and eliminated fluvial cutthroat trout.

The two major tributaries that support cutthroat trout include Lolo Creek and Clear Creek with the majority of these fish occurring on land managed by the USFS. Most of the cutthroat trout that utilize these streams are resident fish. Screw traps and weirs have been operated on these streams to sample outmigrating anadromous fish. Rarely have cutthroat trout been sampled from these traps, suggesting they have little to no fluvial life cycle. Cutthroat trout spawning and rearing populations are not known to occur in Clearwater River tributaries downstream of Lolo Creek and historically were not believed to use this area due to temperature limitations.

In the past, liberal limits allowed harvest of fluvial cutthroat trout that utilized the Clearwater River and Middle Fork Clearwater River. Fishing pressure has been significant in these rivers due to the world-renowned steelhead fishery. In the past, anglers who incidentally caught cutthroat trout while steelhead fishing often kept them. It is believed these harvest impacts have contributed to declines in the longer migrating cutthroat trout that historically utilized the Clearwater River to overwinter. The construction of Dworshak Dam has also reduced abundance of cutthroat trout in the Clearwater River by blocking movement of fluvial fish. Releases from Dworshak Dam have also greatly altered the natural temperature and flow regimes. It is unknown what influence this is having on cutthroat trout that utilize these waters. Fluvial fish entering the Middle Fork Clearwater River to overwinter are more abundant than occur in the Clearwater River. In 2011, more restrictive fishing rules were implemented in these two rivers to reduce the incidental harvest of cutthroat trout and increase their abundance. Impacts to resident fish that occur in Lolo Creek and Clear Creek are mostly related to timber management and grazing practices that occur on them. These activities have impacted sediment, riparian areas, and water temperature. Brook trout are abundant in many tributaries of Lolo Creek and likely have influenced abundance and distribution of cutthroat trout. Cutthroat trout populations in these streams are considered to be depressed. The Clearwater and Middle Fork Clearwater GMU provide limited cutthroat trout angling opportunities due to limited cutthroat trout numbers and distribution in this region.

Lochsa River GMU

The Lochsa River begins in the headwaters of the Bitterroot Mountains on the Idaho-Montana border (Figure 26). It is formed by the confluence of Crooked Fork Creek and Colt Killed Creek (formerly White Sands Creek). It flows 113 km (70 mi) southwest, joining the Selway River at the town of Lowell, Idaho, to form the Middle Fork Clearwater River. Over this distance, the river drops about 600 m in elevation. Major tributaries include Colt Killed, Crooked Fork, Post Office, Warm Springs, Lake, Split, Boulder, Old Man, Fish, and Pete King creeks. The Lochsa River drainage covers 3,056 km^2 (1,180 mi^2), all in Idaho County. Stream flows near the mouth typically range from lows of around 11 m^3/s (400 cfs) in September to peak flows that exceed 565 m^3/s (20,000 cfs) in May. Elevations in the Lochsa watershed range from 448 m at the mouth of the Lochsa River to about 2,685 m at the highest peaks. The majority of the watershed occurs at elevations over 1,200 m. As a result, winter precipitation falls mainly as snow although lower elevation canyons along the Lochsa River and some tributaries may be susceptible to rain-on-snow events. Most of the drainage is granitic rock that is part of the Idaho Batholith. Because these rocks weather rapidly, the streams in the drainage typically erode into weaker joints or faults in the rock and create narrow valleys with steep valley walls (Bugosh 1999). Topography of the Lochsa River drainage is dominated by breaklands and glaciated mountains, with land slopes commonly exceeding 60%.

Land ownership in the Lochsa River drainage is mixed with the majority of the land under public ownership managed by the USFS. Nearly 80% of the drainage is designated as wilderness (Selway Bitterroot Wilderness Area) or roadless. The Lochsa River itself is designated a Wild and Scenic River. Due to this protected status, natural disturbance such as fire, flooding, and drought are factors most likely to influence changes on federal lands over time. The primary private landowner in the drainage is Western Pacific Timber Company and there are a few parcels along the lower Lochsa River deeded under the Homestead Act. The Western Pacific Timber Company (and previous owners) has intensively managed this area for timber production, a fact reflected in the high densities of forest roads throughout much of this area. Road densities in these lands are considered high, typically ranging from about 3 to greater than 7.5 km/km^2. Road densities are believed to indirectly limit fish population production in areas through sedimentation, poor instream cover, and impacts from upland disturbances. The Lochsa River is paralleled by a road along its entire length.

The Lochsa River drainage supports wild runs of spring Chinook salmon, summer steelhead, and Pacific lamprey, although hatchery supplementation for spring Chinook salmon occurs in this watershed. Historically, wild runs of anadromous fish greatly exceeded what occurs today, and these reductions have likely reduced the productivity (decline in marine derived nutrients) of the system. Native WCT, resident redband trout, bull trout, and mountain whitefish also occur. Bull trout are located mainly in the mainstem Lochsa River and the higher-elevation streams whereas mountain whitefish occur mainly in the mainstem Lochsa River and only the largest tributaries. Non-native hatchery rainbow trout were stocked in the Lochsa River for decades. Since 1990, no rainbow trout have been stocked into flowing waters in the Lochsa River drainage.

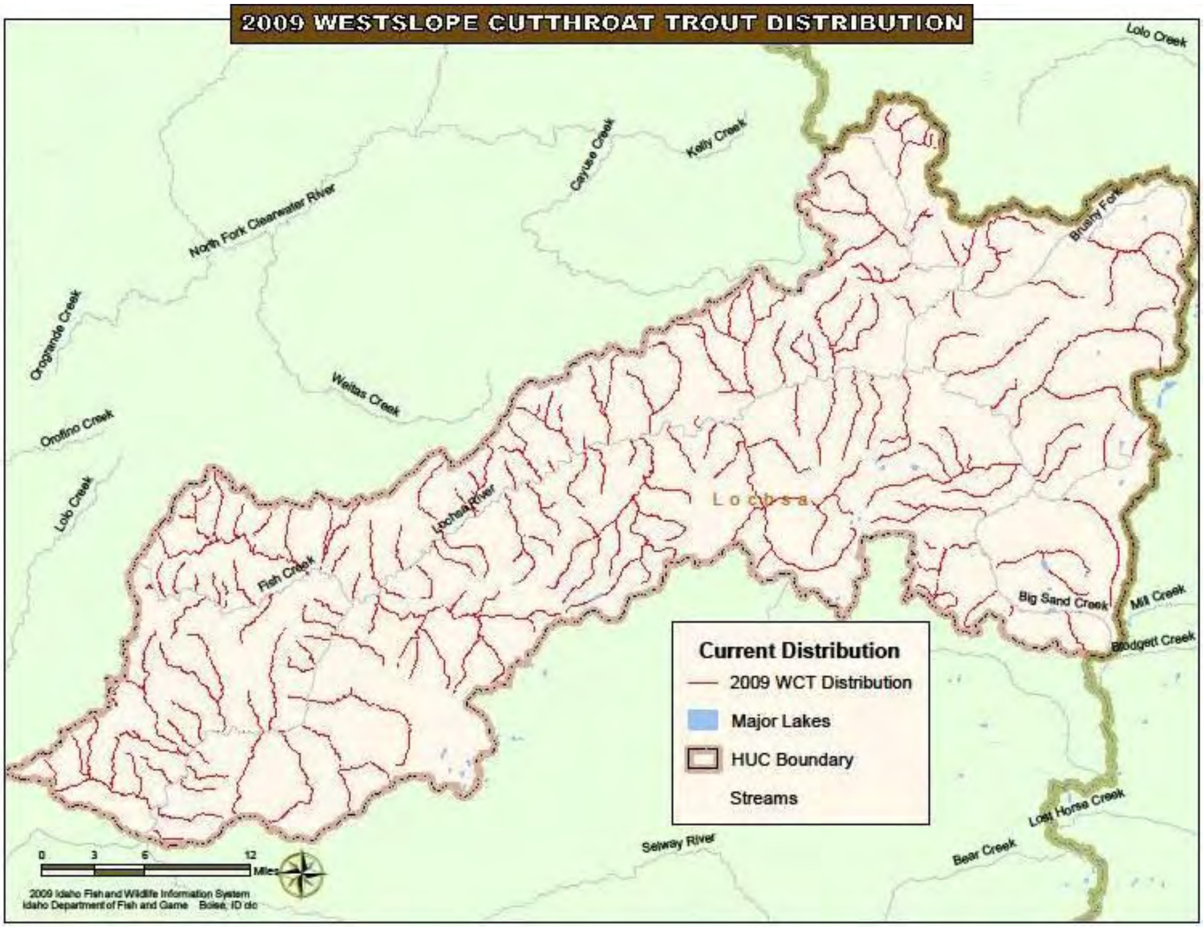

Figure 26. Lochsa River GMU with WCT distribution as per 2009.

Table 10. Summary of WCT data collected from creel surveys conducted on the Lochsa River, Idaho, 1956-1981. U.S. Highway 12 was completed in 1962, and catch-and-release rules were implemented from Boulder Creek upstream in 1977.

	Lochsa River Total				Mouth to Boulder Creek					Boulder Creek – Crooked Fork Creek			
Year	Effort	Catch*	Catch rate	Avg. length	Effort	Catch*	Catch rate	Avg. length	% over 254 mm	Effort	Catch*	Catch rate	Avg. length
1956*	26,657	5,948	0.22	---	23,498	2,888	0.12	---	---	3,159	3,060	0.97	---
1966*	34,884	1,864	0.05	---	10,506	212	0.02	---	---	24,378	1,652	0.07	---
1976	13,679	654	0.05	254	5,430	205	0.04	254	38	8,249	449	0.05	---
1977	9,769	751	0.08	266	8,785	210	0.02	266	42	984	541	0.55	---
1978	8,641	2,890	0.33	276	7,278	513	0.07	276	65	1,363	2,377	1.75	---
1979	7,257	1,736	0.24	288	5,878	467	0.08	288	81	1,369	1,269	0.93	---
1980	9,793	2,951	0.30	277	7,302	886	0.12	262	66	2,491	2,065	0.83	277
1981	7,711	2,940	0.38	300	5,984	317	0.05	306	76	1,727	2,623	1.52	295

Weigel et al. (2003) evaluated WCT hybridization with rainbow trout in the Lochsa River drainage from 1997-1999. This study surveyed 22 different sites and found pure cutthroat trout occurred in 36% of them. Most of the pure populations were found in smaller streams at higher elevations. Although not reported in this manuscript, it is believed that at many of the sites, only low levels of rainbow trout introgression occurred. Weigel et al. (2003) assumed that hybridization occurred because of past stocking efforts and not with resident redband trout. No attempts were made to evaluate whether introgression was with native redband trout that occur in this watershed or from introduced hatchery rainbow trout. Kozfkay et al. (2007) documented that where native populations of cutthroat trout and redband trout coexist, low levels of hybridization often occur. Brook trout were introduced in the early 1900s, mostly into high mountain lakes. Brook trout are now located in high mountain lakes and just a few of the lower gradient streams. Brook trout are rarely observed in the Lochsa River. Smallmouth bass occur in the lower Lochsa River.

WCT are distributed throughout the Lochsa River drainage, occupying both the mainstem river and tributaries. Both resident and fluvial life history forms are found, with some fish remaining in the tributary streams as residents, and some migrate from the main river to tributaries to spawn. Fluvial cutthroat trout are believed to leave the tributaries at 2-4 years of age. Once moving to the Lochsa River, these fish will migrate up and downstream to maximize survival and growth. Fluvial cutthroat trout that utilize the Lochsa River tend to reach a maximum size of about 475 mm. These fish go through similar migrations as we see in other Idaho rivers. They migrate downstream in the fall to overwintering areas (some migrate upwards of 100 km [62 mi] downstream into the Middle Fork Clearwater River) and often remain in these areas until warming water temperatures elicit them to move upstream to areas with more desirable temperatures. They typically spawn in April and May when water temperatures are around 6-9°C, with emergence occurring during June and July.

The abundance of cutthroat trout in the Lochsa River is likely different than it was historically. U.S. Highway 12, which runs along the entire length of the river, was completed in 1962. Its completion opened up the entire length of the Lochsa River to easy access for anglers. By 1966, the cutthroat trout population was considered to have been drastically reduced (Lindland 1977). This is likely due to high levels of harvest. A 1956 creel survey (Corning 1957) estimated cutthroat trout catch at 5,948 fish (Table 10). By the 1976 creel survey (Lindland 1977), catch had dwindled to 654 cutthroat trout. This reduced state of the cutthroat trout population prompted the implementation of catch-and-release rules in 1977 upstream of the Wilderness Gateway Campground Bridge.

Creel surveys were conducted annually from 1976-1981 to evaluate the response of the cutthroat trout population to the catch-and-release rules. Catch rates in the Lochsa River, as a whole, improved from a low 0.05 fish/hour in 1966 and 1976 to a high of 0.38 fish/hour in 1981 (Table 10). After implementation of catch-and-release rules above Boulder Creek, catch rates for cutthroat trout typically exceed 10 times what was observed in the harvest section downstream of Boulder Creek (Table 10). Mean total length of cutthroat trout harvested improved from 254 mm in 1976 to 300 mm in 1981. As was seen in Kelly Creek and the St. Joe River, cutthroat trout in the Lochsa River responded favorably to the implementation of catch-and-release rules (Lindland 1982).

Snorkel surveys have also been conducted to monitor the cutthroat trout population. Densities improved seven-fold in the catch-and-release section, and four-fold in the harvest section from 1977-1981 after the catch-and-release rules were implemented (Lindland 1982). Annual snorkel surveys have been conducted since 1985 in the Lochsa River drainage (Figure 27), and show a steady increase in densities of cutthroat trout. In addition to population trend monitoring, snorkel surveys were conducted from August 10-13, 2003 to develop a population estimate for cutthroat trout in the Lochsa River (Hand et al. 2008). A total of 60 transects were snorkeled, with 728 cutthroat trout observed. Of those fish, 202 were 356 mm or greater in length (Figure 28). Average length of all cutthroat trout observed was 279 mm. The population estimate was 11,533 + 3,683 (Table 11).

Currently, the fishery in the Lochsa River is managed under three separate fishing rules. The mainstem from its mouth upstream to Wilderness Gateway Campground Bridge is catch-and-release from December 1 through Friday before Memorial Day, and has a limit of two trout (none <356 mm) from the Saturday of Memorial Day weekend through November 30. The mainstem upstream of the Wilderness Gateway Campground Bridge is catch-and-release at all times. Both sections have barbless hook and no-bait-allowed rules. The tributaries of the Lochsa River have two-trout limits, but no size or bait restrictions. Access to the Lochsa River is relatively easy, as Highway 12 parallels most of its length.

<u>Lower and Upper Selway River GMU</u>

We have combined the Lower and Upper Selway GMUs in this description for the following reasons:

- Cutthroat trout commonly move back and forth between these two GMUs
- Cutthroat trout have similar life histories and movement patterns in both GMUs
- Land management is very similar in both GMUs
- These two GMUs encompass the entire Selway River watershed

The Selway River originates in the headwaters of the Bitterroot Mountain Range and flows about 163 km (101 mi) to where it combines with the Lochsa River to form the Middle Fork Clearwater River (Figures 29-30). Major tributaries of the Selway River include White Cap Creek, Bear Creek, Moose Creek, and Meadow Creek. The Selway River watershed has an area of over 5,200 km^2 (2,008 mi^2). Stream flows near the mouth typically range from lows around 14 m^3/s (500 cfs) in September to peak flows that exceed 850 m^3/s (30,000 cfs) in May or June. Elevations in the Selway River GMU range from 448 m at the mouth to about 2,740 m at the highest peaks. The majority of the watershed occurs at elevations over 1,200 m. As a result, winter precipitation falls mainly as snow although lower elevation canyons along the Selway River and some tributaries may be susceptible to rain-on-snow events. Topography of the Selway River drainage is dominated by breaklands and glaciated mountains, with land slopes commonly exceeding 60%.

Land ownership in the Selway River drainage is almost 100% federal and is managed by the USFS. About 95% of the Selway River watershed is afforded some level of protected status, primarily as wilderness (Selway Bitterroot and Frank Church River of No Return wildernesses), or inventoried roadless areas. This status limits land use activities and results in minimal road densities (<1 km/km^2) in most areas. The highest road densities are less than 3 km/km^2 and occur in only a few downstream watersheds which encompass less than 5% of the Selway River drainage. The Selway River has a road that parallels it for the lower 30 km (18 mi) and about 15 km (9 mi) in the upper reaches. Due to the protected status of this drainage, natural disturbance such as fire, flooding, and drought are factors most likely to influence changes in the landscape over time.

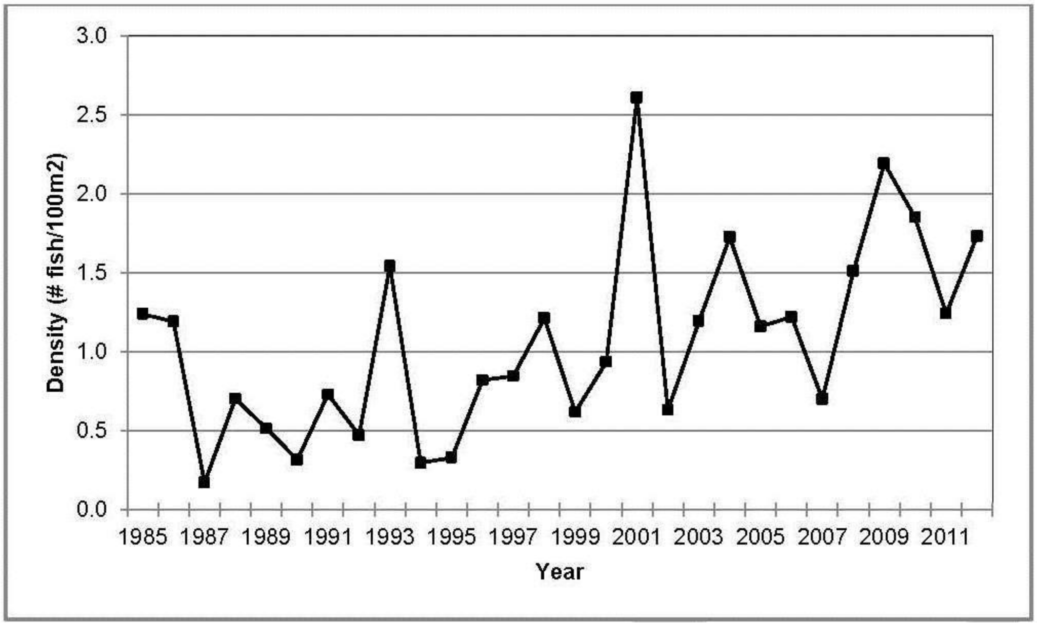

Figure 27. Densities (fish/100 m^2) of WCT as determined by snorkel surveys in the Lochsa River drainage, Idaho, 1985-2012.

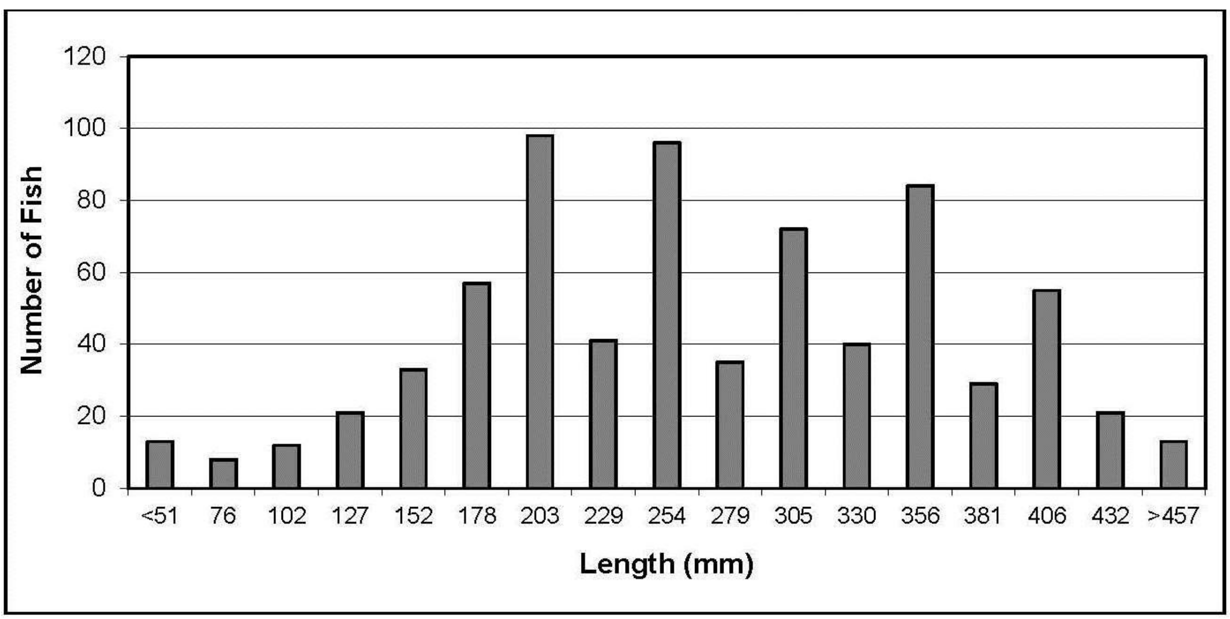

Figure 28. Length frequency distribution of WCT observed in the Lochsa River during population estimate snorkeling surveys in August 2003.

Table 11. Population estimate of WCT in the Lochsa River, Idaho, determined from snorkeling in 2003. Section 1 = confluence with Selway River to Wilderness Gateway Campground Bridge; Section 2 = Wilderness Gateway Campground Bridge to Post Office Creek; Section 3 = Post Office Creek to confluence of Crooked Fork Creek and Colt Killed Creek.

	All WCT		WCT >356 mm	
	Estimate	95% CI	Estimate	95% CI
Section 1	808	923	157	178
Section 2	5,013	2,145	1,071	802
Section 3	10,653	4,427	5,505	2,393
Total population	11,533	3,683	6,733	3,373

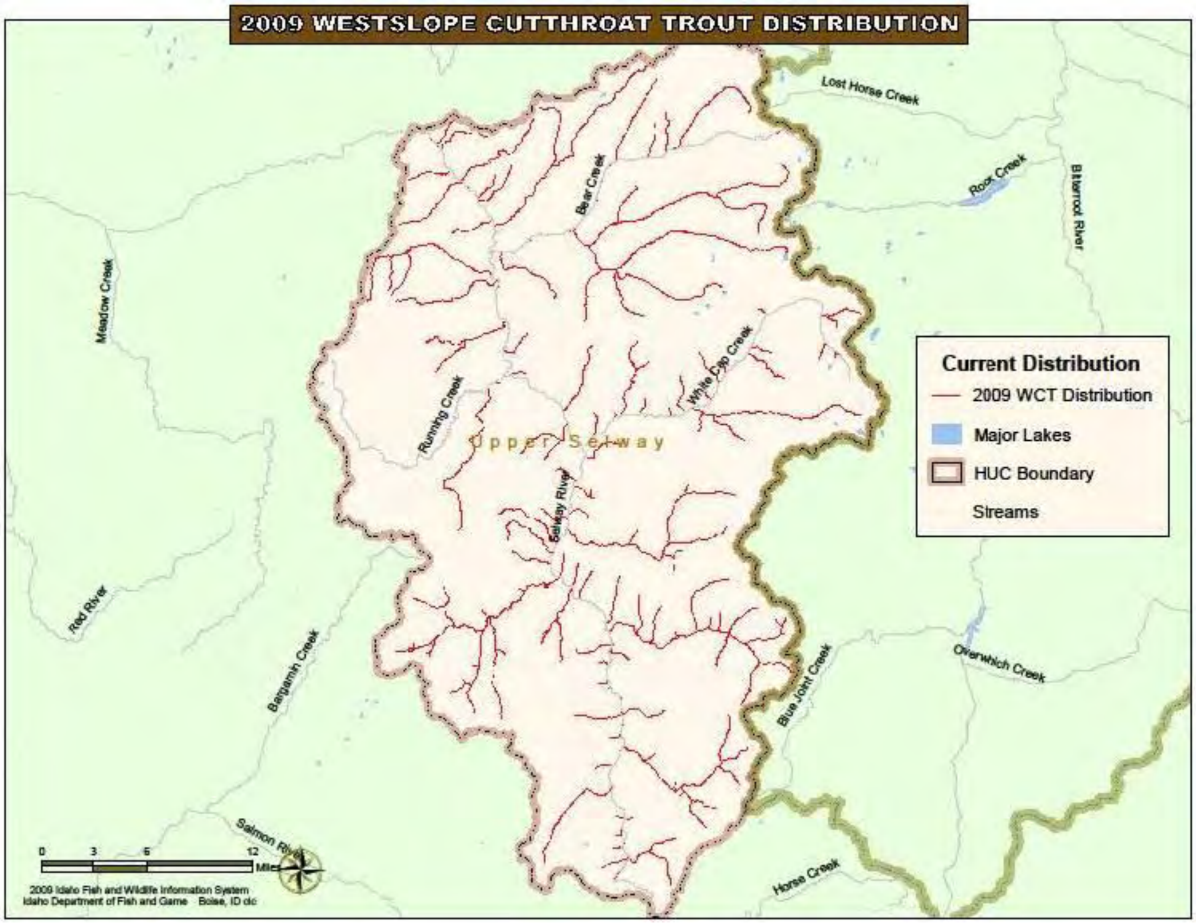

Figure 29. Lower and Upper Selway River GMU with WCT distribution as of 2009.

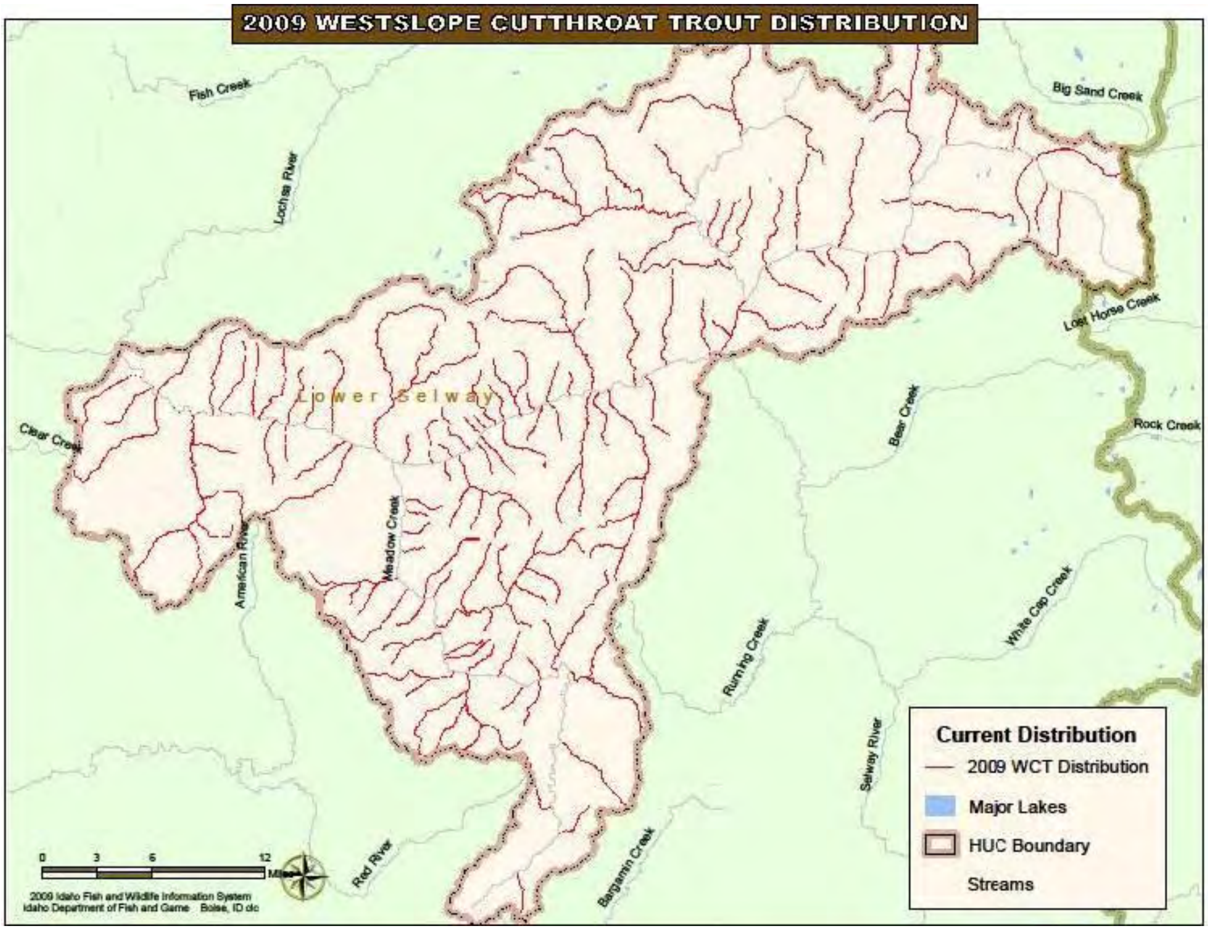

Figure 30. Lower and Upper Selway River GMU with WCT distribution as of 2009.

The Selway River drainage supports wild runs of spring and fall Chinook salmon, summer steelhead, and Pacific lamprey, although hatchery supplementation for both spring and fall Chinook salmon occurs in this watershed. Historically, wild runs of anadromous fish greatly exceeded what occurs today, and these reductions have likely reduced the productivity (decline in marine derived nutrients) of the system. Native WCT, resident redband trout, bull trout, and mountain whitefish also occur. Bull trout are located mainly in the mainstem Selway River and the higher-elevation streams whereas mountain whitefish occur mainly in the mainstem Selway River and only the largest tributaries. Non-native rainbow trout were stocked in the lower Selway River (along the roaded reach) for decades. Since 1990, no rainbow trout have been stocked into flowing waters in the Selway River drainage. Work by Weigel et al. (2003) in adjacent watersheds (Lochsa and North Fork Clearwater rivers) suggest that these stocking efforts have likely led to some level of introgression with rainbow trout. Brook trout were introduced in the early 1900s, mostly into high mountain lakes. Brook trout are now located in some of the lower gradient streams and high mountain lakes mostly in the western half of this watershed. Brook trout are rarely observed in the Selway River. Smallmouth bass occur in the Selway River downstream of Selway Falls.

Cutthroat trout are believed to occur in all the tributaries in the Selway River drainage where sufficient flow and gradient occurs. Densities in individual watersheds are influenced largely by flow, gradient, and elevation. On average, densities in these streams are around one to two fish/100 m^2 (Table 12). These densities are typical of healthy WCT populations in streams with low productivity and steeper gradients. Both resident and fluvial cutthroat trout occur in the tributaries. Fluvial cutthroat trout are believed to leave the tributaries at 2-4 years of age. Once moving to the Selway River, these fish will migrate up and downstream to maximize survival and growth. Fluvial cutthroat trout that utilize the Selway River tend to reach a maximum size of about 425 mm. These fish go through similar migrations as we see in other Idaho rivers. They migrate downstream in the fall to overwintering areas (some migrate upwards of 100 km) and often remain in these areas until warming water temperatures elicit them to move upstream to areas with more desirable temperatures. Selway Falls, which is a series of drops, is located about 30 km (18 mi) upstream from the mouth of the Selway River. It is unclear if and what percent of the fluvial fish navigate Selway Falls during their annual migrations. These falls are not complete barriers to fish as steelhead and Chinook salmon navigate them every year. A fish ladder was built through a tunnel at Selway Falls in 1964 to improve passage of these fish. It is unclear how these falls and tunnel influenced passage for cutthroat trout.

The fishery in the mainstem Selway River has been regularly evaluated through snorkel surveys from White Cap Creek downstream to Selway Falls since 1973. These surveys show that after catch-and-release rules were implemented (1976) in this reach, cutthroat trout abundance more than tripled and peaked out in 1986. After 1986, cutthroat trout counts have fluctuated likely in response to drought, temperature extremes, flooding, and observer variability (Figure 31). Similar fluctuations in WCT abundance have also been observed in other Idaho rivers. As the majority of this watershed is afforded protected status through wilderness or roadless designations, land management and human development have little influence on cutthroat trout abundance. Limiting factors for cutthroat trout are closely tied to natural environmental regimes. The one exception may be where brook trout occur as they have been found to influence cutthroat trout abundance. However, brook trout have been found at higher densities in only a few tributaries, and as such, are not believed to have a population level effect on WCT. The cutthroat trout population in the Selway River is considered to be strong and stable.

Table 12. Densities (fish/100 m^2) of WCT as determined by snorkel surveys in major tributaries of the Selway River, Idaho, 1988-2010.

Fish >305 mm

Stream	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Running Creek	0.3	0.0	0.3	0.4	0.3	0.0	0.2	0.2	0.0	0.0	0.0	0.0		0.0	0.1	0.0	0.1	0.1		0.0	0.1	0.0	0.0	0.0
Bear Creek	0.7	0.0	0.2	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.2		0.1	0.2	0.0	0.0	0.3		0.1	0.1	0.1	1.2	0.1
Moose Creek	0.0	0.0	0.0	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.0		0.3	0.1	0.2	0.2	0.3		0.2	0.2	0.2	0.5	0.2
Three Links Creek	0.0	0.0	0.0	0.0	0.0	0.4	0.6	0.3	0.3	1.1	0.3	0.3		1.1			0.3	0.0		0.0	0.0	0.0	0.0	0.3
Marten Creek					0.7		0.7	0.3	0.0	0.3	0.4	0.0		0.0	0.0	0.0	0.0	0.0		1.9	0.0		0.0	0.0
White Cap Creek	0.1	0.1	0.0	0.1	0.0	0.2	0.4	0.0	0.0	0.0	1.9	0.0		0.1		0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Deep Creek	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
O'Hara Creek						0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1							0.1
Meadow Creek	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.1	0.2	0.1	0.0						0.0
Little Clearwater River							0.4	0.0	0.0	0.0	0.1	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.1
Gedney Creek			0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0			0.0				0.0

All Fish

Stream	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Running Creek	0.9	0.5	0.4	1.5	1.7	0.3	0.8	1.2	0.1	0.3	0.8	0.0		0.0	0.5	0.1	0.4	1.2		.07	0.2	0.1	0.3	0.6
Bear Creek	0.7	0.0	0.2	0.0	0.8	0.6	0.4	0.7	0.6	0.4	0.8	1.1		1.3	0.7	0.6	0.0	0.8		1.4	0.4	0.2	1.9	0.4
Moose Creek	0.0	0.0	0.3	0.5	0.9	0.7	0.9	0.5	0.6	0.2	0.4	.08		0.9	0.8	0.8	0.9	1.4		0.9	0.8	0.9	1.3	0.9
Three Links Creek	0.0	0.0	0.0	0.0	2.8	0.4	2.4	1.4	1.0	3.7	0.8	3.5		2.1			1.1	2.3		1.8	0.5	1.0	25.0	1.1
Marten Creek					1.7		1.4	1.6	0.3	0.3	8.3	2.9		7.8	11.2	0.0	12.7	0.0		5.8	4.3		13.6	4.5
White Cap Creek	0.6	0.9	0.8	0.9	2.7	0.9	2.2	0.7	1.1	0.6	8.6	0.7		0.9		0.3	0.3	0.3	0.6	0.5	0.4	0.5	0.7	0.1
Deep Creek	1.1	1.3	0.2	1.7	2.9	3.7	3.6	2.3	2.3	0.2	2.0	3.1		2.5	4.7	26.0	18.1	6.9	1.2	2.9	1.4	5.9	3.7	3.6
O'Hara Creek						0.0	0.0	0.0		0.3	0.1	2.2	0.0	0.0	0.0	0.0	0.2							1.3
Meadow Creek	0.1		0.1	0.2	0.3	0.3	0.9	0.5	0.3	0.0	1.6		0.1	0.2	0.4	0.8	0.6	0.5						0.4
Little Clearwater River							1.2	0.1	0.4	0.1	0.3	1.6		1.3	0.8	1.5	0.0	2.5	0.5	0.4		2.8	2.1	0.6
Gedney Creek			0.0	0.3	0.1		0.0	0.0	0.1	0.3	0.1	0.0	0.0		0.3					0.0				
Average of all streams	0.5	0.4	0.2	0.6	1.5	0.8	1.2	0.8	0.7	0.6	2.2	1.6	0.0	1.6	2.2	3.1	3.2	1.8	0.8	1.6	1.1	1.6	6.1	1.3

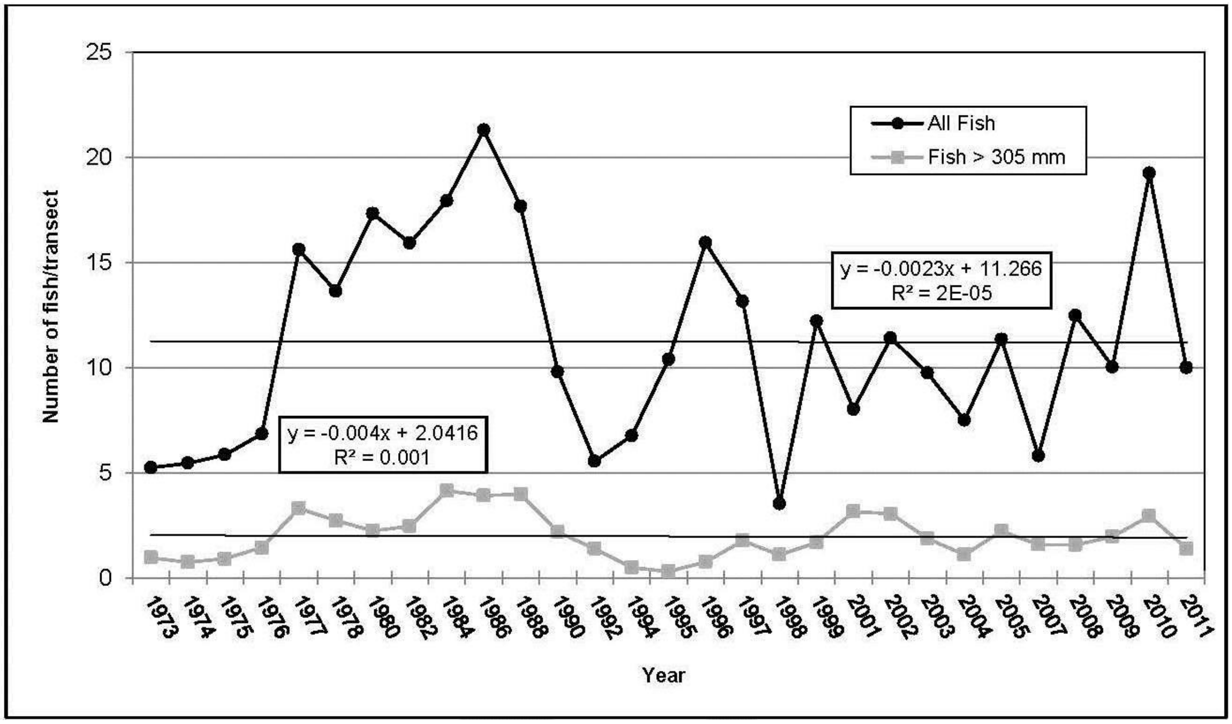

Figure 31. Average number of WCT (all and those >305 mm) counted per transect as determined by one-person snorkel surveys in the mainstem Selway River, Idaho, 1973-2011.

Currently, the fishery in the Selway River drainage is managed under three different fishing rules. In all tributaries, a daily limit of two cutthroat trout is allowed. The rules on the Selway River for cutthroat trout are catch-and-release except for downstream of Selway Falls where a daily limit of two fish >356 mm is allowed from the Saturday of Memorial Day weekend through November 30. Due to limited vehicle access, fishing pressure on the Selway River and its tributaries is relatively light. To fish most of the Selway River, access is by raft, foot, horse, or airplane. To float the Selway River (the easiest way to access and fish the river) before August 1, one must draw a permit regulated by the USFS. As part of the permit process, from 2006-2010, the USFS required permitted floaters to indicate whether they fished, how many fish they caught, and whether they kept any fish if they fished any of the tributaries. Based on the input from these surveys, it is estimated that rafters annually catch and release 1,000 to 2,000 cutthroat trout from the Selway River and the lower reaches of some of the tributaries. No anglers reported keeping any fish from tributaries where harvest is allowed. Work by IDFG on the Selway River suggests hooking mortalities can range from 1-5% depending on the fishing technique. These types of mortality rates combined with the light fishing effort that occurs on this river are estimated to have negligible impacts on this fishery. The area of the Selway River that receives the most recreation is the lower 30 km (18 mi) where a road parallels it. However, cutthroat trout use is very limited in this reach of the Selway River during much of the summer due to unsuitable water temperatures. As a result, impacts from fishing are believed to be insignificant.

South Fork Clearwater River GMU

The mainstem South Fork Clearwater River runs 103 km (64 mi) from the confluence of Red and American rivers near Elk City, Idaho, to its confluence with the Middle Fork Clearwater River at Kooskia, Idaho (Figure 32). The 3,043 km^2 (1,174 mi^2) drainage is bounded by the Camas Prairie highlands to the west, the Salmon River divide to the south, the Selway River divide to the east, and the Clear Creek/Middle Fork Clearwater River divide to the north. Elevations range from 390 m at Kooskia, Idaho, to over 2,724 m in the mountains of the Gospel Hump Wilderness. This is a mountainous region with average slope gradients ranging from 35-60%. Mean annual discharge of the South Fork Clearwater River is approximately 31 m^3/s (1,100 cfs) at the mouth. The month with the lowest mean discharge is September with 6.5 m^3/s (231 cfs), and the month with the highest mean discharge is May with 90 m^3/s (3,180 cfs) (data from http://waterdata.usgs.gov). The majority of the watershed occurs at elevations over 1,200 m. As a result, winter precipitation falls mainly as snow although lower elevation canyons along the South Fork Clearwater River and some tributaries may be susceptible to rain-on-snow events. There are no large lakes in the South Fork Clearwater drainage basin, but there are some small alpine and subalpine lakes in the Gospel Hump area.

Land ownership in the South Fork Clearwater River GMU is primarily federal, with 68% being managed by the Nez Perce National Forest. Private ownership comprises 29% of the drainage, with the remaining ownership being a mixture of BLM, State of Idaho, and Nez Perce Tribe. Land use activities have historically (and currently) included grazing, mining, and timber harvest. Dredge and hydraulic mining played an important role in the land use history of the South Fork Clearwater River, which has led to substantial stream habitat degradation in several major drainages, especially Red River, American River, Crooked River, Newsome Creek, and in the mainstem South Fork Clearwater River. Recreational mining, employing the use of hand operations and small suction dredges, has grown in popularity in recent years and represents an important use of water resources. Logging has occurred throughout the drainage and grazing activities are locally important, especially on private lands. Forest road densities are unevenly distributed as a result of interspersed wilderness or inventoried roadless areas. In areas where forest

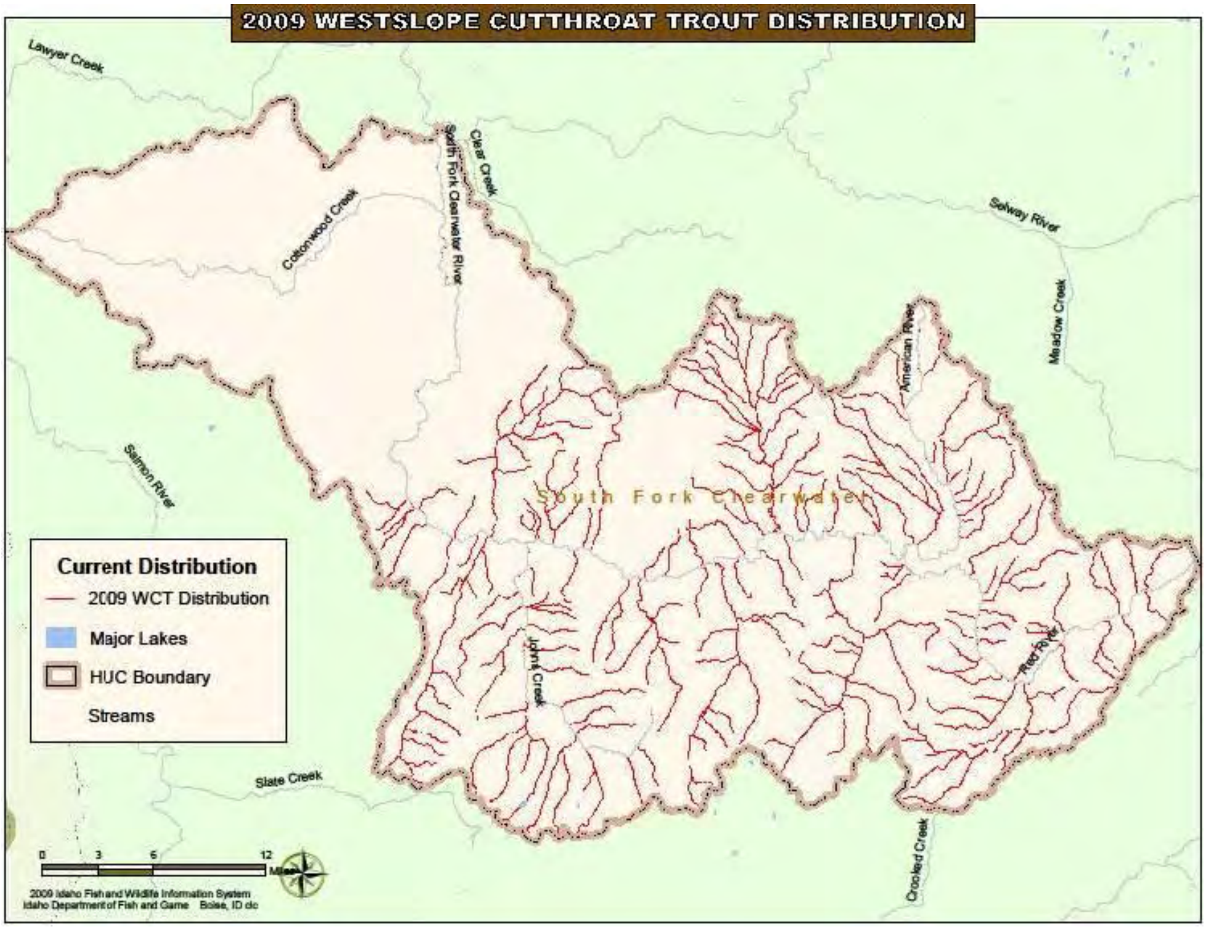

Figure 32. South Fork Clearwater River GMU with WCT distribution as of 2009.

practices occur, road densities exceed 5 km/km^2 in some areas, and commonly exceed 3 km/km^2 in others.

Historically, there were three dams constructed on the mainstem South Fork Clearwater River that influenced the distribution and movement of fishes, especially anadromous salmonids and riverine fluvial species such as WCT. Dewey Dam, constructed in 1895, may have reduced or eliminated fish movement upstream of Mill Creek, but this dam washed out after only a few years of operation. The Kooskia Flour Mill Dam was in operation from 1910-1930, but is assumed to have little influence on fish movement. The Harpster Dam, built in 1927, completely extirpated anadromous fish from the drainage above that point until its removal in 1962, when IDFG began reintroduction activities. The extirpation of anadromous fish and subsequent loss of marine derived nutrients likely had a substantial impact on stream productivity during that period.

The South Fork Clearwater drainage supports wild runs of spring and fall Chinook salmon, summer steelhead, and Pacific lamprey, although millions of salmon and steelhead smolts are released annually into the South Fork Clearwater River to create a fishery and help supplement once extirpated habitat. Historically, wild runs of anadromous fish greatly exceeded what occurs today, and these reductions have likely reduced the productivity (decline in marine derived nutrients) of the system. Native WCT, resident redband trout, bull trout, and mountain whitefish also occur in the watershed. Bull trout are located mainly in the mainstem South Fork Clearwater River and the higher-elevation streams whereas mountain whitefish occur mainly in the mainstem South Fork Clearwater River and only the largest tributaries. Historically, hatchery rainbow trout (many strains) were stocked throughout the drainage, namely in South Fork Clearwater River, Red River, American River, Newsome Creek, and Crooked River. Only sterile fish were stocked after 2000 and all stocking into flowing waters in the South Fork Clearwater River drainage ended in 2011. Work by Weigel et al. (2003) in nearby watersheds (Lochsa and North Fork Clearwater rivers) suggest that these stocking efforts have likely led to some level of introgression with rainbow trout. Non-native brook trout are present in several tributaries throughout the South Fork Clearwater River drainage. Smallmouth bass have not been documented in the South Fork Clearwater River during IDFG surveys; however, they are present in the Middle Fork Clearwater River and they may currently exist at low densities in low-elevation reaches of the South Fork Clearwater River. Current fishing regulations allow for catch and release of WCT in the mainstem South Fork Clearwater River and harvest of two fish in tributaries.

Current distribution of WCT is limited to the mainstem South Fork Clearwater River and tributaries upstream of Mount Idaho Grade, which is approximately 31 km from the river mouth. In this upper portion of the South Fork Clearwater River, cutthroat trout are broadly distributed, though densities are low in the mainstem in many reaches. WCT studies in the drainage have been limited, but some understanding of distribution and densities are possible due to ancillary data collected for other projects. Average annual densities of WCT in snorkel surveys conducted primarily in higher-elevation tributaries of the South Fork Clearwater River (e.g., Crooked River and Red River) vary substantially, but show a subtle increasing trend (IDFG, unpublished data, Figure 33). Average densities observed during these surveys have ranged from near zero fish/100 m^2 in 2007 to nearly two fish/100 m^2 in 2012. A creel survey conducted in 1999 estimated only 38 (1.5% of total resident harvest) cutthroat trout were harvested in the South Fork Clearwater River from February 14 through November 30, despite 19,995 total hours of fishing effort (anglers primarily targeting steelhead) (Cochnauer et al. 2002). While not a direct measure of density or population status, these creel data suggest very low densities of large, fluvial cutthroat trout despite presence of quality habitat in the upper mainstem South Fork Clearwater.

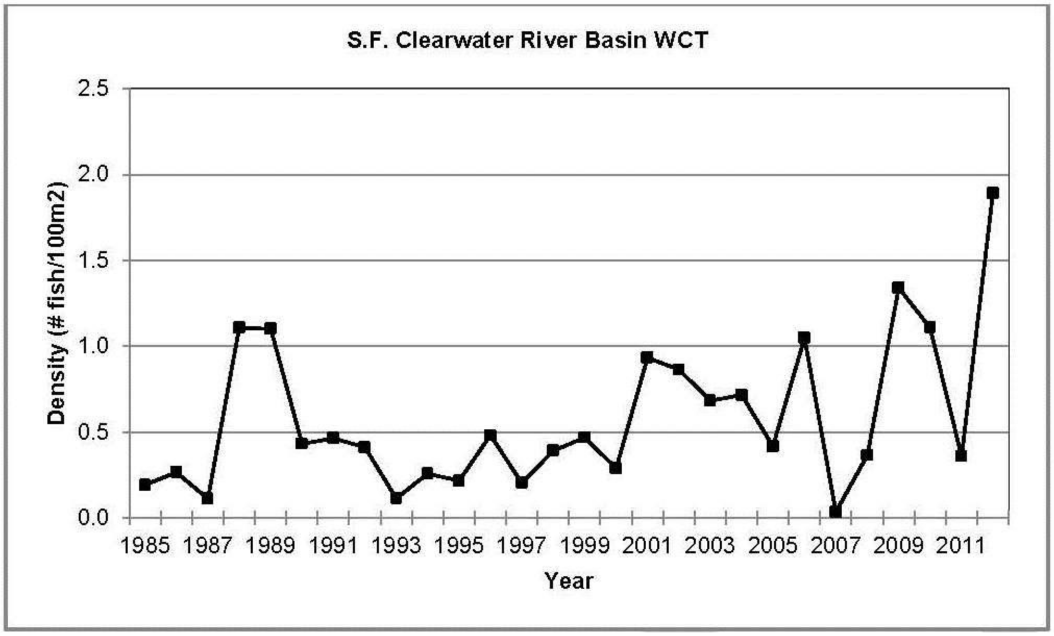

Figure 33. Average annual densities of WCT observed in tributaries of the South Fork Clearwater River during snorkel surveys from 1985-2012.

Only 16 of 2,568 WCT collected in screw traps for anadromous fish studies in Red, Crooked, and American rivers (Figure 34) have been greater than 300 mm from 2002-2012 (IDFG, unpublished data). This is further evidence of low densities of fluvial fish in the drainage or limited use of these tributaries as spawning habitat by these larger fish. Intensive snorkel surveys during the summer of 2000 found cutthroat trout in South Fork Clearwater River from the mouth upstream, but densities were extremely low (0.0 to 0.2 fish/100 m^2). Fish >250 mm in length were seldom seen. Cutthroat trout rules were changed in the South Fork Clearwater River in 2002 from a six-fish general limit to two cutthroat trout >356 mm and again in 2011 to catch-and-release. Since these rule changes were implemented, a follow-up snorkel survey in 2010 suggests there are 30% more cutthroat trout and 90% more >250 mm. Despite these improvements, densities were still low. Visual examinations of cutthroat trout in screw trap samples suggests some genetic introgression (~5%) with rainbow trout has occurred, but it is unclear whether this introgression is due to stocking of non-native stocks of resident rainbow trout or natural introgression with native steelhead and redband trout stocks.

Currently, the fishery in the Lochsa River is managed under two separate fishing rules. The mainstem South Fork Clearwater River is catch-and-release whereas in all the tributaries, a year-round two-fish daily limit is the rule. Access to the South Fork Clearwater River is relatively easy, as a paved road parallels its entire length. The ease of access has led to significant recreation in summer months. Conservation officers have suggested many anglers are not aware of the new catch-and-release rules and likely harvest cutthroat trout unintentionally.

Salmon River Basin

Lemhi River GMU

The Lemhi River flows northwest 96 km (60 mi) from the confluence of Texas and Eighteenmile creeks to the Salmon River at river km 416 (river mile 258) near the city of Salmon, Idaho (Figure 35). The Lemhi River lies in a broad valley and meanders through pastures and meadowlands. The Lemhi Valley is bordered by the steep, forested slopes of the Beaverhead Mountains on the east and the Lemhi Mountains on the west. Elevations in the drainage range from about 1,200 m at the mouth to 3,312 m at the headwaters of Sheep Mountain. Annual precipitation ranges from less than 254 mm at the city of Salmon to about 1,016 mm in the higher mountain elevations. The drainage contains 2,140 km (1,330 mi) of streams. The Lemhi River drainage encompasses approximately 324,323 ha (801,590 ac), of which more than 10,115 ha (25,000 ac) of land is irrigated for hay production and livestock grazing in the valley. The Lemhi River drainage is sparsely populated and rural, with permanent residences and ranches occurring mostly in the river bottom areas. The principal form of irrigation is flooding from an extensive system of ditches. All major mainstem ditches are screened and have bypass systems to prevent fish entrainment. The river is over-appropriated for irrigation and could be seasonally dewatered in the lower reach during low flow years if not for flow leases which protect in-stream flows. Key land uses that have had limiting effects on fish habitat in the Lemhi River and its tributaries are irrigation, grazing, and road construction.

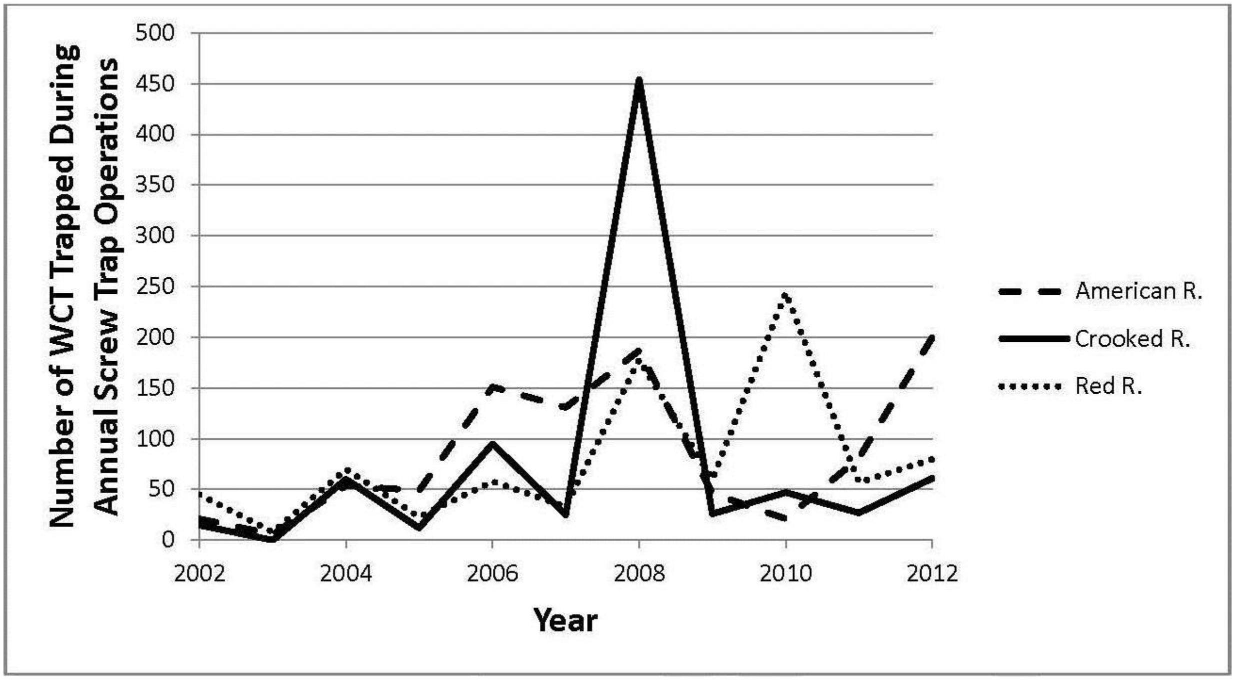

Figure 34. WCT captured during screw trap operations in tributaries of the South Fork Clearwater River from 2002-2012.

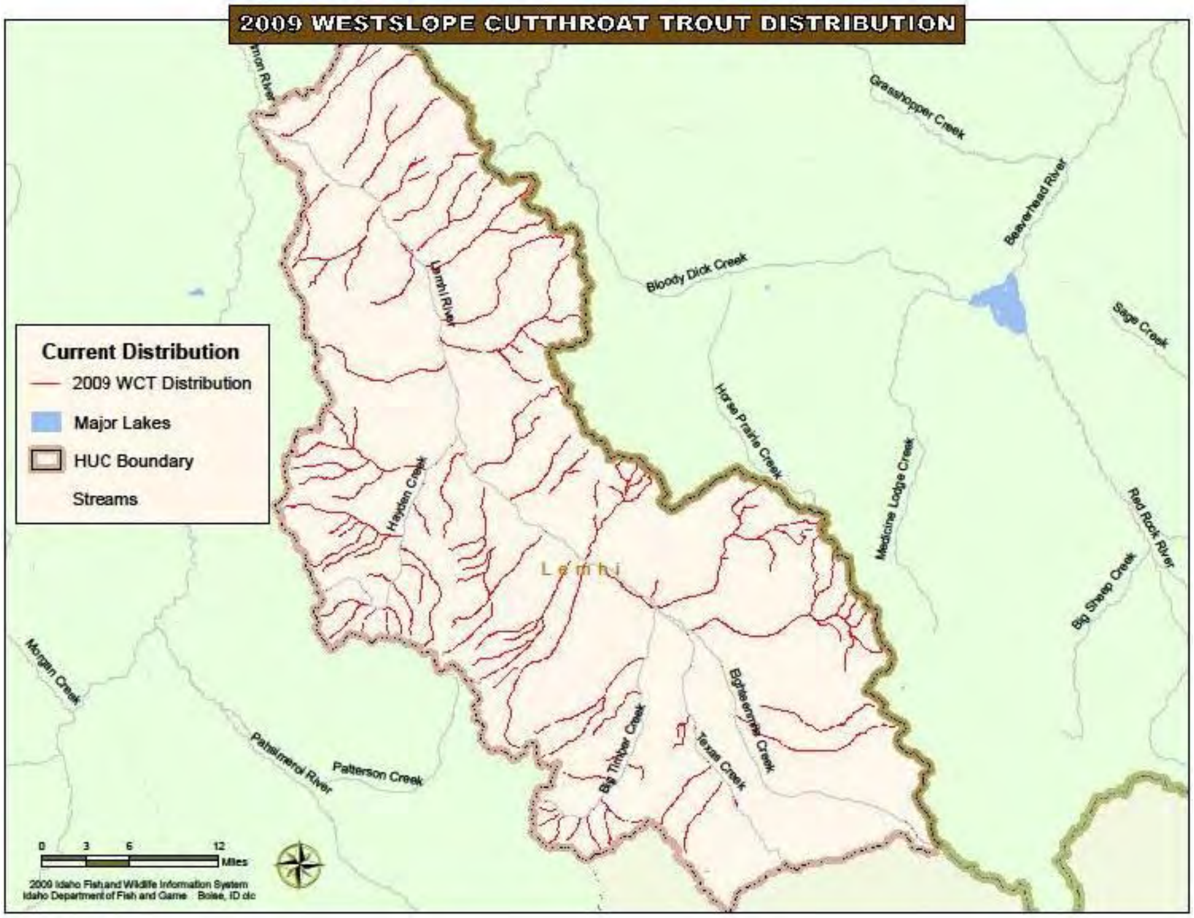

Figure 35. Lemhi River GMU with WCT distribution as of 2009.

Mean annual stream flow in the Lemhi River is 8 m^3/s (270 cfs). High flows occur in June with a mean monthly discharge of 15 m^3/s (541 cfs) and low flows occurring in August (mean monthly flow of 4 m^3/s [148 cfs]). A maximum discharge of 68 m^3/s (2,430 cfs) was recorded on the Lemhi River in June 1984. The hydrologic regime (i.e., peak flows, base flows, and flow timing) and connectivity in the Lemhi River and nearly all of its tributaries are entirely or substantially diverted for irrigation purposes between April and the end of November. These altered flow regimes limit cutthroat trout and other fish access to tributary habitat and delays fish migration in the lower reaches of the mainstem Lemhi River during low flow years. The Lemhi River hydrology has changed dramatically since the mid-1840s due to channelization, irrigation diversions, and loss of floodplain connectivity. In 2000, the Idaho Department of Water Resources identified 83 diversions on the mainstem Lemhi River that divert flows ranging from less than 0.02 m^3/s to almost 2 m^3/s (1 cfs to 60 cfs). Recently though, a number of these diversions have been consolidated.

Stream channels in the Lemhi River drainage are highly variable. Mainstem Lemhi River reaches are low gradient, sinuous stream channel types that were historically excellent fish habitat with wide floodplains and well developed riparian areas. Sedimentation is now a problem in the mainstem Lemhi due to loss of riparian habitat and subsequent bank erosion, altered hydrologic regime, and loss of floodplain connectivity. Headwater and smaller tributary streams to the Lemhi River have steep gradients, moderately confined channels, and are relatively stable. Lemhi River tributaries efficiently transport sediment into the lower mainstem reaches.

Land ownership is primarily (78%) federal, divided equally between the USFS and the BLM. Private lands are located mainly along the mainstem Lemhi River and the lower portions of its tributaries. Land use activities have historically included grazing, mining, and timber harvest. Past mining activities were most apparent in both Kirtley and Bohannon creeks and led to substantial stream habitat degradation in the lower and mid portions of these watersheds. Logging has occurred throughout the drainage, although currently there is very limited timber harvest. Grazing activities remain very important, especially on federal allotments and private lands.

In the 1920s and 1930s, the lower Lemhi River was blocked by a power dam near the town of Salmon, isolating the Lemhi basin during most of the year except during high water periods when water bypassed the dam. The dam most likely had a substantial influence on the distribution and movement of fishes, especially anadromous salmonids and riverine fluvial species, such as WCT. Chinook salmon were trapped at the dam for commercial and hatchery use. Although hatchery personnel attempted to minimize impacts on the Lemhi Chinook salmon run by restocking a portion of the hatchery fish, the combination of the dam, hatchery, and commercial take contributed to the collapse of the Chinook salmon fishery. By the late 1930s, the Chinook salmon run had dwindled to about 200 fish. The impact of historic land use and water management practices to fluvial cutthroat trout is unknown. The power dam was removed in 1938, and anadromous fish runs began to rebuild until the 1960s.

Riparian function and channel morphology on the mainstem Lemhi River has been compromised by intensive agricultural development in the river floodplain, historic railroad construction, flood control projects (e.g., rip-rap and dikes), and the alignment of State Highway 28. The effects of these developments include excessive sedimentation, high stream temperatures, and changes to hydrologic processes. These effects are discernible at various locations throughout the mainstem. However, the impacts are most pronounced in the mid- and lower reaches of the Lemhi River.

Hayden Creek, the largest functionally connected tributary of the Lemhi River, supports the only documented fluvial run of WCT in the drainage. Within the drainage there are occasionally passage barrier issues associated with irrigation diversion structures, and riparian habitats have been impacted, especially in the lower reaches of Hayden Creek. Cottonwood galleries which provide shading, large woody debris recruitment, and bank stability have been reduced on private ground throughout the lower portions of the watershed.

Anthropogenic migration barriers in Lemhi River tributaries are affecting population distribution and connectivity, and could ultimately impact the genetic integrity of cutthroat trout populations. Disconnection of tributaries from mainstem reaches has been identified as one of the most important factors limiting cutthroat trout and other fish populations by restricting salmonid use of potential habitat (e.g., fluvial life histories). Tributaries become disconnected from the mainstem either by structural barriers or loss of flow. Structural barriers typically include culverts, irrigation diversions, and improperly designed road crossings. Reductions in stream flow cause direct (e.g., dry channel) and indirect barriers. Indirect barriers render stream conditions unsuitable for passage either by creating thermal barriers or other types of barriers at low flows. With the exception of Hayden and Big Springs creeks and a handful of recently reconnected streams, many tributaries of the Lemhi are no longer available to WCT and other fishes due to barriers. Migration problems can possibly occur year-round, irrespective of irrigation needs. This may be due to physical obstacles created by the diversion structure and/or the non-removal of diversions during non-irrigation periods.

Nine water bodies (and multiple reaches) in the Lemhi River GMU have been identified by the IDEQ and the EPA as being impaired by pollutants and are considered a 303(d) stream (Table 13).

The Lemhi River drainage supports runs of spring Chinook salmon and summer steelhead, and native resident trout including WCT, redband trout, and bull trout. Non-native brook trout are also present, primarily in tributaries and in low densities in the upper mainstem.

Parkhurst (1941) indicated that cutthroat trout were "very abundant" in the mainstem Lemhi River during the summer of 1941. However, today there are relatively few cutthroat trout observed in the mainstem Lemhi River. Since 1992, densities of cutthroat trout in the upper mainstem Lemhi River have been very low, ranging from 0.0 fish/100 m^2 to 0.2 fish/100 m^2 suggesting that there are significantly fewer cutthroat today compared to the Parkhurst (1941) cursory survey of the river. However, the contemporary samples are not comparable as Parkhurst's sampling techniques are unknown. It is likely that cutthroat trout access to spawning and rearing tributaries in the Lemhi watershed has been compromised since the 1941 inventory due to intensified water development on the mainstem Lemhi River and tributaries for agriculture purposes.

Competition with introduced species (non-native rainbow trout and brook trout) may also be partially responsible for the reduced abundance of cutthroat trout in the mainstem Lemhi River.

Restrictive fishing rules (no cutthroat harvest) were implemented in 1996 in the mainstem Lemhi River to protect fluvial cutthroat trout migrants. The majority (95%) of the mainstem Lemhi River is privately owned, resulting in relatively restricted access to the fishery. Tributaries are managed with general fishing rules, which allow anglers to harvest six trout (mixed bag) with no minimum size restrictions. Angler effort in Lemhi River tributaries is considered very light.

Table 13. 303(d) listed water bodies for the Lemhi River GMU.

Water Body	Location	Pollutants
Lemhi River	Mouth to Kenney Creek & other locations	*Escherichia coli*; fecal coliform
Bohannon Creek	Source to mouth	Sediment/siltation
Eighteenmile Creek	>30 miles of stream	Sediment/siltation
Geertson Creek	Source to mouth	Sediment/siltation
Kirtley Creek	Diversion to mouth	Sediment/siltation; temperature
Kirtley Creek	Source to diversion	Sediment/siltation
McDevitt Creek	Source to mouth	Sediment/siltation
Sandy Creek	Source to mouth	Sediment/siltation
Wimpey Creek	Source to mouth	Sediment/siltation

The IDFG has not stocked catchable rainbow trout into flowing waters of the GMU since 1996. Non-native rainbow and cutthroat trout of various subspecies have been stocked in lakes and streams in the GMU for over 60 years. Past stocking of rainbow trout and non-native cutthroat trout into the Lemhi River GMU may have led to limited hybridization/introgression with cutthroat trout in this area. Currently, it is unknown what level of introgression exists. Since 2000, IDFG began stocking only sterile rainbow trout within the GMU, and in recent decades, the IDFG began stocking only WCT subspecies into mountain lakes within the GMU.

Distribution and Abundance

Since 2000, a total of 352 fish surveys have been conducted at various sites within the Lemhi River drainage (Table 14). Of the fish surveys conducted, WCT were present in 142 sites, which comprised 40% of the sites sampled. WCT densities were extremely low within the mainstem Lemhi River (0.006 trout/100 m^2; SE ± 0.005) (Figure 36). Generally smaller creeks located at higher elevations supported the highest densities of cutthroat trout and were scattered throughout the drainage. The tributary with the highest densities of cutthroat trout was Pattee Creek (23.26 trout/100 m^2; SE ± 13.38), but only contained three sites sampled in the drainage in 2004 and 2006.

Pahsimeroi River GMU

The Pahsimeroi River flows 78 km (49 mi) from the confluence of the East and West Forks to the Salmon River at river km 489 (river mile 304) (Figure 37). The watershed is bordered on the northeast by the Lemhi Range, on the east by the Donkey Hills, and on the southwest by the Lost River Range. Elevation in the drainage ranges from 3,859 m at Mt. Borah to 1,412 m at the confluence with the mainstem Salmon River. Water percolates through broad, alluvial fans in the upper valley and enters the river through ground water and springs lower in the valley. Therefore, productivity in the river is higher than most streams in the upper Salmon River drainage. The Pahsimeroi River has 16 major tributaries and drains 217,836 ha (538,400 ac). Major tributaries to the Pahsimeroi River include Morgan, Morse, Falls, Patterson, Big, and Goldburg creeks which drain the western slopes of the Lemhi Range. Lawson, Sulphur, Meadow, Grouse, and Doublesprings creeks drain the eastern slopes of the Lost River Range.

Table 14. Densities of WCT (fish/100 m^2) and associated standard errors (±SE) based on fish surveys conducted by various agencies in the Lemhi River drainage.

HUC	Creek/River	*N*	Density	±SE
Lemhi	Agency Creek	18	5.73	1.98
	Big Eightmile Creek	11	0.01	0.01
	Big Springs Creek	27	0.01	0.01
	Big Timber Creek	39	2.08	0.67
	Bohannon Creek	19	0.11	0.11
	Canyon Creek	15	2.60	1.47
	DC Gulch Creek	1	5.21	
	Eighteenmile Creek	8	0.00	
	Hawley Creek	30	5.47	1.19
	Hayden Creek	69	1.67	0.90
	Kenny Creek	14	2.93	1.05
	Lee Creek	17	4.83	2.46
	Lemhi River	48	0.01	0.00
	Little Eightmile Creek	5	15.57	4.40
	McDevitt Creek	1	0.00	
	Mill Creek	11	0.51	0.22
	Pattee Creek	3	23.26	13.38
	Sandy Creek	1	9.76	
	Wimpey Creek	11	1.49	1.30
	Withington Creek	3	3.61	3.19
	Yearian Creek	1	0.00	

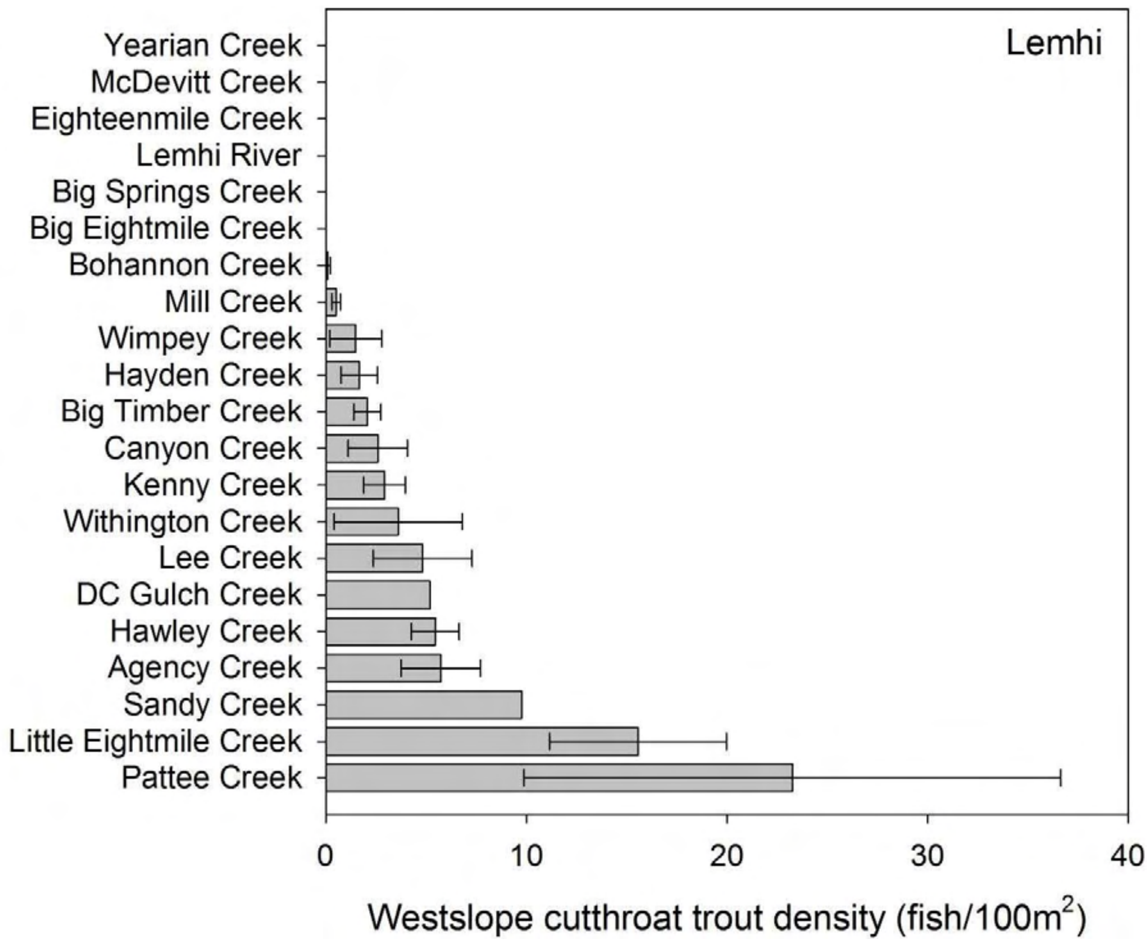

Figure 36. Average WCT densities (fish/100 m^2; ±SE) by tributary in the Lemhi River drainage.

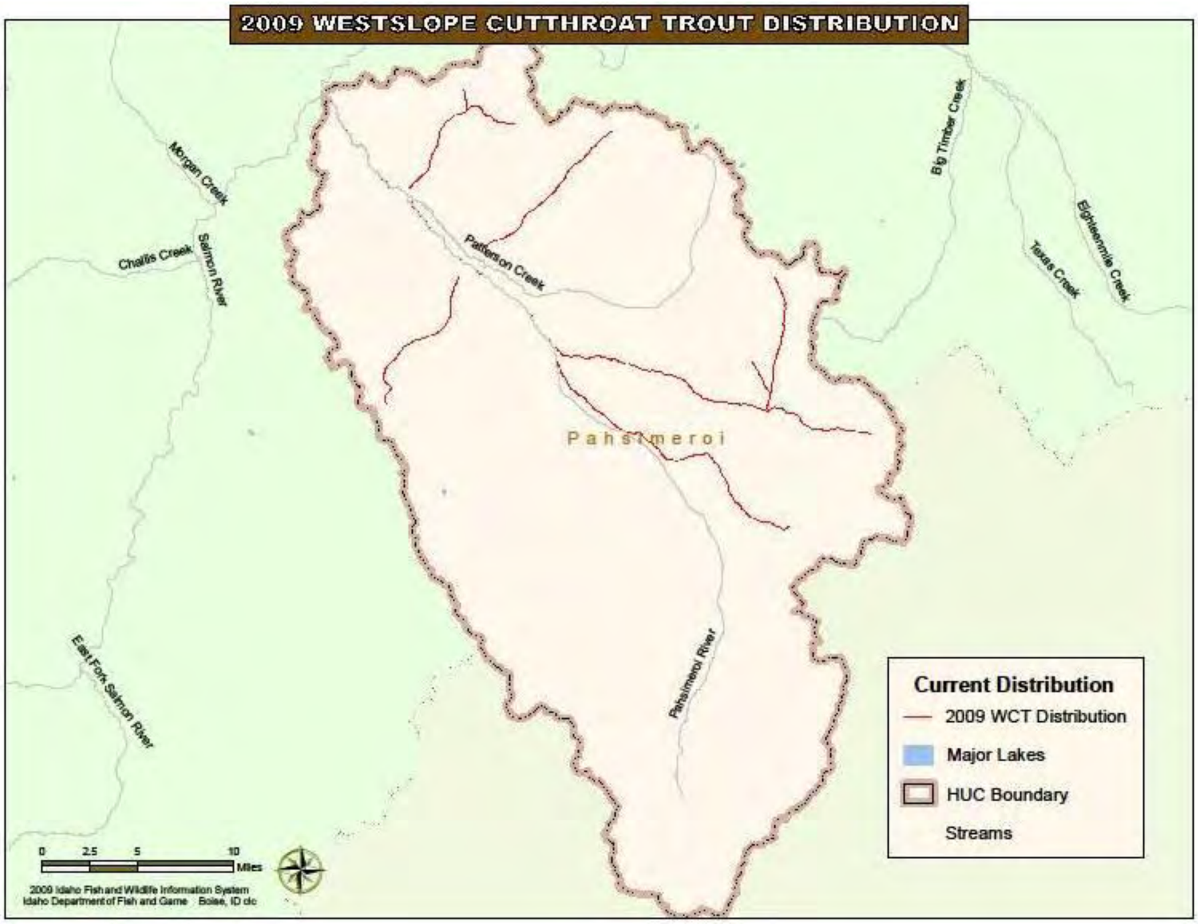

Figure 37. Pahsimeroi River GMU with WCT distribution as of 2007.

Because of extensive irrigation diversions, deteriorated riparian areas, and large natural percolation losses to the coarse alluvium of the valley, these tributaries currently only contribute surface water directly to the Pahsimeroi River during periods of high surface water runoff. The watershed has about 603 stream km (375 mi), including those sections dewatered for irrigation, with about 27 km (17 mi) currently accessible to anadromous fish.

The climate of the Pahsimeroi River drainage is typical of central Idaho mountainous areas with cold winters and hot, dry summers affected by Pacific maritime air masses. Mean annual precipitation ranges from less than 203 mm on the valley floor to more than 762 mm at higher elevations in the Lemhi and Lost River ranges. Most precipitation in the mountains occurs as snow during the winter months.

Mean annual stream flow in the Pahsimeroi River (measured at the mouth) is 6.5 m^3/s (230 cfs). High flows in the mainstem occur in November (mean monthly flow of 8 m^3/s or 297 cfs,) which essentially is a reverse hydrograph compared to other watersheds in the upper Salmon River. Low flows (mean monthly flow of 4 m^3/s or 152 cfs) occur in May. A maximum discharge of 12 m^3/s (410 cfs) was recorded on the Pahsimeroi River in 1985. Development of the watershed has led to mainstem river habitats being isolated into three distinct segments due to irrigation withdrawal and habitat alteration. There has also been a loss of floodplain function, riparian habitats, and excess sedimentation primarily in mainstem spring fed reaches due to the lack of flushing flows. All major tributaries are dewatered almost year-round and are inaccessible to fluvial fish for spawning, rearing, and thermal refugia. This fragmented habitat is primarily because of water diversions and the geology of the valley. Meinzer (1924) indicated that extensive diversion of water from all tributaries had occurred by 1921. The disconnection has not only fragmented the tributary and mainstem habitats but has also resulted in alterations to the mainstem Pahsimeroi River hydrologic regime (i.e., peak and base flows and flow timing) and has created barriers to fish migration. This seasonal dewatering of streams has resulted in isolating WCT and other fish populations in many of the upper tributaries of the Pahsimeroi River, and likely in the suppression of their fluvial life history. Connection of intermittent, disconnected tributaries to mainstem reaches only occurs in instances of extreme high water, which is likely contributing to the absence of functional and connected riparian habitats. Numerous habitat conservation actions have been implemented primarily on mainstem habitats to improve conditions for fish, including water conservation actions, riparian protection, bank stabilization, and the removal of physical barriers. To date, these habitat restoration projects have been targeted in the lower portions of the GMU where anadromous fish habitat is primarily present.

Over a century of livestock grazing and stream flow alterations have substantially altered the integrity and connectivity of riparian zones in the Pahsimeroi River drainage. These changes have resulted in excessive sedimentation, high stream temperatures, reduced shading, and bank instability. Approximately 61% of the tributary basins within the drainage currently have altered riparian vegetation conditions based on riparian vegetation community type assessments. Patterson Creek may have degraded water quality from zinc seeping downstream of the Ima Mine, an abandoned tungsten mine. Most of the altered riparian communities exist in the lower portions of the drainage.

Most land within the Pahsimeroi River drainage is federally owned (~88%). Both the Lemhi and Lost River mountain ranges are within the Salmon-Challis National Forest, and lower slopes to the valley floor are BLM-administered lands. Private lands are found on both sides of the Pahsimeroi River throughout the valley including two large pieces of private land in the Big Creek and Patterson Creek drainages. The principal land use of the drainage is agriculture. Irrigated agriculture occurs on private property on the valley floor while livestock grazing occurs throughout much of the rangeland areas on both private and public lands. Approximately 12,138 ha (30,000 ac) of the drainage are irrigated for agriculture. Most irrigation is in the form of sprinkler irrigation from ground water sources (wells) in the valley. Logging in the drainage has been very limited.

Four water bodies (5 reaches) in the Pahsimeroi River GMU have been listed by the IDEQ and the EPA as 303(d) streams (Table 15).

The drainage supports summer Chinook salmon, summer steelhead, and native resident trout including WCT, redband trout, and bull trout. Non-native brook trout are also present generally in the mid- and lower portions of tributaries. Cutthroat trout harvest has been prohibited in the mainstem Pahsimeroi River since 1996. Tributaries are managed with general fishing rules which allow anglers to harvest six trout (mixed bag) with no minimum size restrictions. Fishing pressure is generally very light within the entire GMU.

Non-native rainbow and cutthroat trout of various subspecies have been stocked in alpine lakes and river environments in the GMU for over 60 years. The IDFG has not stocked catchable trout into flowing waters of the GMU for many decades. Past stocking of rainbow trout and non-native cutthroat trout into the Pahsimeroi River GMU may have led to limited hybridization with cutthroat trout in this area. Currently, it is unknown what level of introgression exists. Since 2000, IDFG began stocking only sterile rainbow trout within the GMU and, in recent decades, the IDFG began stocking only the WCT subspecies into mountain lakes.

Distribution and Abundance

A total of 129 fish surveys have been conducted within the Pahsimeroi River drainage since 1985 (Table 16). Of the fish surveys conducted, WCT were present in 25 sites, representing only 19% of the sites sampled. The mainstem Pahsimeroi River supported low densities of cutthroat trout (0.11 trout/100 m^2; SE ± 0.05) despite a large number of sites (n = 73) sampled over the years (Figure 38). Higher cutthroat trout densities were observed in creeks located in the upper Pahsimeroi River drainage (Mill, Morgan, Morse, and Sulphur creeks). The highest densities of cutthroat trout were observed in the Sulphur Creek drainage (4.79 trout/100 m^2; SE ± 3.98) but the estimates are based on only two sample sites.

Upper Salmon River GMU

The Upper Salmon River GMU is located in the northern Rocky Mountains of central Idaho in the Columbia River Basin (Figure 39). Most of the GMU is characterized by a mosaic of moderate- to high elevation mountain ranges combined with deeply cut valleys of the Salmon River Mountains. The headwater reach of the Salmon River, upstream of the town of Stanley, Idaho, is characterized as a large-scale glacially broad U-shaped valley within the Sawtooth Mountain Range. The principle drainage of the GMU is the Salmon River from its headwaters to the confluence with the Pahsimeroi River. There are 65 major streams within the GMU consisting of 9,188 km (5,711 mi) of streams. The drainage area is approximately 6,280 km^2 (2,425 mi^2). Stream flow regimes are typical of central Idaho mountain streams with peak flows in late spring to early summer from snowmelt runoff. The East Fork Salmon River is the largest tributary to the Salmon River within the GMU. Other tributaries to the Upper Salmon River GMU are relatively small with steep gradients.

Table 15. 303(d) listed water bodies for the Pahsimeroi River GMU.

Water Body	Location	Pollutants
Pahsimeroi River	Dowton Lane to Salmon River	Nutrient, sediment
Pahsimeroi River	Mahogany Creek to Dowton Lane	Nutrient, sediment
Patterson Creek	Inyo Creek to Pahsimeroi River	Sediment, flow alteration
Morse Creek	Forest Boundary to Pahsimeroi River	Sediment, nutrient, flow alteration
Big Creek	Forest Boundary to Pahsimeroi River	Sediment, nutrient

Table 16. Densities of WCT (fish/100 m^2) and associated standard errors (±SE) based on fish surveys conducted by various agencies in the Pahsimeroi River basin.

HUC	Creek/River	*N*	Density	±SE
Pahsimeroi	Big Creek	5	1.13	0.34
	Burnt Creek	7	0.00	
	East Fork Pahsimeroi River	4	0.00	
	Falls Creek	1	0.00	
	Goldburg Creek	2	0.00	
	Lawson Creek	1	0.00	
	Little Pahsimeroi River	2	0.00	
	Mahogany Creek	3	0.00	
	Morgan Creek	3	1.26	0.81
	Morse Creek	1	3.72	
	Pahsimeroi River	73	0.11	0.05
	Patterson Creek	24	0.00	
	Sulphur Creek	2	4.79	3.98
	West Fork Pahsimeroi River	1	0.00	

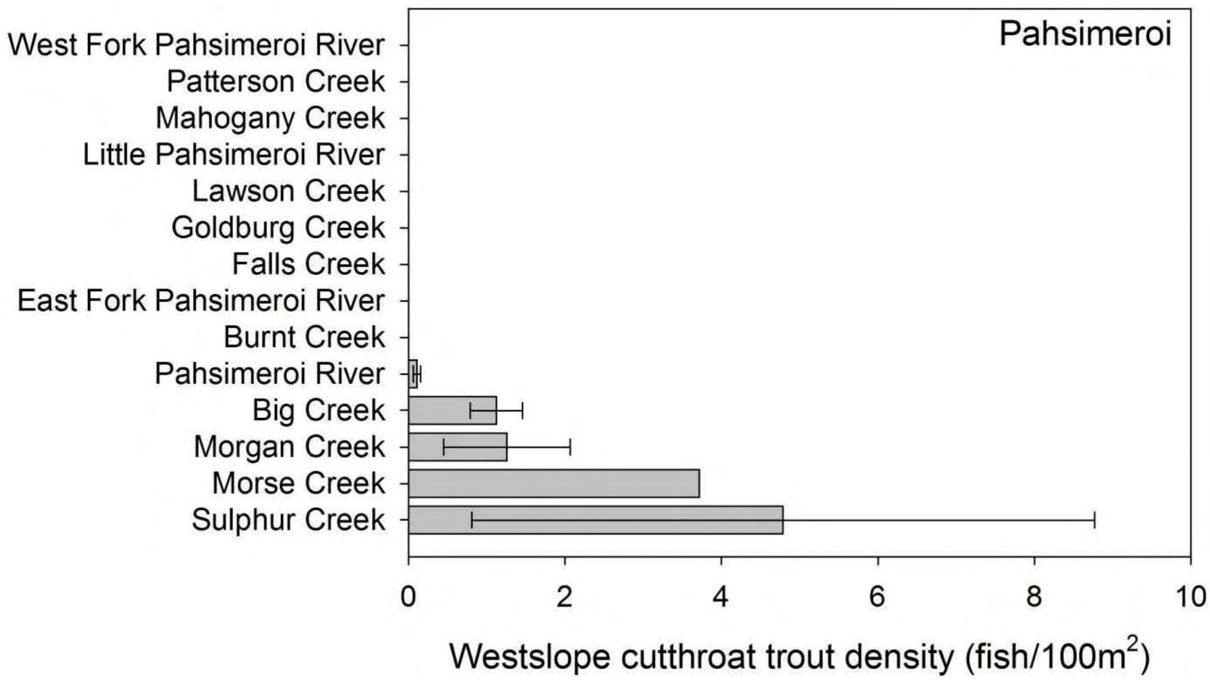

Figure 38. Average WCT densities (fish/100 m^2; ±SE) by drainage in the Pahsimeroi River basin.

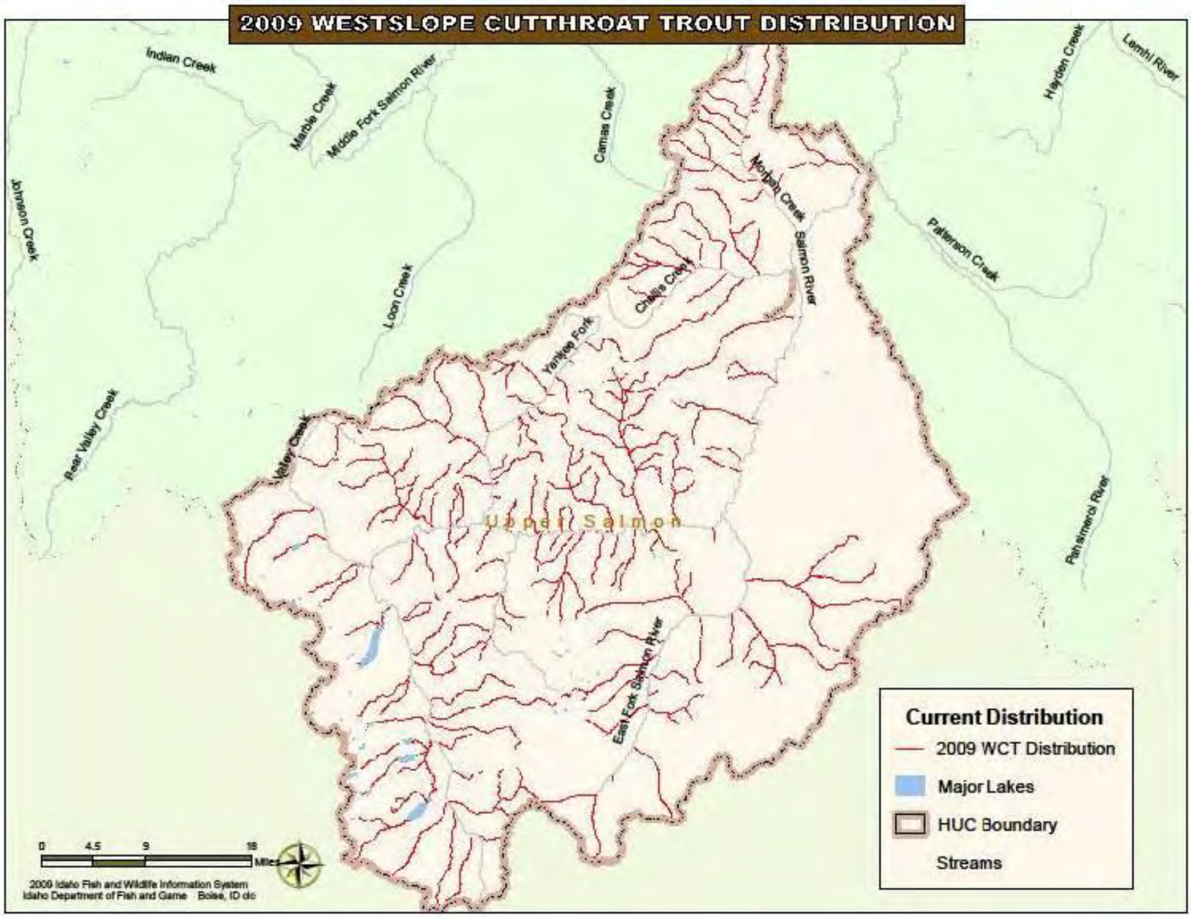

Figure 39. Upper Salmon River GMU with WCT distribution as of 2009.

The natural hydrologic regime in the upper mainstem Salmon River (from its confluence with Valley Creek upstream to the headwaters) has been altered by stream flow withdrawals, although the watershed continues to support a diversity of federally listed species. The effects from these altered flow regimes include a reduction in base flow conditions and some modifications of flow timing. The stream gage (USGS) that best reflects the flow for the GMU is at the City of Salmon, Idaho (river km 416 or river mile 259). Measurements at this site have been recorded from 1913 to 1916 and from 1920 to current. Annual mean discharge ranged from a low of 29 m^3/s (1,024 cfs in 1994) to a high of 90 m^3/s (3,163 cfs in 1965) and averaged 54 m^3/s (1,925 cfs). A maximum discharge of 501 m^3/s (17,700 cfs) was recorded at this gage in 1974.

The GMU extends from the headwaters of the Salmon River downstream to the town of Ellis, Idaho, at the confluence of the Pahsimeroi River. The majority of the Upper Salmon River GMU is publicly owned. These public lands are managed by the Sawtooth National Recreation Area (35%), the Salmon-Challis National Forest (34%), the BLM Challis Resource Area (24%), and the State of Idaho (2%). Private ownership occupies 5% of the land area and is generally concentrated around the City of Challis and along the Salmon River, especially near Stanley. The largest city within the GMU is Challis. Smaller towns include Stanley and Clayton.

The predominant uses of public lands within the drainage are livestock grazing, mining, and recreation. Pastureland and irrigated agriculture exists on private ground throughout the drainage. Mining is very important to the local economy of the Upper Salmon River drainage. Many watersheds have experienced mining activities in the past, with some still in existence today. The largest active mine in the subbasin is the Thompson Creek Molybdenum Mine near Clayton, Idaho. The potential exists for future mining opportunities throughout the drainage. Livestock grazing and irrigated cut hay pasture are the predominant activities on private land. Residential development has occurred along the mainstem Salmon River and tributaries.

Anthropogenic migration barriers in the Upper Salmon River GMU tributaries are affecting distribution, population connectivity, access to thermal refugia, spawning and rearing habitat, and could ultimately impact the genetic integrity of cutthroat trout populations. Disconnection of tributaries from mainstem reaches has been identified as one of the most important factors limiting cutthroat trout and other fish populations by restricting salmonid use of potential high-quality habitat (e.g., fluvial life histories). Tributaries are disconnected from the mainstem Salmon River either by loss of flow or structural barriers. Structural barriers typically include culverts, irrigation diversions, and improperly designed road crossings. Reductions in stream flow cause direct (e.g., dry channel) and indirect barriers. Many tributaries to the mainstem Salmon River are no longer available to WCT during certain times of the year due to this habitat fragmentation.

Ten water bodies (12 reaches) in the Upper Salmon River GMU have been listed by the IDEQ and the EPA as 303(d) streams (Table 17).

Native resident salmonids within the Upper Salmon River GMU include WCT, bull trout, redband trout, and mountain whitefish. Native anadromous species present include Snake River spring and summer Chinook salmon, Snake River sockeye salmon, Snake River summer steelhead trout, and likely Pacific lamprey. All native anadromous salmonids are currently listed under the ESA, along with bull trout. Non-native brook trout are quite common in the upper portions of the GMU and the Valley Creek watershed.

Table 17. 303(d) listed water bodies for the Upper Salmon River GMU.

Water Body	Location	Pollutants
Salmon River	Redfish Lake Creek to E Fork Salmon River	Sediment, temperature
Salmon River	Hell Roaring Creek to Redfish Lake Creek	Sediment
Challis Creek	Forest Boundary to Salmon River	Sediment, nutrient, flow alteration
Garden Creek	Forest Boundary to Salmon River	Sediment, nutrients
Warm Springs Crk	Headwaters to sink	Sediment, nutrients
Thompson Creek	Scheelite Jim Mill to Salmon River	Sediment, metals
Yankee Fork	Jordan Creek to Salmon River	Sediment, habitat alteration
Yankee Fork	Fourth of July Creek to Jordan Creek	Sediment, habitat alteration
Lost Creek	Headwaters to sink	Unknown
Kinnikinic Creek	Sawmill Creek to Salmon River	Unknown
Road Creek	Headwaters to East Fork Salmon River	Unknown
Squaw Creek	Headwaters to mouth	Temperature (EPA, 2001)

Both resident and migratory/fluvial life forms of cutthroat trout are present in the upper Salmon River GMU. Fluvial forms have been documented in the Yankee Fork and East Fork Salmon River, and in Thompson, Basin, and Redfish Lake creeks. Resident cutthroat trout populations are often the most abundant species present in many of the tributaries of the GMU where they exist. Although no adfluvial populations of cutthroat trout have been documented within the GMU, it is likely that they existed in Stanley Basin lakes prior to development and human disturbances.

Cutthroat trout harvest has been prohibited within the GMU in the mainstem Salmon River, mainstem Yankee Fork, and mainstem East Fork Salmon River since 1996. Tributaries are managed with general fishing rules, which allow anglers to harvest a mixed bag of six trout with no minimum size restrictions. Fishing pressure is generally very light in the tributaries of the main Salmon River. Most trout fishing in the upper mainstem Upper Salmon River GMU occurs in the Stanley area and in the Salmon River canyon upstream and downstream of the Yankee Fork confluence. Much of the pressure is supported by the stocking of sterile rainbow trout (25,000 to 30,000 fish annually) in this portion of the GMU. A 2012 creel survey conducted in the mainstem Salmon River suggested that, of the estimated 2,044 wild trout caught and released by anglers in the GMU, 75% (1,500) were cutthroat trout indicating that the fishing rules are protecting mainstem dwelling cutthroat trout populations.

The IDFG has stocked non-native rainbow and cutthroat trout in lake and river environments in the GMU since the 1920s. Past stocking of rainbow trout and non-native cutthroat trout into the Upper Salmon GMU may have led to limited hybridization with cutthroat trout in this area. Currently, it is unknown what level of introgression exists. Since 2000, IDFG began stocking only sterile rainbow trout in waters within the GMU and, in recent decades, the IDFG began stocking only WCT subspecies within the GMU, primarily in lowland and alpine lakes.

Distribution and Abundance

A total of 406 fish surveys have been conducted at various sites within the Upper Salmon River GMU since 1985 (Table 18). WCT were present in 133 (33%) of those sites sampled, and in 23 of 40 drainages located within the GMU. WCT were observed in the mainstem Salmon River (0.83 trout/100 m^2; SE ± 0.35) (Figure 40). However, higher densities were generally observed in tributaries such as Kinnikinic Creek (7.23 trout/100 m^2; SE ± 0.51) and Bayhorse Creek (6.87 trout/100 m^2; SE ± 2.26).

Middle Salmon River-Panther Creek GMU

The Middle Salmon River-Panther Creek GMU is located in east-central Idaho along the Idaho-Montana border. This GMU encompasses 4,688 km^2 (1,810 mi^2) with 3,150 stream km (1,958 stream mi) (Figure 41). The northern extent of the GMU is bounded by the Continental Divide and the southern boundary ends at the town of Ellis, Idaho. Elevations in the GMU range from 928 m in the Salmon River Valley to an elevation of 3,348 m (Lem Peak) along the Lemhi Range in the southern portion of the GMU.

Stream flow regimes are typical of central Idaho mountain streams with peak flows in May or June from snowmelt. Low flows occur in late summer through winter. The upper portion of the Middle Salmon River-Panther Creek GMU is composed of steep, narrow canyon lands with V-shaped drainages. The floodplain of the Salmon River within this GMU is fairly broad compared to the canyon lands in the lower Salmon River further downstream. Some pasture land and irrigated agriculture exists on the river's floodplain in the upper part of the GMU.

Diverse snowmelt patterns within the watershed cause significant runoff events in early spring through late summer. Snowmelt in the lower reaches begins in the early spring while snowmelt on the higher reaches occurs in early to mid-summer. High snow pack in the upper elevations causes greater runoff in the summer months, thus causing larger stream flow discharge in mid- to late summer.

Average flows for the GMU were measured at river km 334 (river mile 208) near Panther Creek from 1945 to 1981 and 2003 to 2012. Annual mean discharge ranged from a low of 48 m^3/s (1,700 cfs) in 2004 to 128 m^3/s (4,513 cfs) in 1965, and averaged almost 84 m^3/s (3,000 cfs). A maximum discharge of 728 m^3/s (25,700 cfs) was recorded at this gage in June 1974. Panther Creek, the largest tributary in the GMU, contributes an average flow of 7 m^3/s (258 cfs). The Panther Creek watershed includes some 644 km (400 mi) of perennial streams, which drain into the lower Salmon River section downstream of Shoup. Stream flow patterns are typically dependent on snowmelt runoff, with peaks in May or June and lows in fall and winter.

The majority of the land in the GMU is publicly owned. The Salmon-Challis National Forest manages 76% of the land area and 11% is managed by the BLM. Private ownership is generally concentrated in areas adjacent to the mainstem Salmon River, North Fork Salmon River, and Panther Creek. Private properties located in the lowlands are used primarily for agriculture (i.e., livestock and hay production). Agriculture has been a major part of the economic base of the area since the beginning of the last century, and continues to be a key industry in the area.

Table 18. Densities of WCT (fish/100 m^2) and associated standard errors (±SE) based on fish surveys conducted by various agencies in the Upper Salmon River GMU.

GMU	Creek/River	*N*	Density	±SE
Upper Salmon	Alturas Lake Creek	9	0.00	
	Basin Creek	5	2.13	1.02
	Bayhorse Creek	12	6.87	2.26
	Beaver Creek	14	1.41	0.99
	Big Casino Creek	7	0.84	0.32
	Boundary Creek	2	1.73	0.75
	Challis Creek	10	5.04	3.37
	Challis Hot Springs	8	0.00	
	Champion Creek	1	0.00	
	East Fork Salmon River	86	0.47	0.23
	Ellis Creek	1	0.00	
	Fisher Creek	2	0.00	
	Fourth of July Creek	2	3.55	3.55
	French Creek	1	5.29	
	Frenchman Creek	10	0.06	0.06
	Gold Creek	6	1.01	0.61
	Hannah Slough	7	0.09	0.09
	Huckleberry Creek	7	1.84	1.04
	Iron Creek	7	0.00	
	Kinnikinic Creek	2	7.23	0.51
	Little Casino Creek	4	1.24	1.11
	Lyon Creek	4	0.00	
	Morgan Creek	24	3.48	0.93
	Peach Creek	1	1.31	
	Pole Creek	9	0.00	
	Redfish Lake Creek	7	0.00	
	Salmon River	35	0.83	0.35
	Slate Creek	8	0.00	
	Smiley Creek	1	0.00	
	Spud Creek	1	0.00	
	Squaw Creek	7	3.01	0.87
	Stanley Creek	5	0.00	
	Stanley Lake Creek	6	0.00	
	Sullivan Creek	2	0.00	
	Thompson Creek	4	0.00	
	Upper Harden Creek	2	1.88	1.88
	Valley Creek	39	0.77	0.62
	Warm Springs Creek	25	5.00	1.03
	Williams Creek	2	0.00	
	Yankee Fork Salmon River	21	1.31	0.64

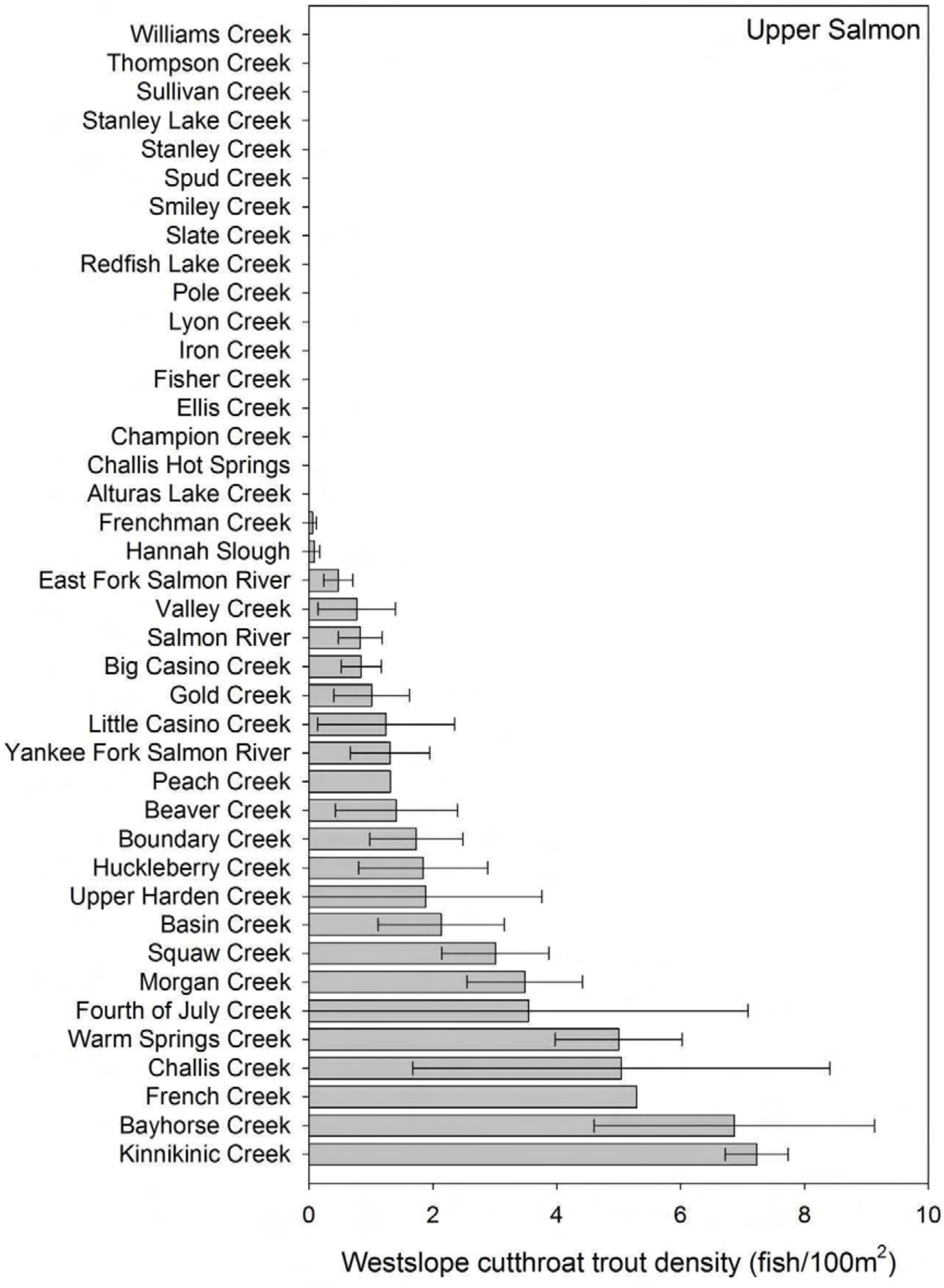

Figure 40. Average WCT densities (fish per 100 m^2; ±SE) by drainage in the Upper Salmon River subbasin.

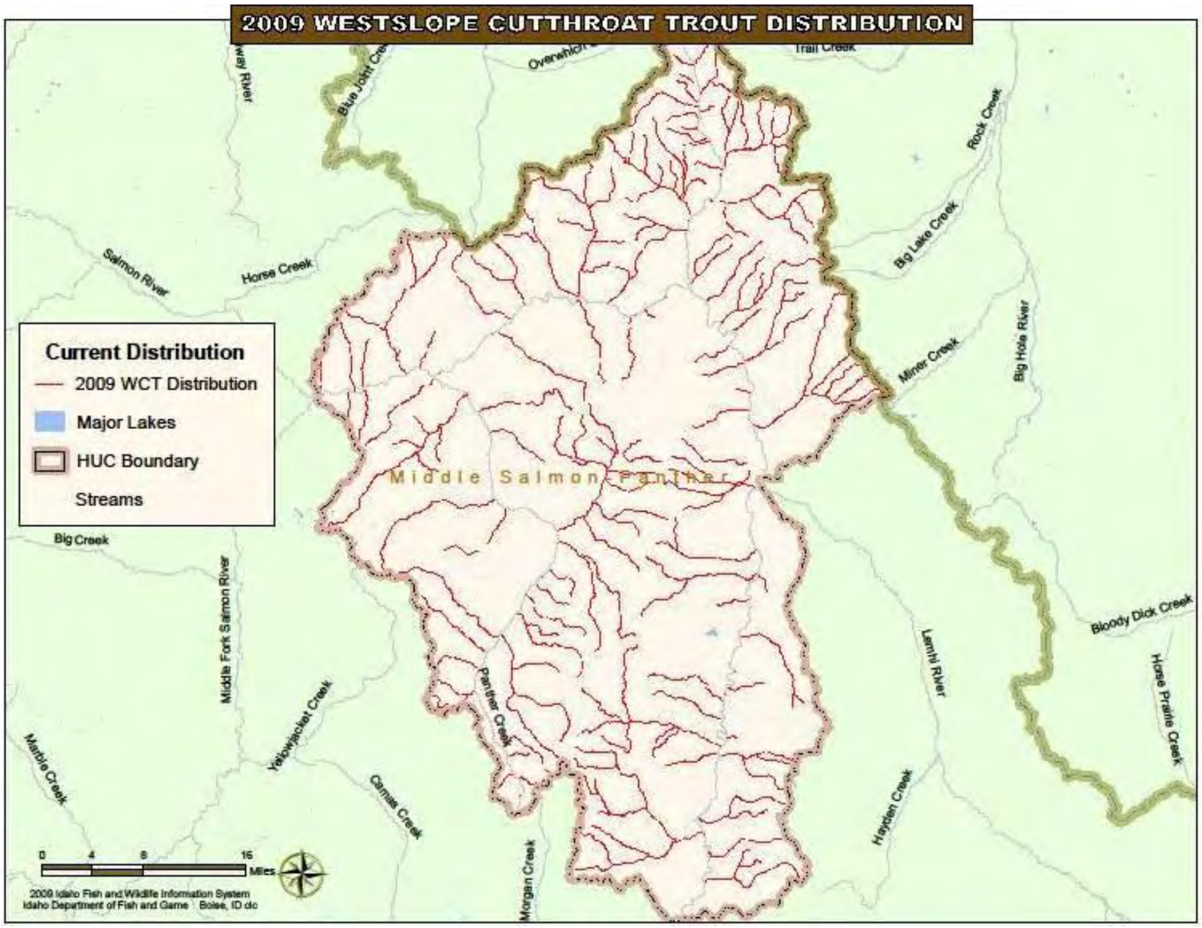

Figure 41. Middle Salmon River-Panther Creek GMU with WCT distribution as of 2009.

The predominant uses of public lands within the GMU are livestock grazing, mining, and recreation. Mining has frequently been very important to the local economy of the GMU, and many of its watersheds have experienced mining activities in the past. Beartrack Mine, located in the Panther Creek watershed, is the most recently active large-scale mine within the GMU. The Blackbird Mine, a major supplier of cobalt during World War II, ceased operations in 1982 and is now undergoing regulated cleanup. The area around the Blackbird Mine is one of the largest cobalt deposits in North America and coincidently a new cobalt mine is currently being pursued in upper Deer Creek, within the Panther Creek watershed. Portions of the Panther Creek drainage can still experience poor water quality during high flows due to mining effluent from the Blackbird Mine.

Several water bodies in the GMU have been listed by the IDEQ and the EPA as 303(d) streams. Nine water bodies in the GMU were identified; four of these were associated with metals contamination from the Blackbird Mine. Idaho's 1994 303(d) list also identified these four streams and clean-up of the Blackbird Mine was started. These four streams remained on IDEQ's 1998 303(d) list, along with four other stream segments identified in Table 19.

There is little active timber harvest occurring in the Middle Salmon River-Panther Creek GMU. In the past, timber production was a major contributor to the economy of Salmon, Idaho. Since the 1960s, logging activities have been on the decline and there is currently only one timber product plant located in Lemhi County that is primarily used for the production of beams.

Throughout most of the Middle Salmon River-Panther Creek GMU, quality habitat is limited by lack of large woody debris and insufficient pool habitat. Sedimentation from roads, grazing activities, and mining (in the Panther Creek drainage) is also a significant factor. The Salmon River and its tributaries within the GMU are prone to high temperatures, channel modifications for flood control, and low flows due to irrigation operations.

Fish migration to and from the tributaries of the Salmon River is impeded at numerous locations. Issues include dewatering due to irrigation withdrawal, tributaries that are intercepted by mainstem irrigation complexes, irrigation diversion dams, inadequate culverts, and other structures. Habitat fragmentation has resulted in native fish losing access to critical thermal refugia and high quality spawning and rearing habitats. Additionally, migratory forms of salmonids are likely depressed by migration blockages and these stocks cannot exhibit fluvial life history strategies.

Mainstem river riparian habitats have been altered and impacted in numerous areas along the Salmon River, particularly in the Elk Bend area, in the vicinity of the city of Salmon from approximately river km 434 (river mile 270) near Lake Creek to river km 396 (river mile 246) downstream of Tower Creek, and the mainstem North Fork Salmon River below Dahlonega Creek. Cottonwood galleries which provide shading, large woody debris recruitment, and bank stability, have been removed and reduced throughout the GMU. Loss of floodplain function due to dredge mining (North Fork Salmon River), rip-rapping and diking for flood control, grazing practices, subdivision development, and highway construction have isolated historic side-channels and spring habitats, and have resulted in the loss of critical thermal refugia and key rearing areas.

Table 19. 303(d) listed water bodies for the Middle Salmon River-Panther Creek GMU.

Water Body	Location	Pollutants
Big Deer Creek	South Fork Big Deer Creek to Panther Creek	Sediment, pH, metals
Blackbird Creek	Blackbird Reservoir to Panther Creek	Sediment, pH, metals
Bucktail Creek	Headwaters to Big Deer Creek	Metals
Panther Creek	Blackbird Creek to Salmon River	Metals
Diamond Creek	Headwaters to Salmon River	Unknown
Dump Creek	Headwaters to Salmon River	Sediment
Salmon River	Pahsimeroi River to North Fork Salmon River	Unknown
Williams Lake	Lake Creek sub-watershed	DO, nutrients
Carmen Creek	Freeman Creek to North Fork Salmon River	Sediment

Resident native fish within the GMU include WCT, bull trout, redband trout, and mountain whitefish. Native anadromous fish present in the GMU include Snake River spring and summer Chinook salmon, Snake River sockeye salmon, Snake River summer steelhead trout, and likely Pacific lamprey. Sockeye salmon are only present during their juvenile and adult migration periods and no spawning occurs in the GMU. All native anadromous salmonids are currently listed under the ESA, along with bull trout. Non-native brook trout are common in the upper portions and tributaries of Panther Creek and in the North Fork Salmon River and several of its tributaries. Smallmouth bass occur in this GMU in the mainstem Salmon River. These fish have been found to impact cutthroat trout through predation. Currently, these fish are not considered to be a major threat as their abundance and distribution in the watershed is limited.

Cutthroat trout habitat in tributaries of the mainstem Salmon River is primarily limited by modified hydrologic regimes, fragmented tributary access, inadequate pool: riffle ratios, and structural migration barriers.

Within the GMU, the mainstem Salmon River serves primarily as over-wintering habitat for migratory fluvial cutthroat trout; summertime temperatures in the main Salmon are not conducive for salmonid rearing. Fluvial cutthroat trout populations have been documented migrating seasonally from the mainstem Salmon River into Panther Creek, the North Fork Salmon River, the lower Middle Fork Salmon River, and the Lemhi River. Cutthroat trout harvest has been prohibited in the mainstem Salmon River and mainstem North Fork within the GMU since 1996. Very little trout fishing occurs in the mainstem Salmon River. However, an intensive steelhead fishery occurs in the fall and spring in which cutthroat could and would likely be harvested if the opportunity existed. Tributaries within the GMU are managed with general fishing rules which allow anglers to harvest six trout (mixed bag) with no minimum size restrictions. Fishing pressure is very light in the tributaries of the main Salmon River within the GMU with the exception of Panther Creek and the North Fork Salmon River, which both receive modest pressure.

The IDFG has not stocked catchable trout into flowing waters of the GMU since 1995. Non-native rainbow and cutthroat trout have been stocked in lake and river environments in the GMU for over 60 years. Past stocking of rainbow trout and non-native cutthroat trout into the Middle Salmon River-Panther Creek GMU may have led to limited hybridization with cutthroat trout in this area. Currently, it is unknown what level of introgression exists. Since 2000, IDFG began stocking only sterile rainbow trout in lowland lakes within the GMU and, in recent decades, The IDFG began stocking only the WCT subspecies into lowland and mountain lakes.

Distribution and Abundance

Since 1994, a total of 507 fish surveys have been conducted within the Middle Salmon River-Panther Creek GMU (Table 20). WCT were present in 260 sites (51%). WCT were found in most of the drainages in the GMU, with the exception of Boulder, Dump, and Owl creeks. Also, WCT were not observed during mainstem Salmon River electrofishing surveys conducted in 2005 and 2006. The highest densities of WCT were found in Wagonhammer Creek (18.73 trout/100 m^2; SE ± 2.39), a tributary to the mainstem Salmon River (Figure 42).

Middle Fork Salmon River GMU

The Middle Fork Salmon River drains 7,329 km^2 (2,830 mi^2) of central Idaho (Figures 43-44). The main river is federally classified as “wild” as part of the Wild and Scenic Rivers System. Most of the drainage is within the Frank Church River of No Return Wilderness Area. Prior to its classification as wilderness, the Middle Fork Salmon River drainage was included in the former Idaho Primitive Area.

The U.S. Geological Survey measures stream flow at two locations on the mainstem Middle Fork Salmon River: at Middle Fork Lodge, near Yellow Pine, Idaho, and at the mouth. Annual mean discharge at Middle Fork Lodge, from 1977 to 1981 and 2000 to 2011, ranged from a low of 16 m^3/s (582 cfs) in 1977 to 76 m^3/s (2,697 cfs) in 1974 and averaged 40 m^3/s (1,397 cfs). At the mouth of the Middle Fork Salmon River, annual mean discharge from 1995 to 2011 ranged from a low of 40 m^3/s (1,415 cfs) in 2001 to 132 m^3/s (4,648 cfs) in 1997 and averaged 80 m^3/s (2,819 cfs).

The topography in the drainage is extremely rugged and remote. Road access is limited to the headwater reaches outside of the wilderness boundary. The principal means of access are by aircraft, non-motorized boat, and by hiking or horseback on wilderness trails.

Except for some alpine lakes and a few small streams, the Middle Fork Salmon River drainage contains primarily native fish species. Smallmouth bass have been detected in the lower mainstem. Historically, a substantial portion of Chinook salmon and steelhead trout in the Salmon River drainage spawned and reared in the Middle Fork Salmon River and its tributaries. Native resident game species include bull trout, redband trout/steelhead, WCT, and mountain whitefish.

Historical stocking of non-native trout in alpine lakes within the Middle Fork drainage has caused limited introgressive hybridization in some tributaries. Research conducted by Kozfkay et al. (2007) indicated that introgression levels in most locations were low and patterns of hybridization were largely consistent with recent, natural hybridization events. The IDFG has collected an extensive number of WCT and redband trout/steelhead genetic samples in the majority of Middle Fork Salmon River tributaries within the past 10 years. The intent is to have these samples analyzed to delineate the genetic status of populations.

Table 20. Densities of WCT (fish/100 m^2) and associated standard errors (±SE) based on fish surveys conducted by various agencies in the Middle Salmon River-Panther Creek GMU.

HUC	Creek/River	*N*	Density	±SE
Salmon-Panther	Allison Creek	1	6.00	
	Boulder Creek	6	0.00	
	Carmen Creek	28	2.05	1.02
	Colson Creek	5	9.78	3.98
	Cow Creek	8	3.08	2.26
	Deer Creek	1	2.00	
	Dump Creek	3	0.00	
	Fourth of July Creek	19	1.50	0.63
	Hat Creek	20	3.24	0.93
	Indian Creek	9	2.60	0.90
	Iron Creek	21	1.34	0.97
	McKim Creek	9	3.21	0.97
	Moose Creek	3	0.29	0.29
	North Fork Salmon River	126	5.12	0.83
	Owl Creek	2	0.00	
	Panther Creek	150	0.79	0.22
	Perreau Creek	2	9.44	5.09
	Pine Creek	15	3.23	1.46
	Pollard Canyon	1	4.60	
	Sage Creek	2	0.38	0.38
	Salmon River	13	0.00	
	Sheep Creek	1	15.94	
	Spring Creek	7	4.40	1.60
	Squaw Creek	9	4.27	1.93
	Tower Creek	12	1.85	1.51
	Twelvemile Creek	8	7.51	3.09
	Wagonhammer Creek	21	18.73	2.39
	Wallace Creek	2	2.06	2.06
	Williams Creek	3	14.29	10.09

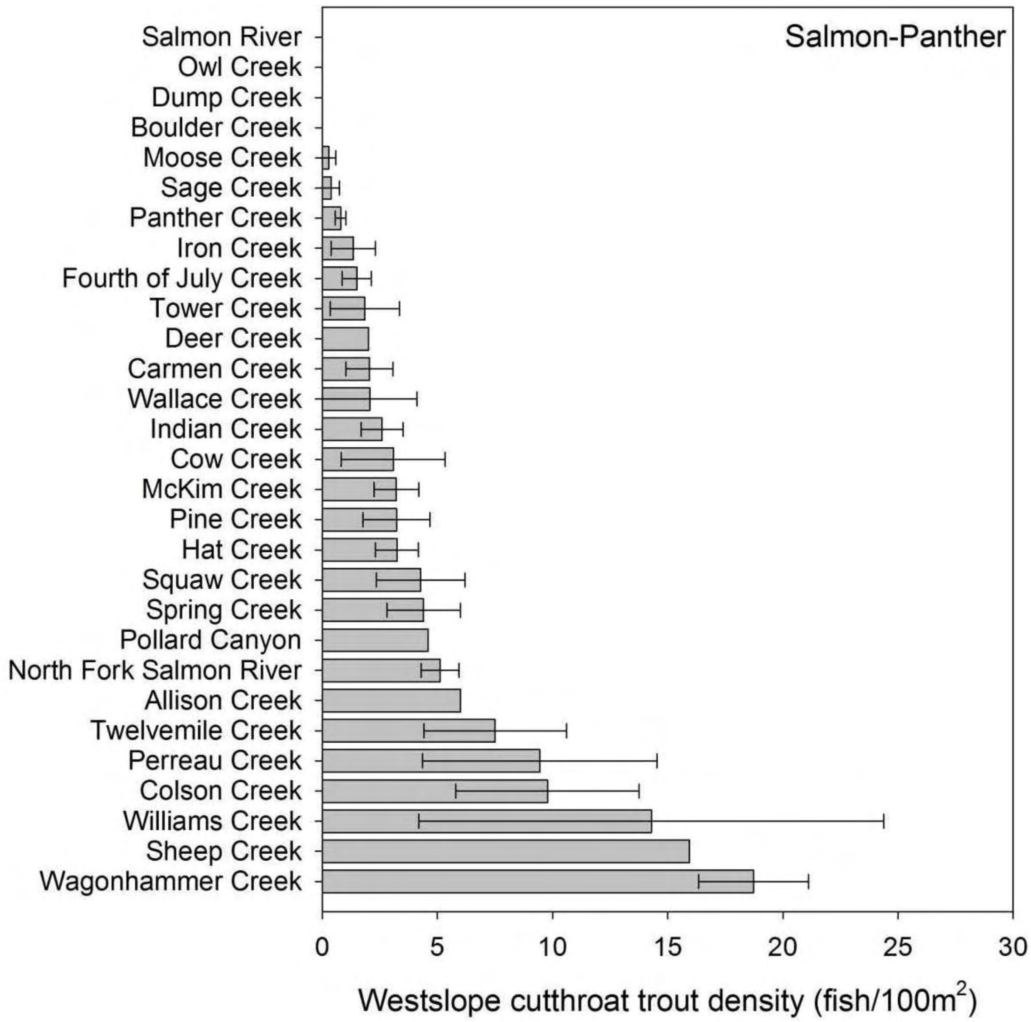

Figure 42. Average WCT densities (fish/100 m^2; ±SE) by drainage in the Middle Salmon River-Panther Creek GMU.

Figure 43. Middle Fork Salmon River GMU with WCT distribution as of 2009.

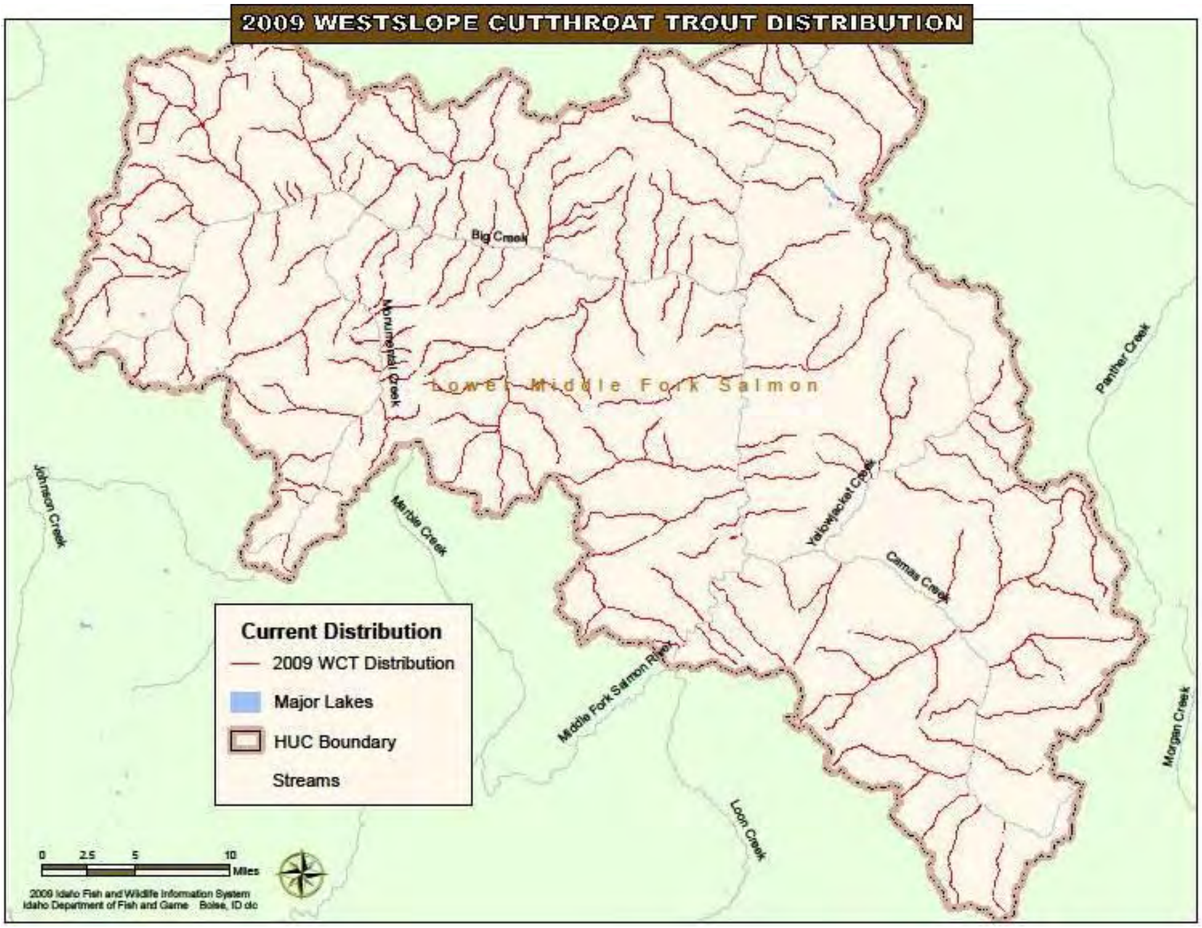

Figure 44. Middle Fork Salmon River GMU with WCT distribution as of 2009.

There are no major dams in the Middle Fork Salmon River drainage, and most streams are in a natural state and considered in relatively pristine condition. The headwaters of some tributary streams have experienced habitat alterations from both anthropogenic (mining, agricultural) as well as natural sources (fires, floods). Major mining sites and their access roads were not included in the wilderness area established in 1980. Other tributaries have been historically impacted by grazing, but most watersheds are now improving under more controlled management. The Frank Church River of No Return Wilderness Area provides the highest level of land protection; however, some upper watersheds were not included in the 1980 wilderness designation.

The drainage is a high-use recreational river during the summer months. The number of people floating the mainstem Middle Fork during the permit season has increased substantially in the past 50 years from 625 in 1962 to 9,557 floaters in 2012. The USFS estimated total user days to be 58,184 days in 2012, down from a high of 67,000 estimated user days in 2004.

Bear Valley, Elk, and Sulphur creeks are headwater tributaries in the upper half of the Middle Fork Salmon River GMU. Total drainage area of these systems combined is 712 km^2 (274 mi^2). Elevations range from 2,890 m at mountain peaks to 1,690 m at the confluence of Sulphur Creek and the Middle Fork Salmon River. Upland soils are typical of the Idaho batholith: unproductive, granitic, and erosive. Upland slopes are vegetated by grasses and sage brush, as well as lodgepole pine and Douglas fir stands that are prone to high-intensity forest fires. Median annual precipitation is 145 cm with over 70% coming as snow during winter. All three drainages possess long reaches of wide, low-gradient valley floors (<2%), despite the steep surrounding topography. Due to these physical characteristics, mainstem stream channels are highly sinuous (E-type). This tendency is most pronounced in Bear Valley and Elk creeks (>95% of mainstem), whereas about 40% of the Sulphur Creek mainstem is of this channel type.

Native populations of bull trout, mountain whitefish, spring/summer Chinook salmon, steelhead, and WCT inhabit Bear Valley, Elk, and Sulphur creeks. WCT that use these creeks are primarily fluvial and make long distance spawning and wintering migrations to and from the Middle Fork Salmon River, with infrequent movements as far downstream as the Main Salmon River (Zurstadt and Stephan 2004). Resident or non-migratory cutthroat trout are less abundant due to the severity of winters and ice formation. Cutthroat trout have been positively identified in the mainstems of these three streams only, with the exception of Bearskin Creek, a tributary to Elk Creek. However, *Oncorhynchus* fry have been sampled via snorkeling from several tributaries, but species *O. mykiss vs. O. clarkii* was not determinable with this sampling method.

Non-native trout were introduced to these drainages primarily through alpine lake and stream stocking. Stream stocking ceased prior to 1955, with no records from Sulphur Creek. Two alpine lakes are still stocked, but only with WCT. Brook trout as well as their hybrids (with bull trout) became established from some initial introductions and persist in Elk and Bear Valley creeks and their tributaries, especially in or near alpine lakes, dredge ponds, and beaver complexes. Genetic status of cutthroat trout in these three drainages is unknown.

The Bear Valley, Elk, and Sulphur creek drainages are managed with wild trout rules. Current fishing rules disallow harvest of cutthroat trout and use of bait, and require use of barbless hooks. Brook trout harvest is encouraged with a 25-fish daily bag limit. Angler use of this area is low, except near bridge crossings and near backcountry recreational ranches.

Most lands within these three drainages are federal lands administered by the USFS, with the exception of small private inholdings. Furthermore, nearly all of Sulphur Creek and all but the lower 16 km (10 mi) of Elk Creek are encompassed within the Frank Church River of No Return Wilderness Area. Historically, these drainages supported mining, grazing, and timber harvest. Impacts from these activities were most severe in Bear Valley, less severe in Elk Creek, and low in Sulphur Creek. These activities have been curtailed by wilderness designation, market forces, or to protect spawning and rearing habitat for federally listed fish species (bull trout, spring/summer Chinook salmon, and steelhead). Placer mining was used extensively in upper Bear Valley Creek to mine euxenite, thorium, and uranium from the 1950s through the 1970s. This mining technique created excessive sediment loads that are still evident today, despite restoration of the mine site during 1986-1988. Further restoration of a channelized reach of Casner Creek (used as a water supply) is ongoing in an attempt to restore natural function to this reach. The impacts of Portland Mine (divide between Elk and Sulphur creeks) are unknown. Both sheep and cattle grazing occurred for much of the Twentieth Century. Grazing intensity was gradually reduced then eliminated with sheep grazing ending in 1984 and cattle grazing ending in 2002. Grazing allotments were permanently retired via purchase by the Bonneville Power Administration during 2002. Response of channel morphology and sediments has been slow (Burton 2008). Small scale timber harvesting still occurs. Road densities are very low. Recently, the USFS has been replacing poorly designed culverts (Fir, Tennessee, and Sack creeks) to eliminate passage barriers and reduce fine sediment inputs with several additional culverts slated for removal/improvement in the next five years.

Big Creek, a fourth-order tributary, enters the Middle Fork Salmon River from the west approximately 28 km from the confluence with the Salmon River. The drainage is almost entirely in the wilderness except for its headwaters near the old mining area of Edwardsburg. This headwater area was mined in the late 1800s. Several re-openings of mining claims have been proposed recently on federal lands. A major mining operation existed in the headwaters of Monumental Creek for decades. Various tailing pond failures deposited a significant amount of sediment into this watershed over the years (Nelson 2011).

Big Creek contains very high quality stream rearing habitat for salmonids. No hatchery fish have been introduced into the drainage, but brook trout are documented, likely from illegal stocking (Table 21). Salmonids in Big Creek consist of Chinook salmon, bull trout, brook trout, WCT, redband trout/steelhead, and mountain whitefish. Big Creek is considered a desirable destination fishery for an outstanding WCT fishing experience in the wilderness.

Distribution and Abundance

WCT are distributed throughout the Middle Fork Salmon River GMU (Table 22, Figure 45). Snorkeling transects established by the IDFG in the Middle Fork Salmon River mainstem in the early 1970s show a generally steady proportion of cutthroat trout >300 mm (Figure 46). The Middle Fork Salmon River drainage is considered to be a stronghold for WCT, and supports an outstanding fishery for cutthroat trout, from its headwater streams of Bear Valley and Marsh creeks, to its confluence with the Salmon River. Anglers travel from across the United States and from foreign countries to float and fish the Middle Fork Salmon River. Catch-and-release rules for WCT have been in effect on the mainstem Middle Fork since 1972. Prior to this date, about 20% of cutthroat trout caught by IDFG project anglers were longer than 300 mm total length. Since the rule change, this proportion has fluctuated yearly, ranging from 26% to 53% (Figure 47) and through 2012 averaged 39%.

Table 21. Minimum densities of various salmonids in the vicinity of Edwardsburg, Idaho, an old mining area in the Big Creek drainage, in 2008. Big Creek is a major tributary to the Middle Fork Salmon River.

Stream		Salmonid Densities							
		Redband Trout/Steelhead		Westslope Cutthroat Trout		Bull Trout		Brook Trout	
Name	Reach	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2	#/100 m	#/100 m^2
Upper Big Creek[a]	1								
	2								
	3								
	Average								
Logan Creek	1	5.9	0.8	4.9	67.5	0.0	0.0	0.0	0.0
	2								
	3	0.0	0.1	1.0	13.4	1.0	0.1	0.0	0.0
	4								
	5	3.0	0.4	3.0	0.4	0.5	0.1	0.0	0.0
	Average	1.4	0.2	0.0	0.0	0.2	0.0	0.0	0.0
NF Logan Creek	1	1.8	0.8	1.8	0.8	0.0	0.0	0.0	0.0
	2	11.9	4.0	2.2	0.7	0.0	0.0	0.0	0.0
	3	7.6	2.1	1.0	0.3	0.0	0.0	0.0	0.0
	Average	7.1	2.3	1.7	0.6	0.0	0.0	0.0	0.0
Government Creek	1	0.0	0.0	0.0	0.0	1.0	0.3	1.0	0.3
	2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Average	0.0	0.0	0.0	0.0	0.5	0.1	0.5	0.1
McKorkle Creek	1								
	2								
	3								
	Average								
Coin Creek	1	0.9	0.4	0.9	0.4	0.0	0.0	0.0	0.0
	Average	0.9	0.4	0.9	0.4	0.0	0.0	0.0	0.0

Table 22. Densities of WCT (fish/100 m^2) and associated standard errors (±SE) based on fish surveys conducted by various agencies in the Middle Fork Salmon River drainage.

HUC	Creek/River	*N*	Density	±SE
Middle Fork	Aparejo Creek	1	8.93	
	Bear Valley Creek	19	0.05	0.03
	Bernard Creek	2	0.34	0.34
	Big Creek	230	0.73	0.08
	Boundary Creek	1	3.33	
	Brush Creek	9	5.40	1.33
	Camas Creek	138	0.76	0.18
	Cub Creek	1	6.11	
	Dagger Creek	2	0.68	0.68
	Grouse Creek	1	2.29	
	Indian Creek	13	1.17	0.46
	Loon Creek	4	2.41	0.88
	Marble Creek	68	5.86	0.96
	Marsh Creek	154	0.02	0.01
	Middle Fork Salmon River	231	1.21	0.20
	Pistol Creek	8	2.51	0.78
	Rapid River	23	1.70	0.55
	Sheep Creek	1	0.00	
	Ship Island Creek	1	1.61	
	Soldier Creek	1	0.00	
	Stoddard Creek	1	0.00	
	Sulphur Creek	78	1.02	0.35
	Wilson Creek	1	0.25	

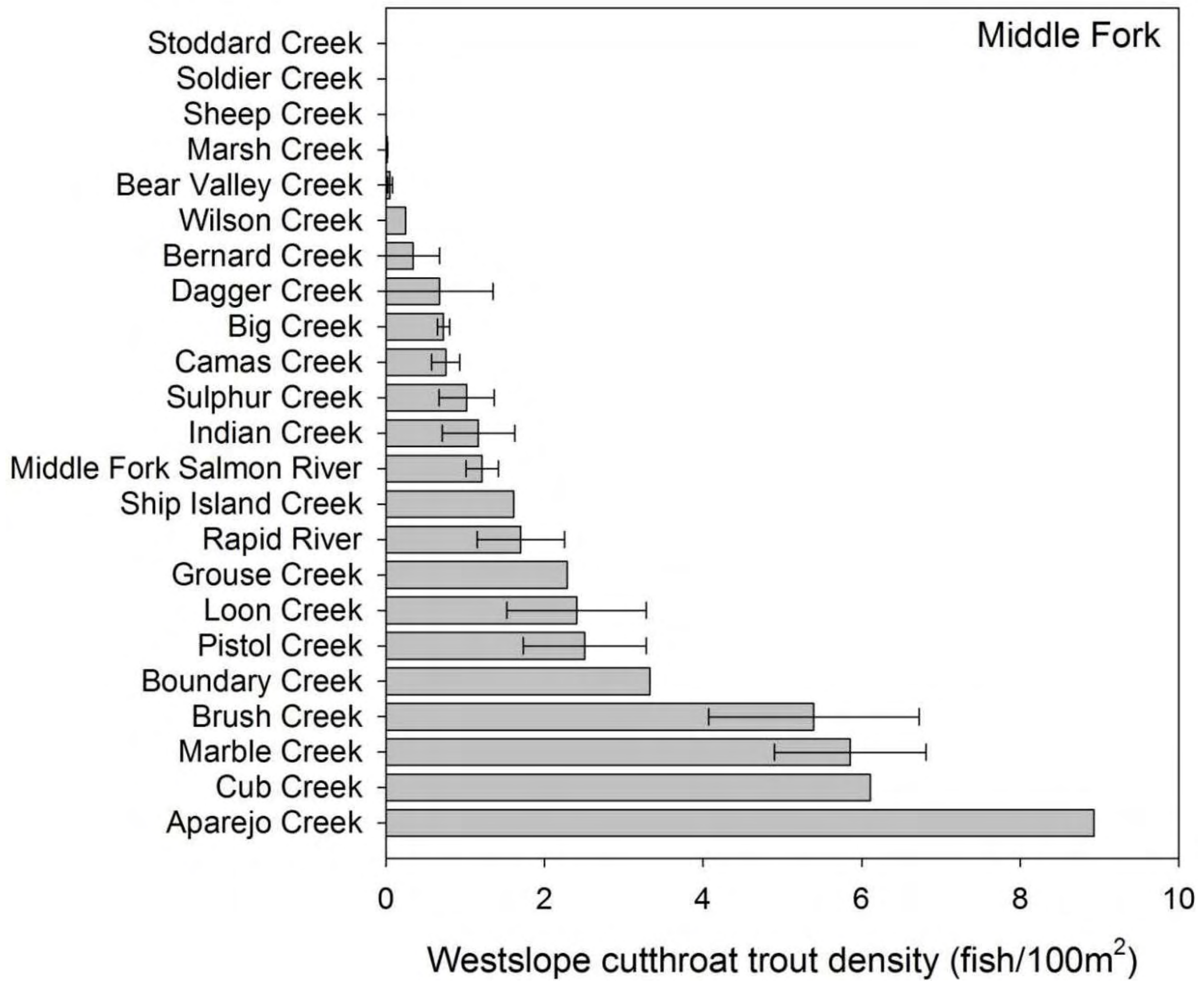

Figure 45. Average WCT densities (fish/100 m^2; ±SE) by tributary drainage in the Middle Fork Salmon River drainage.

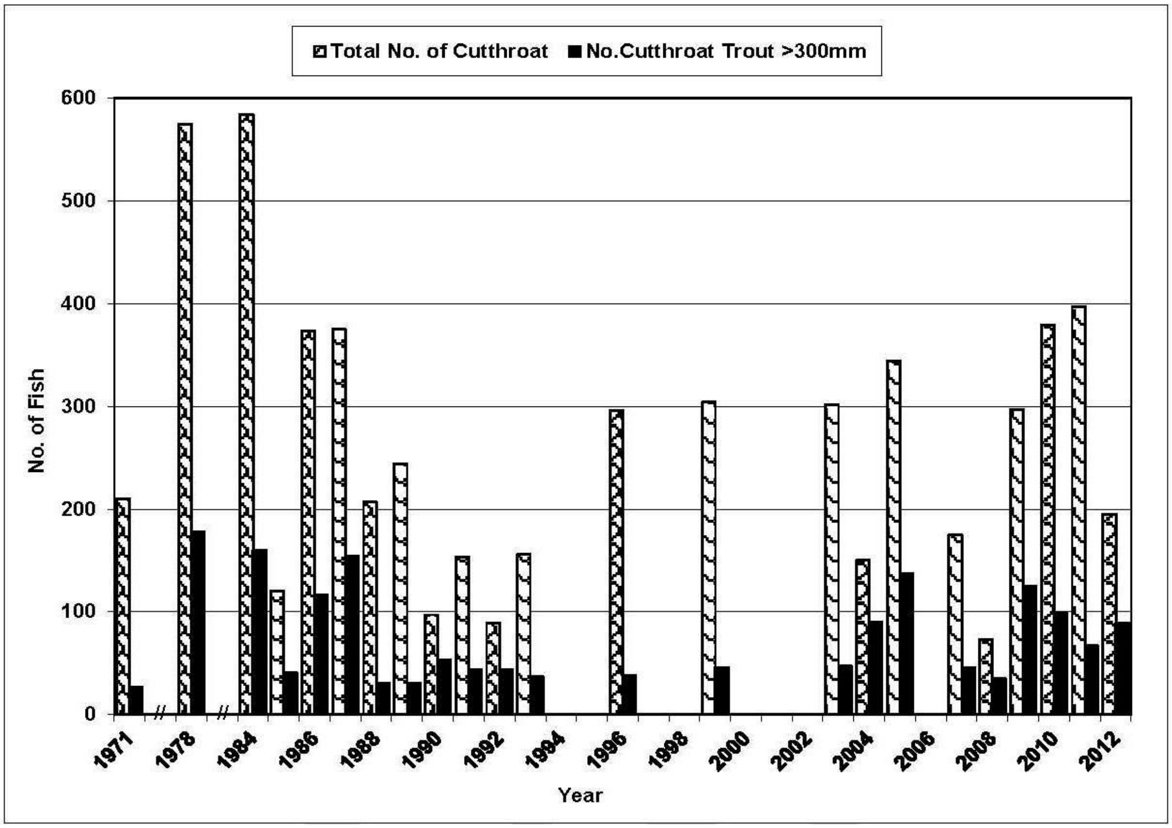

Figure 46. Number of WCT counted in mainstem Middle Fork Salmon River snorkel transects, and the number of cutthroat larger than 300 mm total length (TL) per year sampled in the Middle Fork, 1971, 1978, 1984 to 2012. Not all transects sampled in all years.

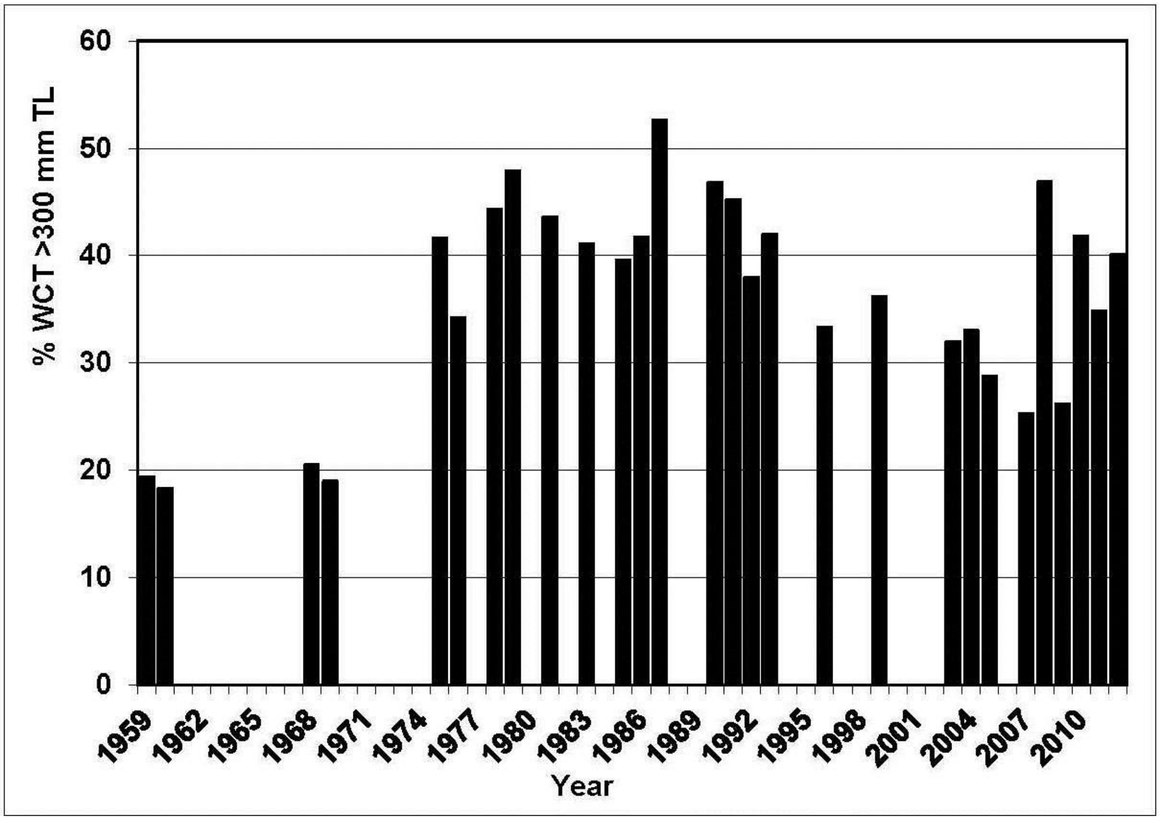

Figure 47. Percent of WCT greater than 300 mm total length that were sampled by IDFG project anglers in the Middle Fork Salmon River, 1959 to 2012.

Generally, WCT migrate upstream to spawn in various headwater streams of the Middle Fork Salmon River from their overwintering areas lower in the system. Adults use tributaries, especially headwater streams, for spawning and then drop back to the mainstem for the majority of the year (Zurstadt and Stephan 2004).

South Fork Salmon River GMU

The South Fork Salmon River drainage lies in central Idaho in Valley and Idaho counties (Figure 48). The drainage flows northerly through the Idaho batholith and enters the Salmon River at Mackay Bar. Elevations vary from 2,828 m at North Loon Mountain to 660 m at the mouth.

The land is characterized by extreme changes in elevation and aspect within short distances. Topography varies from steep canyon lands to meadows. The Idaho batholith soils consist largely of weathered granitic sands and fines and are sensitive to disturbance. Precipitation averages 812 mm annually, with major storm events occurring about every 10 years. A variety of land uses occur on public and private land, including, but not limited to, livestock grazing, mining, recreation, road maintenance and reconstruction, road use, and timber harvest.

Peak stream discharge occurs during a six-week period in May and June following snowmelt. Base flows occur from September through January. From 1967 to 2010, mean annual discharge ranged from 5 m^3/s (179 cfs) to 28 m^3/s (974 cfs), on the South Fork Salmon River near the Krassel Work Station, with a peak of 274 m^3/s (9,710 cfs) in 2010 (Zurstadt 2012).

Principal tributaries to the South Fork Salmon River are the Secesh River, the East Fork South Fork Salmon River, and its tributary, Johnson Creek. Warm Lake is the largest lake, measuring 258 ha (640 ac); all others are alpine lakes and range in size from less than 0.4 ha (1 ac) to 64 ha (160 ac). Above the confluence with the East Fork, the South Fork Salmon River alternates between V-shaped canyon sections and open U-shaped valley reaches. Low gradient reaches occur at Stolle Meadows, Dollar Creek, Poverty Flats, Secesh Meadows, Lake Creek, and Glory Hole areas, all traditional spawning areas for Chinook salmon and steelhead. Smaller tributary streams generally have steeper gradients.

In 1964 and 1965, a series of intense storms and rain-on-snow events created numerous landslides and slumps, inundating the South Fork Salmon River and some of its tributaries with heavy sediment loads. Sediment delivery from these debris flows was exacerbated by high logging road density. In the 1990s, changes in channel profiles and cross sections indicated a decrease in channel bed elevation and percentage of fines. More recent data vary in upward vs. downward trend in fines. High runoff in the winter and spring of 1995-1996, extensive flooding, and hillslope failures in the winter and spring of 1996-1997 appear to have had less effect on substrate quality than the events of 1964-1965 (Zurstadt 2012).

Resident fish species, including redband trout, WCT, bull trout, mountain whitefish, brook trout, and several nongame fish species occupy 828 km (515 mi) of streams and 37 lakes. They provide popular fisheries for many anglers.

Figure 48. South Fork Salmon River GMU with WCT distribution as of 2009.

Anadromous fish species (Chinook salmon, steelhead trout) have access to most of the drainage. Historically, the steelhead spawning run exceeded 3,000 fish. The South Fork Salmon River historically supported the largest summer Chinook run in the state of Idaho. Salmon fishing was a major economic resource in the South Fork prior to 1965, when anglers harvested 1,700-4,000 salmon annually. Steelhead anglers harvested 750-800 fish per year. These runs have dwindled considerably since then, and run sizes are about one-tenth of their former abundance. The seasons were closed in 1965 for Chinook and in 1968 for steelhead. The decrease in numbers of South Fork stocks of Chinook salmon and steelhead were caused by two major problems: 1) logging and road construction activities created unstable soil conditions that severely damaged the aquatic habitat, and 2) the construction of hydroelectric dams on the lower Snake and Columbia rivers.

The South Fork Salmon River is one of only four drainages in the Columbia River basin that supports populations of wild, native steelhead trout classified as B-run. These fish are predominantly large steelhead, which spend two or three years in the ocean, compared to the smaller A-run steelhead which inhabit much of the rest of the Salmon River drainage. Preservation of this native gene pool is a high priority. Following harvest closures on cutthroat trout (1985) and bull trout (1994), and cessation of hatchery trout stocking (1993), steelhead parr became the targeted fish harvested under general bag limits. This instigated a change to a drainage-wide catch-and-release rule, implemented in 1998.

Distribution and Abundance

WCT are widely distributed within the South Fork Salmon River drainage. Not all streams have cutthroat trout present. In general, the cutthroat trout densities are less in the major forks of the South Fork than in the higher gradient tributaries.

Steelhead/redband trout is the dominant salmonid in the system. Table 23 documents the tributary fish sampling on the main roaded section of the South Fork Salmon River mainstem. Mean snorkel densities for long term monitoring sites within the GMU are presented in Table 24. Mountain lakes are now stocked with WCT and/or other non-hybridizing salmonids. In the past, diploid rainbow trout had been stocked. There are no known genetic sampling studies for investigating the possible introgression from these diploid rainbow trout. No stocking of fish other than McCall Hatchery production Chinook salmon occurs in the river system.

Table 23. Presence or absence of fish species from tributaries of the South Fork Salmon River collected in 2009 by electrofishing. RBT-redband/rainbow trout; WCT-WCT; WCT/RBT-cutbow; BKT-brook trout; BLT-bull trout; BLT/BKT-bull trout x brook trout hybrid; LND-longnose dace; SCU-sculpin; CHN-Chinook salmon; and MWF-mountain whitefish.

Stream	Easting UTM Coordinate (NAD 27)	Northing UTM Coordinate (NAD 27)	RBT	WCT	WCT/RBT	BKT	BLT	BLT/BKT	LND	SCU	CHN	MWF
Bear Creek	604730	4941577	Y	N	N	Y	N	N	N	Y	N	N
Boulder Creek	578468	4969324	Y	N	N	Y	N	N	N	N	N	N
Boulder Creek	581247	4968682	Y	N	N	Y	N	N	N	N	N	N
Boulder Creek	582584	4968828	Y	Y	Y	N	N	N	N	N	N	N
Brush Creek	575364	4990619	Y	N	N	N	N	N	N	N	N	N
Calf Creek	596005	4989801	N	Y	N	N	N	N	N	N	N	N
N.F. Camp Creek	604986	4972768	N	N	N	N	N	N	N	N	N	N
Camp Creek	602178	4971340	Y	N	N	Y	N	N	Y	Y	Y	N
N.F. Camp Creek Lower	603451	4971291	Y	Y	N	N	N	N	N	N	N	N
M.F. Camp Creek	604459	4970915	N	Y	N	N	N	N	N	N	N	N
S.F. Camp Creek	604405	4970861	N	Y	N	N	N	N	N	N	N	N
Circle End Creek	605009	4988838	N	N	N	N	N	N	N	N	N	N
Cliff Creek Lower	604998	4961159	N	Y	N	N	N	N	N	N	N	N
Cliff Creek Upper	602652	4959708	N	N	N	N	N	N	N	N	N	N
Cow Creek	596647	4988676	N	Y	N	N	N	N	N	N	N	N
Devil Creek	607936	4994389	N	N	N	N	N	N	N	N	N	N
Dime Creek	603459	4950679	N	N	N	N	N	N	N	N	N	N
Dollar Creek	603402	4952502	Y	N	N	N	N	N	N	Y	N	Y
Fritser Creek	608001	4993772	N	N	N	N	N	N	N	N	N	N
Goat Creek Lower	604209	4956766	Y	N	N	Y	N	N	N	N	Y	N
S.F. Goat Creek	605618	4956100	Y	N	N	N	N	N	N	N	N	N
N.F. Goat Creek	605510	495723	Y	N	N	N	N	N	N	N	N	N
Grave Creek	607544	4992936	N	N	N	N	N	N	N	N	N	N
Hamilton Creek	602526	4987405	N	N	N	N	N	N	N	N	N	N
Indian Creek	600208	4980341	Y	N	N	N	N	N	N	N	Y	N
N.F. Lake Fork Creek	584491	4985818	Y	N	N	Y	N	N	N	N	N	N
E.F. Lake Fork Creek	583344	4974715	N	N	N	Y	N	N	N	N	N	N

Table 23. Continued.

Stream	Easting UTM Coordinate (NAD 27)	Northing UTM Coordinate (NAD 27)	RBT	WCT	WCT/RBT	BKT	BLT	BLT/BKT	LND	SCU	CHN	MWF
S.F. Lake Fork Creek	584620	4974117	N	N	N	Y	N	N	N	N	N	N
M.F. Lake Fork Creek	585315	4974610	N	Y	N	Y	N	N	N	N	N	N
E.F. Lake Fork Creek	585194	4974801	Y	N	N	Y	N	N	N	N	N	N
Little Indian Creek	600516	4979924	N	N	N	N	N	N	N	N	N	N
Lodgepole Creek	605734	4938135	Y	N	Y	N	Y	Y	N	N	N	N
Martin Creek	601919	4970471	N	N	N	N	N	N	N	N	N	N
Maverick Creek Lower	596676	4990336	N	Y	N	N	N	N	N	N	N	N
Maverick Creek Upper	595703	4990068	N	Y	N	N	N	N	N	N	N	N
Mirror Creek	603642	4953656	N	N	N	N	N	N	N	N	N	N
Mormon Creek	603851	4930622	Y	N	N	N	Y	N	N	N	N	N
Nasty Creek	602975	4969867	Y	Y	N	N	N	N	N	N	N	N
Nickel Creek	603500	4951410	N	N	N	N	N	N	N	N	N	N
S.F. Phoebe Creek	602845	4973277	N	N	N	N	N	N	N	N	N	N
M.F. Phoebe Creek	602821	4973667	N	N	N	N	N	N	N	N	N	N
Phoebe Creek	601526	4972217	Y	N	N	Y	N	N	Y	Y	Y	N
Pidgeon Creek	606786	4992398	N	N	N	N	N	N	N	N	N	N
Reeves Creek	606300	4946722	Y	N	N	Y	N	N	N	Y	N	N
Rice Creek	607426	4933576	Y	Y	N	Y	Y	N	N	N	N	N
Roaring Creek	604434	4955430	Y	N	N	N	N	N	N	N	N	N
Salt Creek	630046	4978485	N	Y	N	N	Y	N	N	N	N	N
Sister Creek	604636	4958124	N	N	N	N	N	N	N	N	N	N
Six-Bit Creek	600332	4947678	N	N	N	N	Y	Y	N	N	N	N
Snowslide Creek	604106	4960454	N	N	N	N	N	N	N	N	N	N
Split Creek	595794	4991930	Y	Y	N	Y	N	N	N	N	N	N
E.F. Split Creek	595805	4993231	N	Y	N	N	N	N	N	N	N	N
W.F. Split Creek	593764	4993089	N	N	N	Y	N	N	N	N	N	N
Tailholt Creek	604200	4988347	Y	Y	N	N	N	N	N	N	N	N
S.F. Twin Creek	604486	4958716	N	N	N	N	N	N	N	N	N	N

Table 23. Continued.

Stream	Easting UTM Coordinate (NAD 27)	Northing UTM Coordinate (NAD 27)	RBT	WCT	WCT/RBT	BKT	BLT	BLT/BKT	LND	SCU	CHN	MWF
N.F. Twin Creek	604497	4958860	N	N	N	N	N	N	N	N	N	N
Two-Bit Creek	602047	4946974	N	Y	N	Y	N	N	N	N	N	N
Tyndall Creek	604292	4936732	N	N	N	N	N	N	N	N	N	N
Upper S.F. Salmon River	603462	4929575	Y	N	N	N	Y	N	N	N	N	N
Warm Lake Creek	605047	4945876	Y	Y	N	Y	N	N	Y	Y	Y	N
Yellow Jacket Creek	603118	4933004	Y	N	N	N	Y	N	N	N	N	N
E.F. Zena Creek	600736	4990650	N	Y	N	N	N	N	N	N	N	N
W.F. Zena Creek	600065	4990228	Y	Y	N	N	N	N	N	N	N	N
Zena Creek	598705	4988157	Y	N	N	N	Y	N	N	Y	Y	N
W.F. Zena Creek Upper	601807	4994712	N	N	N	N	N	N	N	N	N	N
Trail Creek	600715	4942719	Y	N	N	Y	N	Y	N	Y	N	N
Cabin Creek	606927	4950214	Y	N	N	Y	N	N	N	N	N	N
Curtis Creek	601695	4942855	Y	N	N	N	N	Y	N	Y	Y	N
Non-Named Creek 1	604966	4937570	N	N	N	N	N	N	N	N	N	N
Non-Named Creek 2	604152	4932395	Y	Y	N	Y	N	Y	N	N	N	N
Profile Creek	626673	4985269	N	Y	N	N	Y	N	N	N	N	N
Knox Creek	603965	4947043	N	N	N	N	N	N	N	N	N	N

Table 24. Mean densities (number/100m^2) of WCT in the South Fork Salmon River drainage. Densities calculated from drainage-wide snorkel estimates from 2003 to 2012.

Site	Density
South Fork Salmon River	0.07
East Fork South Fork Salmon River	0.60
Johnson Creek	0.19
Secesh River	0.06

Middle Salmon River-Chamberlain Creek GMU

The Middle Salmon River-Chamberlain Creek GMU bisects the central Idaho wilderness from east to west and has a watershed area of 443,843 ha (1,096,736 ac) (Figure 49). The land ownership is 99% federal ownership administered by the Nez Perce, Bitterroot, and Payette National Forests. Almost the entire watershed south of the Salmon River is within the Frank Church River of No Return Wilderness Area. The northwest part of the watershed lies within the Gospel Hump Wilderness Area. The GMU has the Horse Creek drainage and the Middle Fork Salmon River as the upstream boundary and ends just before the Wind River and Vinegar Creek drainages approximately where the Salmon River road ends. There are 119 km (74 mi) of roadless river corridor between Vinegar Creek and Horse Creek. This section of the Salmon River is commonly referred to as the Salmon River Canyon. This reach of river has limited access and is classified "wild" under the Wild and Scenic Rivers System.

The entire area is mountainous with steep gradient tributaries draining to the Salmon River. The watershed lies largely within the Idaho Batholith. This erodible base produces large amounts of granitic sand that is delivered to the main river. Much of the Salmon River Canyon has significant granite outcrop, many forming steep canyon walls to the river. Elevations range between 2,682 m in mountain ranges adjacent to the Salmon River Canyon to between 652 m to 564 m at the Salmon River proper.

The watershed is lightly impacted by human development with only the small towns of Dixie and Warren presently occupied. The area has a history of mineral extraction activities starting about 1860 with the gold rush areas of Warren, Dixie, Marshall Mountain, and Florence becoming boom towns. The localized areas and streams were impacted near these towns but have since mostly recovered. Now the primary uses of the area are mostly recreational with private and commercial jet boat and rafting traffic on the main Salmon River.

Many of the tributary streams in the Salmon River Canyon are important producers of wild steelhead trout. These tributaries represent the largest and the only contiguous production area for wild A-run steelhead trout in the Salmon River. Fish species present in tributaries to the mainstem canyon reach are primarily wild juvenile steelhead trout and WCT.

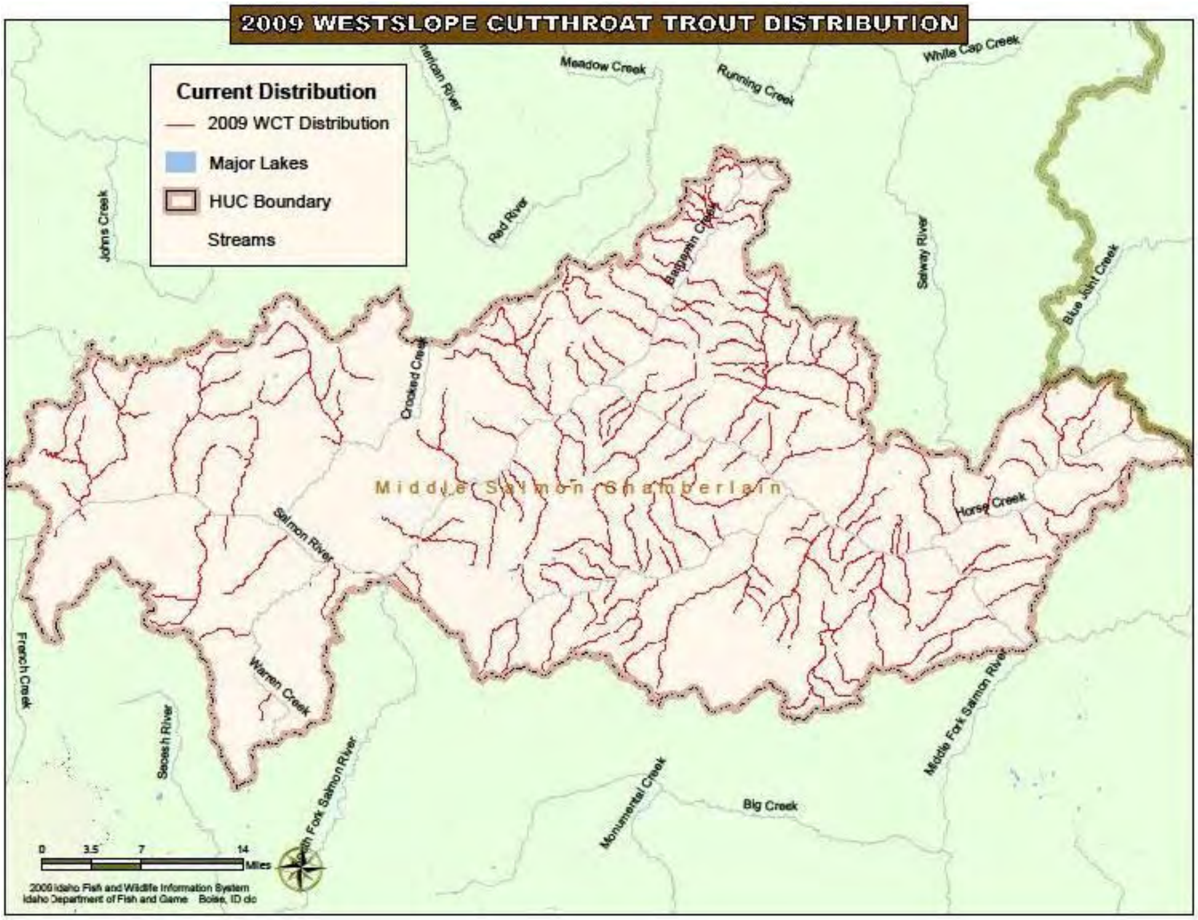

Figure 49. Middle Salmon River-Chamberlain Creek GMU with WCT distribution as of 2009.

WCT are thought to be widely distributed within the GMU as shown in Figure 49. The main tributaries to the south are Chamberlain and Warren creeks. The larger northern tributaries are Horse, Bargamin, and Crooked creeks which all support cutthroat trout. Little fishery survey work is documented, most likely because of the general lack of road access and lack of perceived threats to the fisheries. Table 25 is a summary of snorkel surveys conducted in this GMU. The IDEQ has monitoring sites scattered within the GMU but little fishery data collected. Mountain lakes have been stocked in the GMU but only WCT have been stocked in the last 20 years. No baseline genetic samples on cutthroat trout are known to exist.

Little Salmon River GMU

The Little Salmon River originates in the Meadows Valley in Adams County and flows northward to its confluence with the Salmon River at Riggins, Idaho (Figure 50). Major tributaries include Goose, Hazard, Boulder, and Mud creeks, and Rapid River. Major lakes and reservoirs include Fish (Mud) Lake, Goose Lake, Brundage Reservoir, and Hazard Lake. The drainage area is 1,366 km^2 (516 mi^2) and includes elevations from 536 m at the mouth to 2,743 m in the Seven Devils Mountains and Hazard Creek drainages. Discharge at Riggins averages 24 m^3/s (854 cfs) with extremes of almost 3 m^3/s (98 cfs) to 356 m^3/s (12,600 cfs) recorded.

Most of the drainage is forest lands, including designated wilderness and roadless areas. Within the drainage, there are 6,190 ha (15,300 ac) of irrigated agricultural lands, primarily comprised of hay meadows and pastures.

The Little Salmon River drainage from its mouth to and including Hazard Creek supports spring Chinook salmon, steelhead trout, redband trout, WCT, bull trout, brook trout, mountain whitefish, and nongame species. High gradient cascades prevent anadromous fish species from upstream migration beyond Round Valley Creek. Above Round Valley Creek, the Little Salmon River is a low gradient, meandering stream with high gradient tributaries.

Rapid River is designated as “wild” as part of the Wild and Scenic River system in its upper reaches. The drainage is extremely important to Idaho’s anadromous fishery program. Upper Rapid River is classified as wilderness, and this drainage provides essential, good quality spawning and rearing habitat for resident trout and steelhead to maintain natural production. It also supplies high-quality water for Idaho Power Company’s Rapid River Hatchery which spawns and rears spring Chinook salmon.

Little Salmon River steelhead stocking is designed to provide harvest opportunity on hatchery steelhead in the mainstem Salmon River near Riggins, Idaho, and in the Little Salmon River. It is the only Salmon River tributary open during steelhead season.

Brundage Reservoir and Lake Serene are managed for trophy fishing opportunities. Goose and Fish Lake reservoirs, Hazard Lake, and other alpine lakes are popular recreation areas and provide general fishing opportunity in high elevation settings for many anglers.

Current habitat improvement efforts are focused on water quality and the riparian corridor in the upper Little Salmon River. IDFG intends to continue to participate with agencies and landowners to implement and monitor various projects prescribed through recently completed Total Maximum Daily Load and water management plans.

Table 25. Density of WCT (fish/100 m^2) obtained by entire width snorkel surveys in the Middle Salmon River–Chamberlain Creek GMU.

Stream name	Fish/100 m^2	No. of surveys
Bargamin	0.3	6
Big Mallard	2.5	2
Cache	1.0	1
McCalla	0.1	1
Whimstick	0.3	1
West Fork Chamberlain	0.2	1
Chamberlain	0.3	1

Figure 50. Little Salmon River GMU with WCT distribution as of 2009.

WCT distribution is discontinuous in the drainage. Likely several of the tributaries that contain cutthroat trout occur because of alpine lake stocking and downstream escapement. The major tributaries to the Little Salmon River, Rapid River, and Boulder Creek may have originally contained cutthroat trout. The Little Salmon River GMU has low densities of cutthroat trout (Table 26). The upper drainage above the falls does not have any cutthroat trout documented. Much of this is mainstem river habitat in the Meadows Valley that has been affected by poor water quality from agricultural practices. The very upper tributaries of the Little Salmon River support redband trout but not cutthroat trout.

Lower Salmon River GMU

The Lower Salmon River GMU is the most downstream GMU of the entire Salmon River basin. This GMU spans from the French Creek watershed downstream to the mouth of the Salmon River and encompasses 389,789 ha (963,168 ac) of land and about 1,900 km (1,180 mi) of stream (Figure 51). The Salmon River flows 168 km (104 mi) through the middle of this GMU, but watersheds outside of this GMU have the most influence on flow in the Salmon River proper. Flows in the Salmon River at Whitebird, Idaho, have lows in September of around 85-133 m^3/s (3,000-4,000 cfs) and peak flows that typically exceed 1,415 m^3/s (50,000 cfs) in May or June. Elevations in this GMU range from 277 m at the mouth to over 2,130 m at some of the peaks. Much of this GMU has elevations less than 1,200 m making the tributaries very susceptible to rain-on-snow events. Because the vast majority of the Salmon River drains land upstream of this GMU where higher elevations occur, flows in the Salmon River are more snowmelt driven. Topography of this GMU is dominated by breaklands with land slopes commonly exceeding 60%.

Land ownership in this GMU is comprised mostly of federal land (BLM) along the river corridor although it is intermixed with private lands in places. Directly upslope of the river corridor, land ownership is mostly private. In the upper half of this GMU where timberland becomes more common, federal ownership (USFS) occurs mostly in the higher elevations.

Downstream of Whitebird Creek, grazing activity is widely distributed occurring mainly in the canyons and pockets of timberland. On the Camas Prairie, dryland farming has occurred since the early 1900s. Where forests occur, timber harvest practices are common. Upstream of Whitebird Creek, the ground is not suitable for dryland farming, but hay production is common among many of the lower gradient reaches of tributaries. Many of these hay fields are irrigated by water diverted from these streams. Grazing occurs throughout this area. The federal grounds along the river corridor are managed primarily for recreation whereas on federal lands in the higher elevations, timber management and grazing practices occur. Much of this federal land is not suitable for active resource management due to the steepness and dryness of the landscape. Both placer and hardrock mining has occurred along the river corridor in the past. A few mining claims are still active, but impacts to the environment are not overarching. Few roads occur along the lower 84 km (52 mi) of the Salmon River whereas a road parallels along the entire path of the upper half of the Salmon River in this GMU.

Table 26. Mean densities of WCT (fish/100 m^2) in the Little Salmon River drainage obtained by snorkel surveys.

Tributary	Fish/100 m^2
Little Salmon	0.1
Boulder Creek	0.3
Hazard Creek	0.4
Rapid River	0.2

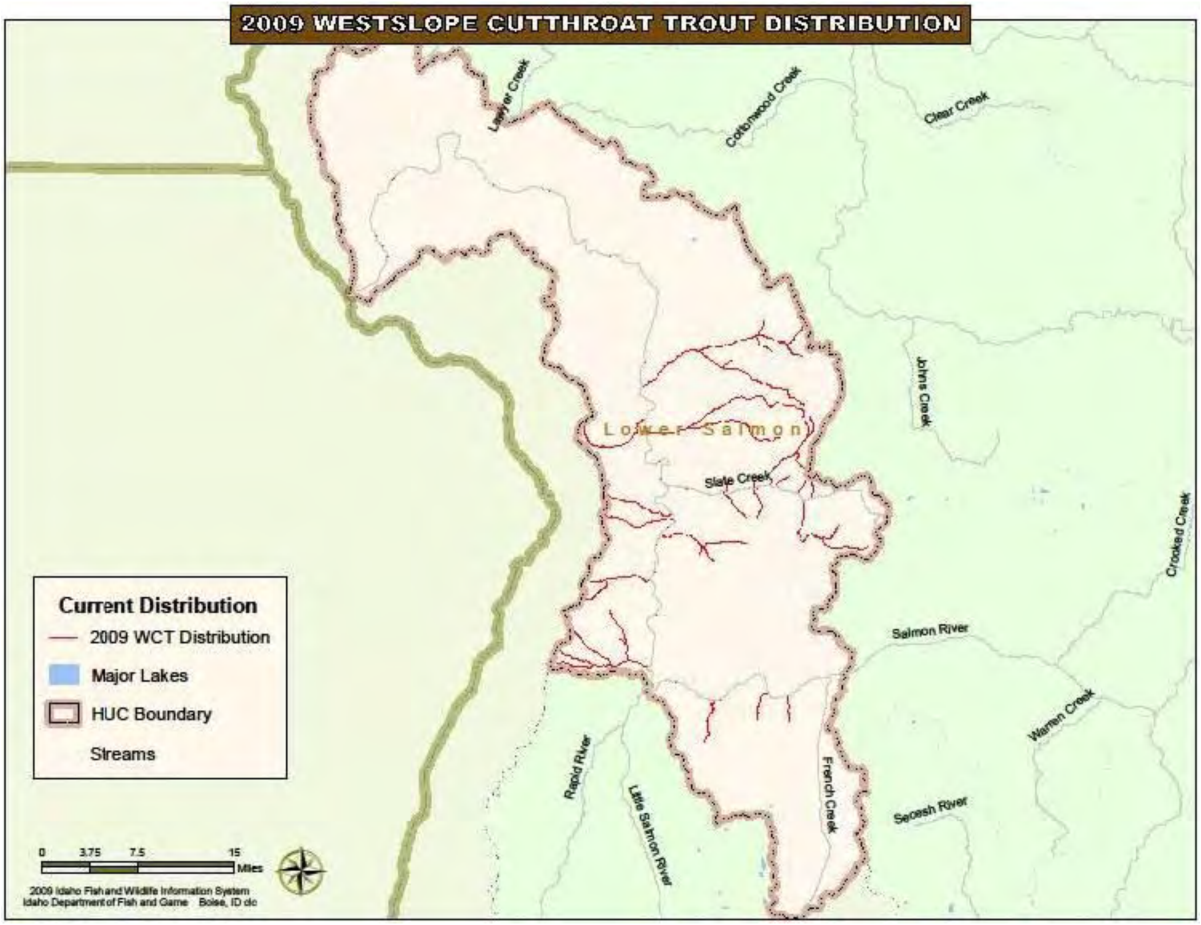

Figure 51. Lower Salmon River GMU with WCT distribution as of 2009.

This GMU is a migratory corridor for anadromous runs of spring, summer, and fall Chinook salmon and summer steelhead. Hatchery releases account for the majority (~67%) of these salmon and steelhead runs. Millions of hatchery salmon and steelhead smolts are released outside of this GMU that migrate through the Salmon River every spring. Low numbers of fall Chinook salmon spawn in the Salmon River in this GMU and wild steelhead spawn in most of the tributaries with adequate flow and gradient. Native cutthroat trout, resident redband trout, and bull trout all occur seasonally in the Salmon River, although they tend to primarily use this as overwintering and migratory habitat. Mountain whitefish are the most abundant salmonid that use this river on a year-round basis. Hatchery rainbow trout were stocked into many of the larger tributaries in this GMU including Whitebird Creek, Slate Creek, and Skookumchuck Creek from 1980 to 1988. Sterile Kamloops rainbow trout were stocked into the Salmon River from 2000 to 2010. No rainbow trout are currently being stocked into flowing waters in this GMU. No evaluation of potential rainbow trout introgression with WCT has occurred in this GMU. Brook trout occur in many of the larger tributaries and smallmouth bass occur throughout the Salmon River.

Spawning and rearing populations of cutthroat trout occur in a few of the tributaries upstream of and including Whitebird Creek where water temperatures are suitable. Naturally reproducing populations of cutthroat trout are not known to occur downstream of Whitebird Creek and historically were not believed to use this area due to temperature limitations. Most spawning and rearing cutthroat trout populations in this GMU are represented by resident fish and are often located only in the headwaters. Some of these populations are believed to support a limited fluvial life history. Fluvial cutthroat trout that spawn and rear outside of this GMU will migrate into the Salmon River to overwinter.

The Lower Salmon River GMU provides limited cutthroat trout fishing opportunities due to their limited distribution, isolated nature, and low numbers of fluvial fish. Currently, the cutthroat trout fishery in the Lower Salmon River GMU is managed under two different fishing rules. In all tributaries, a daily limit of two cutthroat trout is allowed. On the Salmon River, only catch-and-release fishing is allowed.

FACTORS AFFECTING STATUS

Habitat Degradation and Fragmentation

Habitat conditions vary widely across the range of WCT in Idaho. However, in general, stream reaches in the upper parts of GMUs are in better overall condition than stream reaches in the lower parts of GMUs. This is a function in part of cooler conditions as a result of higher elevations and more shade, partly because of being farther removed from agricultural lands, and partly because much of the higher-elevation land is in federal ownership.

An extensive body of published scientific literature exists on the effects of human-caused disturbance to salmonid habitat (see Beschta et al. 1987; Chamberlin et al. 1991; Furniss et al. 1991; Meehan 1991; Sedell and Everest 1991; Frissell 1993; Henjum et al. 1994; McIntosh et al. 1994; Wissmar et al. 1994; USDA and USDI 1996; Gresswell 1999; Trombulak and Frissell 2000). Declines in populations of native salmonids including WCT can result from combined effects of habitat degradation and fragmentation, blocked migration corridors, degraded water quality or quantity, angler harvest and poaching, entrainment into diversion canals and dams, non-native fish species interactions, and other factors (USFWS 2002). Examples of land and water management activities that could degrade habitat and depress salmonid populations include dams and other diversion structures, forestry management, livestock grazing, intensive agriculture, road construction and maintenance, mining, and urban/rural landscape development.

Rieman and Apperson (1989) and McIntyre and Rieman (1995) provide assessments of habitat degradation impacts on WCT. Land use practices and other human development have degraded habitat and adversely affected WCT. Habitat degradation is probably one of the leading causes of the decline of WCT throughout its range.

Construction of dams, irrigation diversions, or other migration barriers such as culverts (Rieman and Apperson 1989) have isolated or eliminated areas of WCT habitat that were once available to migratory populations (McIntyre and Rieman 1995). In Idaho, entire river basins have been blocked by dams (e.g., Pend Oreille River). Resident populations may persist in isolated stream segments, but the absence of the migratory form and connection with other populations potentially important to gene flow or metapopulation dynamics may seriously compromise the potential for long-term persistence (McIntyre and Rieman 1995).

Habitat Quality

In the 2009 status assessment, habitat quality was viewed as an important addition to the revised database. Across the range of WCT, a high percentage (59%) of habitats were judged to be in either excellent (18%) or good (41%) condition (Figure 52). Fair habitat conditions were assigned to 24% of the currently occupied habitat and only 4% of habitat was judged to be in poor condition (Figure 52). Habitat quality for 13% of the occupied habitat was judged to be unknown.

Non-native Species

Non-native salmonids including rainbow trout, brown trout, brook trout, lake trout, kokanee, and lake whitefish have been linked to declines of WCT in lakes and streams (Behnke 1992; Fausch 1988, 1989). Competition and predation are both thought to be important.

Fish Stocking

Information related to fish stocking within the current distribution area of WCT and the presence of other fish that could create detrimental competition or hybridization was also added to the database. It should be noted that both Chinook salmon and redband (rainbow) trout were tracked in the stocking records along with the presence of other fish. Both of these species are native to significant portions of the range and are generally not considered to create detrimental influences on WCT. Competing species include brook, brown, rainbow, and other cutthroat trout subspecies that are not native within the range of WCT. Rainbow trout and other cutthroat trout subspecies can hybridize with WCT.

There were no records of fish stocking within 63% of the current distribution of WCT (Figure 53). Records of rainbow trout of non-native origin were the most stocked species followed by other cutthroat trout subspecies, brook trout, and brown trout.

Habitat quality estimates for the current distribution for each state reflect a somewhat finer level of resolution of habitat quality based on stream mileage within each state (Table 27).

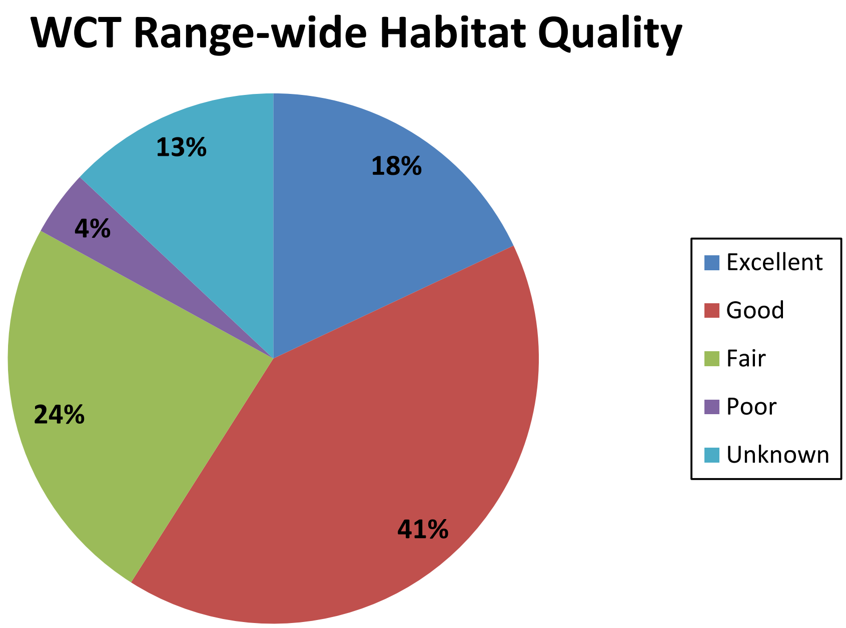

Figure 52. Habitat quality associated with the current distribution of WCT based on stream miles for each habitat quality rating.

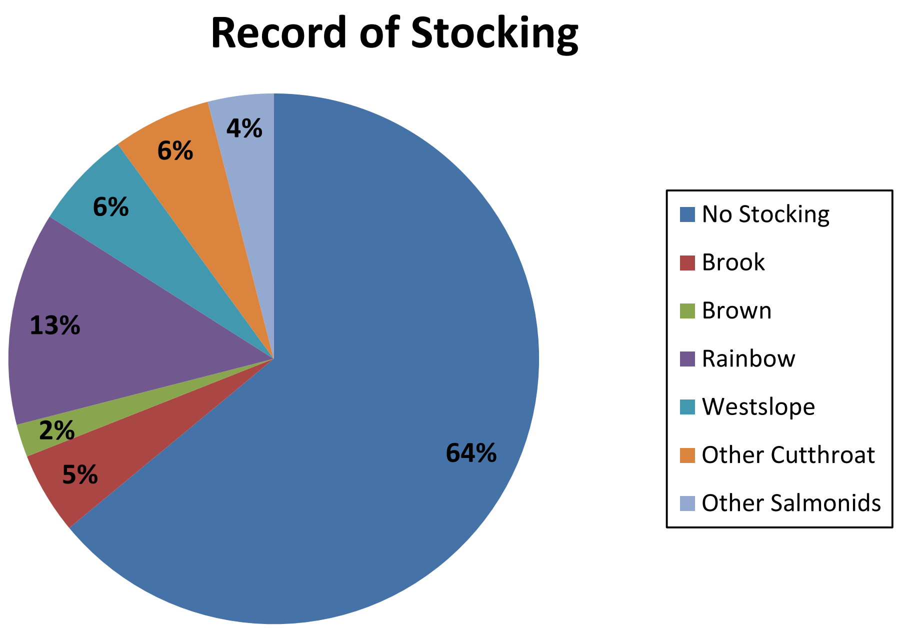

Figure 53. Record of fish stocking within the current distribution of WCT.

Table 27. Habitat quality estimates within the states supporting current distributions of WCT.

State	Excellent	Good	Fair	Poor	Unknown
Idaho	21%	44%	19%	3%	13%
Montana	16%	40%	30%	5%	9%
Oregon	4%	38%	19%	11%	28%
Washington	11%	29%	30%	3%	27%
Wyoming	---	100%	---	---	---

The IDFG Fisheries Management Plan states, "...hatchery-reared fish will be stocked as appropriate to preserve, establish, or reestablish depleted fish populations and to provide angling opportunity to the general public..." (IDFG 2013). The Fisheries Management Plan also indicates that emphasis will be placed on protection and enhancement of native trout, especially through habitat maintenance or improvement and regulation to control harvest. At the same time, IDFG will continue to emphasize catchable programs on streams with good angler access, where return-to-the-creel is good, and where stocked fish do not affect the persistence of native fish. Hatchery fish are also used extensively to maintain reservoir and lake fisheries.

To minimize the potential for hatchery trout to hybridize with native cutthroat trout, the IDFG implemented a statewide triploid rainbow trout program in 2000. To be consistent, and to further reduce risks posed by hybridizing species, the IDFG has required private pond owners to stock only sterile fish in drainages where native cutthroat trout exist.

Presence of Other Fish Species

A significantly more important metric included in the 2009 status assessment was the information on the actual presence of other fish species, both native and non-native, currently occupying WCT habitat. In contrast to the 63% of habitat that did not have records of other fish being stocked, only 20% of stream habitats were judged to have no additional native or non-native fish (primarily salmonids) present (Figure 54).

Presence of native and non-native fish for the habitats currently occupied by WCT for each state shows a somewhat finer level of resolution (Table 28). In Idaho, brook trout and non-native rainbow trout are the two most prevalent non-native salmonids occupying the range of WCT. Native redband trout and Chinook salmon were tracked along with the presence of non-native species of significance. Both native redband trout and Chinook salmon were considered to have co-evolved with WCT and therefore, were not viewed as being incompatible. In general, non-native salmonids and other non-native fish species are viewed as negative stressors to WCT.

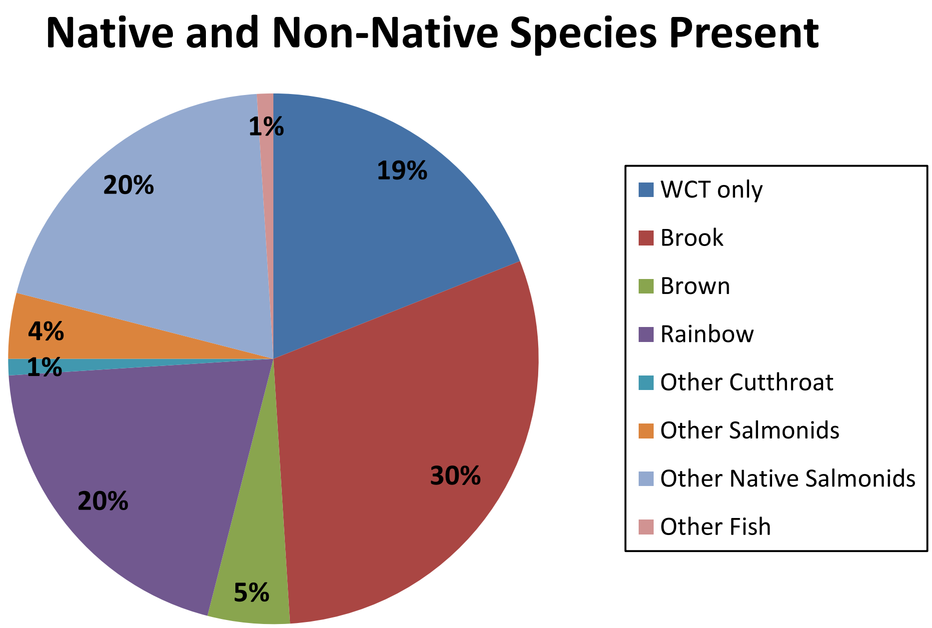

Figure 54. Native and non-native species present (primarily salmonids) within the current distribution of WCT based on the percentage of stream miles.

Table 28. Presence of native and non-native fish (primarily salmonids) within the occupied habitat for each state. Numbers represent a percentage of the stream km occupied.

State	Native	Brook	Brown	Rainbow	Other cutthroat	Other non-native salmonids	Other native salmonids	Other fish species
Idaho	16%	26%	<1%	19%	11%	<1%	34%	1%
Montana	29%	37%	9%	20%	1%	2%	---	2%
Oregon	55%	21%	---	2%	22%	---	---	---
Washington	4%	25%	5%	25%	1%	20%	28%	<1%
Wyoming	---	---	100%	---	---	---	---	---

Genetic Introgression

Genetic introgression poses a serious threat to WCT populations (Liknes and Graham 1988), and is a topic of much debate (Haig and Allendorf 2004; Allendorf et al. 2005). Introductions of non-native trout for fisheries management purposes have occurred throughout the range of WCT for many years. It is well documented that these introductions have often led to hybridization and introgression, a very serious, ongoing genetic hazard throughout much of the subspecies present range (Weigel et al. 2002, 2003; Leary et al. 1995; Boyer et al. 2008).

Genetics Associated with the Current Distribution – As of 2009, genetic sampling had been conducted on approximately 13,538 km (8,414 mi) of occupied habitats (25% of occupied habitats; Table 29). No evidence of introgression was found from samples covering about 6,932 km (4,308 mi) (51% of tested area and about 13% of the total occupied habitats). By comparison, the 2002 status assessment reported that genetic sampling had been conducted in over 9,814 km (6,100 mi) of occupied habitats (18% of occupied habitats) and no evidence of introgression was found from samples covering about 5,470 km (3,400 mi) (56% of the area tested and 10% of the total occupied habitats). Introgression, in varying degrees, was slightly different for the two reporting periods (Table 29). In 2009, WCT in about 16,571 km (10,299 mi) (31% of occupied habitats) were untested and viewed as being potentially unaltered because there were no records of stocking within the occupied stream segments and no evidence of hybridizing species being present. This contrasted with the 2002 information where 14,654 km (9,108 mi) (27%) of occupied habitat were not believed to be altered because there were no stocking records of hybridizing fish nor were hybridizing fish present.

Exploitation

WCT are highly susceptible to angling (MacPhee 1966; Lewynsky 1986; Behnke 2002). Relatively low fishing effort can produce high exploitation (Rieman and Apperson 1989). Fishing effort associated with documented declines in WCT on Kelly Creek and the Lochsa and Coeur d'Alene rivers, ranged from 100 to 200 hours/km (Lewynsky 1986). Over a number of decades, the IDFG has adopted restrictive fishing rules across much of the range of WCT in Idaho.

Table 29. Genetic status for WCT by stream km within the occupied habitat reported for 2002 and 2009.

	2002		2009	
Genetic Status	Stream km (mi)	% of occupied	Stream km (mi)	% of occupied
Tested, Unaltered	5,588 (3,473)	10.3	6,932 (4,308)	13
Tested; 1% to 10% introgression	1,985 (1,234)	3.7	3,286 (2,042)	6
Tested; 11% to 25% introgression	806 (501)	1.5	1,034 (643)	2
Tested; >25% introgression	1,480 (920)	2.7	926 (576)	2
Suspected unaltered	14,654 (9,108)	27.1	16,571 (10,299)	31
Potentially altered	27,812 (17,285)	51.5	23,584 (14,658)	44
Mixed stock; altered and unaltered	1,668 (1,037)	3.1	1,280 (796)	2
Unknown	---	---	380 (236)	<1
Totals	53,993 (33,557)	~100	54,057 (33,608)	~100

Water Quality

Every two years, the IDEQ is required by the federal Clean Water Act to conduct a comprehensive analysis of Idaho’s water bodies to determine whether they meet state water quality standards and support beneficial uses, or if additional pollution controls are needed. This analysis is summarized in an “Integrated Water Quality Monitoring and Assessment Report” (Integrated Report). IDEQ has prepared a draft 2012 Integrated Report that is due to go to public comment in Spring/Summer 2013. After public comment, the draft will be revised accordingly, and then submitted to the EPA. Once approved by EPA, the 2012 Integrated Report will replace the current 2010 Integrated Report.

The below mapping application interactively displays the results of the Final 2010 Integrated Report, 305B and 303(d) listed streams, with links to IDEQ’s monitoring data and EPA-approved total maximum daily loads (TMDLs).

http://mapcase.deq.idaho.gov/wq2010/

On this map server, water quality status in basins supporting WCT can be viewed by fourth-order HUC. For example, in the Clearwater River Basin, the Middle Fork Clearwater River is designated as “full support” for those waters that have been assessed. For those waters not assessed, that means that the IDEQ has not yet performed a Beneficial Use Reconnaissance Program assessment. There are no TMDLs issued for the Middle Fork Clearwater River, Upper Selway River, and Lower Selway River. However, for the Lochsa River there are several temperature listings. Temperature TMDLs have been prepared by the IDEQ for the Lochsa River fourth-order HUC and relevant tributaries and submitted to EPA for approval. However, no action has yet been taken by EPA.

Approved TMDLs for specific stream reaches that support WCT in fourth-order HUCs includes the following:

Clearwater	17060306
Coeur d'Alene Lake	17010303
Lemhi	17060204
Little Salmon	17060210
Lochsa	17060303
Lower Clark Fork	17010213
Lower Kootenai	17010104
Lower Middle Fork Salmon	17060206
Lower North Fork Clearwater	17060308
Lower Salmon	17060209
Middle Salmon-Chamberlain	17060207
Middle Salmon-Panther	17060203
Moyie	17010105
Pahsimeroi	17060202
Pend Oreille	17010216
Pend Oreille Lake	17010214
Priest	17010215
South Fork Clearwater	17060305
South Fork Coeur d'Alene	17010302
South Fork Salmon	17060208
St. Joe	17010304
Upper Coeur d'Alene	17010301
Upper Middle Fork Salmon	17060205
Upper North Fork Clearwater	17060307
Upper Salmon	17060201
Upper Spokane	17010305

For further information regarding the actual TMDLs that apply and the load reductions prescribed, see IDEQ's Table of Subbasin Assessments, TMDLs, and Implementation Plans at
http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls.aspx.

Climate Change

Climate change may play an important role in restricting the distribution of WCT populations in the future. WCT prefer cold water. The primary distribution of rearing cutthroat trout populations is often in the headwater reaches of drainage basins. As an example, Mullan et al. (1992) speculated that warmer temperatures associated with climate change would result in further restriction of cutthroat trout in the Methow River basin of Washington. WCT have a broader range and occupy more watersheds than any other native salmonid in Idaho. Haak et al. (2010) suggested that WCT occupied habitat is at a low risk for increasing summer temperatures and moderate risk for drought, but that risk of winter flooding and wildfire are more variable across basins.

Due to global climate change, winter and spring temperatures have generally increased in western North America during the Twentieth Century and there is evidence that this warming has produced changes to stream hydrology and may be reflected in changes in biota. The timing of spring snowmelt has generally shifted to earlier in the year. Researchers studying global warming predict snowpack will continue to decline and the rate of decrease may accelerate (Leung et al. 2004; Mote et al. 2005; Stewart et al. 2005; Regonda et al. 2005). In addition, Regonda et al. (2005) used models to predict a trend towards a decrease in snow water equivalent and a general increase in winter precipitation in the form of rain in the western United States, particularly at lower elevations. Warming temperatures may geographically isolate cold water stream fish in increasingly confined headwater reaches (Hauer et al. 1997). These predicted climatic changes may have an impact upon WCT populations throughout their range, particularly those populations that persist in streams with already limited water resources by further limiting available habitat and decreasing connectivity (Fausch et al. 2002).

Climate change will likely interact with other stressors, such as habitat loss and fragmentation (Rieman et al. 2007; Porter and Nelitz 2009); forest fire (Isaak et al. 2010); invasions of non-native fish (Rahel et al. 2008; Wenger et al. 2011a); diseases and parasites (McCullough et al. 2009); predators and competitors (McMahon et al. 2007; Rahel et al. 2008); and flow alteration (McCullough et al. 2009; Wenger et al. 2011b), rendering some current spawning, rearing, and migratory habitats marginal or wholly unsuitable.

Rieman and Isaak (2010) and other authors (e.g., Furniss et al. 2010; Bisson 2008) provide some general guidance on how natural resource managers might respond to climate change. They cite examples of management options that could support adaptation of native salmonid populations and stream communities to the effects of climate change. Based on the scientific literature (e.g., Noss 2001; Bisson et al. 2009), adaptation to restore or conserve resistant and resilient native fish populations can be distilled into four key areas: reduce non-climate stresses, conserve and expand critical habitats, reconnect streams and habitats, and conserve genetic and phenotypic diversity. We believe this approach will provide effective conservation of WCT habitats and populations in the face of a changing climate.

Population Trends and Extinction Risk

Quantitative evaluations of extinction risk for WCT populations using Population Viability Analysis have been limited. McIntyre and Rieman (1995) summarized data for six WCT populations in Idaho and Montana and calculated variances of infinitesimal rate of growth. The authors used the modeling approach of Dennis et al. (1991) and concluded that stochastic extinction risk will increase dramatically for populations that drop to fewer than 2,000 individuals. McIntyre and Rieman (1995) assumed their study populations varied around equilibrium with no long-term trend in population number. Their results represent risk associated with random and not deterministic factors. Shepard et al. (1997) used a Bayesian modeling approach to estimate extinction risk for 144 WCT populations in the upper Missouri River basin in Montana. Ninety percent of the populations evaluated had a high or very high probability of going extinct during 100 years based on model projections.

Schill et al. (2004) summarized data for 10 WCT populations in Idaho and used the modeling approach of Dennis et al. (1991) to estimate population persistence. Estimates of population persistence for 100 years ranged from high to low for various individual local populations; however, results suggested that numerous large sub-populations, available to interact in a classic or less traditional metapopulation framework, would result in a high (>95%) probability of persistence over 100 years in many instances. Estimated instantaneous rates of change (μ) for WCT populations in these 10 Idaho systems ranged from -0.059 to 0.1643. Eight of 10 estimates were positive, implying increased population growth for the Middle Fork Salmon River, St. Joe River, Coeur d'Alene River, Selway River, Clearwater River, Lower

Salmon River, South Fork Clearwater River, and Upper Salmon River. Instantaneous rates of change were negative for the Lochsa River and South Fork Salmon River, suggesting negative population growth.

Extinction risks related to random variation of populations appear to be an important cause for concern (McIntyre and Rieman 1995). Extinction of many isolated populations may be unavoidable. Effective conservation of WCT will probably require the maintenance or restoration of well-connected mosaics of habitat (Frissell et al. 1993; Rieman et al. 1993; Rieman and McIntyre 1993).

Based on the 2009 range-wide status assessment, WCT occupy an estimated 80% of their historical range in Idaho (May 2009). It is suspected this is the case because much of the core WCT habitat in Idaho is contained within federally protected lands designated as wilderness, roadless areas, or national forests. In other states within the range of occupation of WCT, habitat degradation has taken a significant toll on distribution and abundance of the subspecies combined with negative non-native species interactions.

Fishing Rules

Since WCT populations are highly susceptible to exploitation by angling, special rules are the norm in Idaho. The IDFG has progressively taken steps to conserve and better manage native cutthroat trout populations. Pioneering research in the late 1960s and early 1970s in north Idaho on Kelly Creek, the St. Joe River, and the Lochsa River documented significant benefits to cutthroat trout populations from either catch-and-release or restrictive bag and size limits. In general, fishing rules are designed to allow WCT populations to be healthy and productive within the confines of the habitat carrying capacity.

Fish Stocking

Stocking has long been an integral part of the IDFG fisheries management program within the range of WCT. The IDFG's Fisheries Management Plan states, "...fish will be stocked as appropriate to preserve, establish, or reestablish depleted fish populations and to provide angling opportunity to the general public" (IDFG 2013). The IDFG instituted a state-wide policy of stocking only sterile rainbow trout in 2000. Additionally, non-native species of fish will only be introduced in waters where they are not expected to adversely impact native fish.

One of the more pervasive threats to WCT is introgressive hybridization with non-native rainbow trout stocks. The IDFG will continue to monitor introgression levels in WCT populations.

WCT are an important part of the IDFG's mountain lake stocking program. The IDFG rears WCT fry at Ashton, Cabinet Gorge, Mackay, McCall, and Sawtooth fish hatcheries. During the period 2008-2012, the IDFG produced on average 165,270 WCT fry compared to an average of 74,413 rainbow trout fry for mountain lakes stocking. The IDFG strives to minimize or avoid any adverse impacts to downstream stocks of native salmonids with implementation of its mountain lakes management program.

Restoring Connectivity

Prior to the intensive development of land and water resources in Idaho, it is likely that WCT had fairly unconstrained access to much of their historical range. Full connectivity cannot feasibly be restored to conditions that existed historically, nor is that the intent of this management plan. Existing dams and irrigation diversions will in all likelihood remain in place and many stream and river systems are degraded to the point where restoration will prove difficult. The IDFG will collaborate with other parties to restore connectivity in drainages where significant benefits to the subspecies can be realized.

Genetic Considerations in Management and Conservation

The IDFG is a participant in a multi-state position paper on genetic considerations concerning cutthroat trout management (UDWR 2000). This position paper indicates that cutthroat trout management includes two distinct but equally important components that must be addressed. These components include the conservation element and the sport fishery or recreational element. Further, the position paper indicates that there are two components of cutthroat trout conservation: 1) preservation and management of genetically pure populations referred to as *core conservation populations*, and 2) *conservation populations* which may be slightly introgressed but maintain the appropriate phenotypic characters of the subspecies with unique ecological, behavioral, or genetic traits.

The IDFG's primary management goal for core conservation populations is to facilitate the long-term persistence of cutthroat trout subspecies in a genetically pure strain condition. Core conservation populations will serve as the primary source of gametes for introductions and reintroductions through transplants and broodstock development, and will be comprised of individuals that have been determined to be >99% pure from a genetic standpoint, and phenotypically true to the subspecies. For range expansion purposes, the IDFG will take care to utilize only those populations that exhibit desirable population characteristics such as large population size, full representation of age classes, and successful annual reproduction. Potential management options related to conservation and preservation of core conservation populations may include: 1) prevention of all non-native fish stocking or alternatively the stocking of only sterile hatchery fish, 2) managing sport fishing and harvest, 3) removal or suppression of non-native competitors, 4) habitat restoration and enhancement, 5) removal of gametes and individuals for genetic founders in range expansion efforts, and 6) collection of gametes for broodstock development.

To ensure the long-term persistence of core conservation populations, the IDFG will strive to maintain metapopulations. High quality habitat that maintains connectivity is an essential component contributing towards the viability and survival of metapopulations, and optimization of habitat is imperative.

WCT coevolved with *O. mykiss gairdneri* in the Salmon and Clearwater river basins of Idaho without significant introgressive hybridization (Kozfkay et al. 2007). The two species' distributions also overlap in the Kootenai River basin. In Idaho, the distribution of the two species overlaps in an estimated 9,764 km (6,066 mi). Where natural introgression occurs between the two species within the historical range of WCT, the IDFG may opt to classify cutthroat trout populations as core.

For conservation populations, the IDFG's primary management goal is to preserve and conserve unique ecological and behavioral characteristics of the subspecies that exist on a population by population basis. Conservation populations retain all of the phenotypic attributes associated with the subspecies, although they exist in a slightly introgressed condition. In general, conservation populations possess less than 10% non-native species alleles, but introgression may be greater or extend to a higher level (e.g., up to 20%) depending upon the management circumstances and the values and attributes to be preserved (UDWR 2000; USFWS 2003). The unique ecological, behavioral, and genetic attributes may include: 1) the presence of migratory life histories, 2) genetic predisposition for large size, and

3) ecological adaptations to unique or extreme environmental conditions. There is a high probability that certain of these attributes are genetically linked to some degree.

Potential management options for conservation populations are the same as for core conservation populations. Conservation populations can be considered as sources for introductions or reintroductions if the objective is to duplicate the unique genetic, ecological, or behavioral attributes. The long-term persistence of conservation populations will be enhanced by the development of metapopulations and optimizing habitat conditions. Conservation populations may be targeted for conversion to core conservation populations by eradicating existing fish and subsequent reintroduction or genetic replacement.

As per Utah Division of Wildlife Resources (2000), a third group of fish was referred to as sportfish populations. For the sake of WCT management and conservation, the IDFG will refer to these populations as hybridized. The focus of this group of populations is primarily for recreational benefit to the public versus conservation. This group of populations falls outside of the stringent introgression benchmarks cited by Utah Division of Wildlife Resources (2000) for core conservation and conservation populations. Hybridized populations may or may not meet the subspecies phenotypic expression defined by morphological and meristic characters of cutthroat trout.

The IDFG generally will require specific information on the genetic status of WCT before designating populations as core conservation, conservation, or hybridized populations, and subsequently determining the appropriate management scenarios. However, in many instances we lack specific genetic status information, so for the sake of this management plan, we err on the side of being conservative. For example, where a river basin had a past history of fish stocking with non-native salmonids that posed a hybridization risk, but where stocking has not occurred for many years and hybridization/introgression has not been documented, we chose to designate populations as potentially core conservation/conservation versus core conservation (genetically pure) because of uncertainty. As genetic information becomes available, we can update these population designations and management scenarios.

General Management Actions

The 2009 range-wide status assessment for WCT (May 2009) served as a catalyst in providing the necessary updated “baseline” information for completion of this management plan. The long-term assessment of many populations of WCT over large landscapes in Idaho is difficult to sustain. However, the IDFG will continue collaborating with its partners to assess the status of the subspecies by conducting monitoring of occupied river basins. We will focus our efforts on assessing habitat quality, population status, habitat connectivity, and genetic status.

General statewide management actions proposed by the IDFG to meet the goals and objectives for this WCT management plan are described below.

1. Reestablish WCT in historically occupied habitats where they are no longer supported. Consider reestablishing WCT in areas within their historical range where they have been extirpated. Some of the factors that will need to be considered during planning include: 1) amount of survey work completed to document WCT status, 2) existing habitat suitability and condition, 3) presence/absence of non-native species, 4) feasibility of removing or suppressing non-native

species, 5) suitable donor populations, 6) project cost and likelihood of success, and 7) priority of the restoration project relative to other projects.

2. Reduce negative impacts of non-native fish on WCT populations. Assess the feasibility of suppressing or removing non-native fish species in watersheds where it would clearly benefit WCT. Strategies that can reduce non-native fish impacts include chemical renovations, liberalized angler harvest, changes in fish stocking practices, mechanical removal (e.g., electrofishing, nets), and improving degraded habitat conditions that could be favoring non-native fish. The IDFG will collaborate with neighboring state fish and wildlife agencies to prevent the spread and proliferation of harmful non-native species that may prey upon WCT (e.g., walleye, northern pike). Management agencies will need to consider the desires of anglers in their decisions about whether or not to remove non-native fish such as brook trout, brown trout, or rainbow trout since these are desired species in many instances. Also, it is impossible to remove undesirable species in all instances so programs have to be well targeted and prioritized.
3. Identify fish passage barriers. Complete fish passage surveys in all river basins within the range of WCT in Idaho. The IDFG will coordinate and consult with land management agencies and private landowners to provide fish passage. Connecting populations of WCT is a priority, but in some circumstances barriers prevent active expansion of non-native fish species and will be considered in decision-making (see Fausch et al. 2006).
4. Screen irrigation diversions. Complete irrigation diversion assessments that identify sites that adversely impact WCT populations. Identify and cooperate with willing landowners and irrigation companies in screening projects. Seek cooperative partnerships with other agencies and parties to secure funding for projects.
5. Improve watershed habitat. Work with federal land management agencies to conduct watershed analyses in important habitat areas currently not surveyed to provide a local data clearinghouse, and to derive restoration opportunities through the comparison of past and current conditions. The IDFG will coordinate with land management agencies and private landowners to identify streams that will benefit from riparian and stream channel restoration activities and/or modified land management activities. Work with agencies, water users, and other parties to restore adequate stream flows in those reaches partially or completely dewatered.
6. Promote recreational fishing opportunities for WCT. Better promote the existing angling opportunities for WCT populations. Benefits of doing so could include better engaging the public in long-term conservation efforts.
7. Continue doing genetic analyses. Complete genetic analyses for all WCT populations in Idaho. This will be a daunting task, but according to the 2009 range-wide status assessment, the length of stream where genetic information is now available has doubled since 2002. The IDFG believes collecting this information to document the genetic status of WCT populations is critical to the long-term management and conservation of the subspecies.
8. Continue monitoring WCT populations. The IDFG monitors WCT population status and trends in key river basins throughout its range (e.g., Coeur d'Alene River, St. Joe River, and Middle Fork Salmon River). This is necessary to document long-term population trends.
9. Maintain the existing range-wide database for WCT and continue to update the IDFG internal database. A comprehensive database was recently updated during the 2009 range-wide status assessment performed for WCT (May 2009). This multiple state effort was funded by a grant from the Western Native Trout Initiative to update the previous 2002 status assessment. The IDFG is the lead agency responsible for undertaking the range-wide status assessment and database update. This is normally done every five years. However, this range-wide database

does not capture a number of quantitative measures normally associated with population surveys. The IDFG has developed an internal database where data regarding WCT populations is housed. This information is updated annually.

10. Public Outreach. Continue public outreach and education efforts directed at native fish conservation including WCT. In order for the IDFG to be successful in our efforts to conserve WCT, we must enhance public understanding and support.

Management Priorities and Actions

The IDFG proposes a number of management actions within each GMU to benefit populations of WCT. This will be an ongoing assessment and management actions will evolve over time. The IDFG will consider population and genetic status and the primary limiting factors when making decisions about what management actions to explore and implement. Core conservation and conservation populations, because they are the repositories of genetic material for the subspecies, will receive the highest priority in management decisions. In most cases, the current restrictive angling rules for cutthroat trout in Idaho should provide ample protection. However, we recommend that depressed populations, except those with adequate connectivity, whether core conservation or conservation, should be protected from harvest.

The top priority of the IDFG for WCT conservation is habitat protection and enhancement, particularly for core conservation and conservation populations. The IDFG's regional fishery management staff will work with other agencies and stakeholders to identify and implement habitat enhancement measures across the range of WCT in Idaho. IDFG headquarters staff will assist with identifying funding sources and planning and implementing projects.

Where connectivity can feasibly be restored between populations, it should be pursued except where it may increase the risk to core conservation populations from invasions by non-native species (e.g., brook trout). Where it is not deemed practical to reconnect small, isolated populations, or where establishing connectivity creates the risk of non-native species invasions, translocations should be considered as an alternative to maintain or enhance genetic diversity until non-native species can feasibly be removed and connectivity is restored.

Decisions on whether to leave a small population of WCT isolated will be made by examining the overall risk factors to populations within the drainage and weighing the likelihood of future connectivity against the risks of isolation. Fausch et al. (2006) provide a review of the state of knowledge regarding factors that affect the tradeoff between invasion by non-native species and isolation (from constructed barriers), and present a framework for analyzing and prioritizing conservation actions.

One of the possible management actions for protecting small core conservation populations is limiting upstream movement by installing migration barriers. Installing upstream migration barriers should only be viewed as a short-term conservation measure to protect the genetic integrity of core conservation populations, and then only after a complete genetic inventory of the GMU. Maintaining migratory behavior is likely as important as maintaining genetic purity over the long term.

Supplementing small populations of WCT to maintain or enhance genetic diversity will be pursued only after very careful assessment of the stocking source to ensure its genetic purity.

When there is no genetic information on particular populations, we will manage them conservatively and treat them like core conservation populations until we have the necessary data on genetic status. Similarly, where introgression is a possibility or likely, the population will be treated as a conservation population until genetic information is gathered.

While management actions should be done to benefit WCT populations on a prioritized basis, the IDFG and other stakeholders should continue to undertake important but opportunistic conservation actions. This is especially true of potential opportunities on private lands. The management actions that follow in this plan are not comprehensive and undoubtedly, further opportunities will be explored. Priority rankings (1, 2, and 3) in the tables are meant to provide some guidance for IDFG staff to pursue these projects based on the presumed level of importance for providing conservation benefits to WCT.

PROPOSED CONSERVATION ACTIONS FOR WCT BY GMU

North Idaho River Basins

Moyie River GMU

The healthy populations of cutthroat trout in the Moyie River GMU are restricted to resident populations in tributaries. Little interchange between local populations likely occurs. Rebuilding the fluvial cutthroat trout population in the Moyie River would require resources and public support well beyond what is currently available. The absence of fluvial cutthroat trout in the mainstem Moyie River can likely be attributed to several factors including competition with rainbow trout and brook trout, loss of access to lower reaches of tributaries, degraded mainstem habitat, and high historical fishing mortality. Both rainbow trout and brook trout have been found to displace WCT from river and stream habitat (Griffith 1970; Behnke 1992), and these species are the most abundant salmonids in the river. Loss of pool habitat and large woody debris has likely resulted from past logging and floodplain development (railroads, roads, homes; IDEQ 2006).

To be successful, any effort to restore a viable fluvial population would entail reducing the rainbow trout and brook trout population, improving access to tributary streams, improving mainstem habitat, and restricting cutthroat trout harvest. Recognizing these limitations, cutthroat trout conservation efforts are focused on maintaining and improving habitat supporting resident populations, while at the same time, working to provide passage over artificial barriers (Table 30).

Each modification of existing passage barriers warrants careful consideration of the risks and benefits to the resident cutthroat trout populations upstream. The 2005 genetic evaluation indicated that introgression levels (% rainbow trout alleles detected out of total) in Moyie River tributaries were low. No sites had observed rainbow trout introgression levels greater than 2.34%, and no individual fish with genotypes indicative of rainbow trout or F1 hybrids were detected. The likelihood of exposing these relatively pure cutthroat trout to introgressive hybridization with fluvial Moyie River rainbow trout will need to be weighed against the risk of loss of local populations to stochastic events. In the event that the risk of improving upstream passage is considered high, genetic diversity will be monitored and maintained through translocations, if necessary.

Table 30. Conservation actions for WCT in the Moyie River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Moyie River	Hybridized	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	3	Ongoing
Moyie River	Hybridized	Periodically evaluate mainstem salmonid density and relative abundance.	3	Ongoing
Moyie River drainage	Core	Work with land managers through technical comment process to minimize detrimental impacts associated with development, timber harvest, and road construction.	2	Ongoing
Moyie River tributaries	Core	Complete fish passage barrier assessment and identify opportunities to improve connectivity for fluvial populations.	2	Long-term
Moyie River tributaries	Core	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence.	2	Ongoing

Lower Kootenai River GMU

Not unlike the Moyie River GMU, the lower Kootenai River GMU contains several healthy populations of WCT, but most are resident populations located in tributaries. Metapopulation interchange between local populations likely occurs on a larger scale, given the size of many of the tributary drainages. Given the dominance of rainbow trout in habitats supporting a fluvial life history, cutthroat trout conservation efforts in the GMU are primarily focused on maintaining and improving habitat supporting resident populations in tributaries (Table 31). Nevertheless, nutrient restoration and mainstem habitat enhancement projects have the potential to improve the existing fluvial cutthroat trout population.

Priest River-Lakes GMU

Although healthy populations of resident cutthroat trout exist in streams throughout the GMU, fluvial and adfluvial populations are depressed. Restoring the once abundant migratory populations of cutthroat trout in this watershed will require both improvements to habitat and successful control of non-native species. Many tributaries are dominated by brook trout, which can adversely impact cutthroat trout. Evidence from Yellowstone Lake and elsewhere suggest lake trout populations in both Priest and Upper Priest lakes are likely adversely impacting adfluvial cutthroat trout in the Priest drainage. Road construction has confined many streams in the basin to narrow, linear channels with minimal riparian vegetation. Road crossings and inadequate culverts have created fish passage barriers in tributaries to the Priest River. Intensive logging, large stand replacing fires, and white pine blister rust have significantly altered the species composition and age structure of the timber in the basin over the

Table 31. Conservation actions for WCT in the Lower Kootenai River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Kootenai River	Hybridized	Continue nutrient restoration program.	2	Long-term
Kootenai River	Hybridized	Work with Kootenai Tribe to evaluate impacts and benefits of side-channel restoration projects.	3	Long-term
Kootenai River tributaries	Core	Work with land managers through technical comment process to minimize detrimental impacts associated with land development, timber harvest, and road construction.	2	Ongoing
Kootenai River	Hybridized	Periodically monitor mainstem fish populations to evaluate trends in abundance.	2	Ongoing
Kootenai River tributaries	Core	Complete fish passage barrier assessment and identify opportunities to improve connectivity for fluvial populations.	1	Long-term
Kootenai River tributaries	Core	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence.	2	Ongoing
Kootenai River tributaries	Core	Manage with conservative regulations to ensure angling mortality does not have detrimental impacts.	2	Ongoing

last 100+ years. Development of road systems associated with timber harvest has contributed to increased transport of disturbed soils and fine sediments, resulting in sand deposits in many of the tributary streams. These alterations to the habitat have negatively impacted cutthroat trout and allowed non-native brook trout to become the dominant salmonid in many impacted streams. Brook trout can reproduce in relatively fine sediments, whereas cutthroat trout reproduction is limited to the few remaining areas with clean gravels. Elevated summer water temperatures and lack of thermal refugia in the mainstem Priest River limit the fluvial cutthroat trout population. Elevated water temperatures are further exacerbated by the construction and operation of an outlet dam on Priest Lake, which creates an artificially shallow area with a high retention time. The dam also creates at least a seasonal migration barrier for cutthroat trout.

A watershed-level habitat survey would be useful to define stream conditions, identify fish passage barriers, and help prioritize future efforts to reduce brook trout and restore WCT (Table 32). Streams or stream sections with clean gravel substrates need to be given high priority for protection from further impacts due to sedimentation. Natural barriers need to be defined, and fish populations surveyed above and below barriers. These barriers may provide natural upstream refuges for native cutthroat trout that could be used to reseed downstream areas as habitat conditions are restored and brook trout are reduced.

Table 32. Conservation actions for WCT in the Priest River-Lakes GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Priest and Upper Priest lakes	Core	Investigate biological and social potential to suppress lake trout to decrease predation on adfluvial populations.	1	Short-term
Priest and Upper Priest lakes	Core	Manage non-native predators with liberal regulations to encourage harvest.	2	Ongoing
Drainage-wide	Core	Complete watershed level habitat and barrier assessment. Combine with fish population surveys to identify priority areas to focus restoration efforts.	2	Long-term
Drainage-wide	Core	Identify areas where brook trout removal can be efficiently conducted with a high probability of long-term success.	2	Long-term
Drainage-wide	Core	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence.	2	Ongoing
Lower Priest River	Core	Work cooperatively with agency, tribal, and mitigation partners to enhance coldwater sources in the lower Priest River.	1	Long-term
Priest River (below Priest Lake)	Core	Evaluate the feasibility of seasonal coldwater withdrawal from Priest Lake to decrease water temperatures in the Priest River and create thermal refugia. Implement if feasible, practical, and socially acceptable.	1	Short-term
Priest River (below Priest Lake)	Core	Periodically monitor cutthroat trout population through electrofishing and snorkel surveys.	1	Ongoing
Priest River drainage (below Priest Lake)	Core	Work with Kalispel Tribal research program on telemetry project to better understand habitat use and migration patterns of cutthroat trout in the drainage.	1	Short-term

Pend Oreille/Clark Fork GMU

The Pend Oreille/Clark Fork GMU contains numerous healthy populations of cutthroat trout, exhibiting adfluvial and resident life history patterns. Lake trout have likely represented the greatest threat to the adfluvial cutthroat trout population in recent years. Effective lake trout suppression will be a vital component of ensuring persistence of a healthy adfluvial cutthroat trout population (Table 33). The IDFG will continue annual suppression efforts while developing a “maintenance netting” strategy to prevent the lake trout population from reestablishing. Though other non-native predators, including smallmouth bass and walleye potentially may impact adfluvial cutthroat trout populations, management actions to effectively control these species and minimize predation have yet to be identified.

Table 33. Conservation actions for WCT in the Pend Oreille/Clark Fork GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Lake Pend Oreille	Conservation	Remove non-native lake trout using angler incentive and commercial netting equipment; develop a long-term netting strategy.	1	Ongoing
Lake Pend Oreille	Conservation	Evaluate in-lake survival of cutthroat trout through PIT tag marking of juvenile outmigrants.	2	Long-term
Pend Oreille Lake and River	Conservation	Manage smallmouth and walleye with liberal regulations to encourage harvest.	2	Ongoing
Lake Pend Oreille tributaries	Conservation	Identify streams where Gerrard rainbow trout are produced and determine the necessary amount of stream habitat to maintain the trophy rainbow trout fishery; manage the remainder of streams entirely for cutthroat trout.	1	Long-term
Pack River and tributaries	Conservation	Evaluate genetic composition of *Oncorhynchus* spp. to determine extent of hybridization/ introgression and if rainbow trout are primarily of Gerrard stock.	1	Short-term
Granite Creek	Conservation	Maintain channel complexity and connectivity through maintenance of habitat restoration structures and property acquisitions in lower Granite Creek.	1	Long-term
Lake Pend Oreille, Pack River, and Lightning Creek tributaries	Conservation	Continue periodic electrofishing surveys to monitor cutthroat trout distribution and abundance on 2-3 year interval.	1	Ongoing
Porcupine Lake and Creek	Core	Continue to monitor effectiveness of 2011 rotenone treatment to ensure brook trout do not reestablish in Porcupine Creek headwaters.	2	Short-term
Pend Oreille drainage	Core	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	2	Ongoing
Lake Pend Oreille, Pack River, and Lightning Creek tributaries	Conservation	Work with land managers through technical comment process to minimize detrimental impacts associated with development, timber harvest, and road construction.	2	Ongoing
Lower Clark Fork River and tributaries	Core	Identify feasible opportunities to reduce pathogen concerns in support of cutthroat trout passage at Cabinet Gorge Dam.	2	Short-term
Lower Clark Fork River and tributaries	Core	Survey pathogen presence to identify existing threat of passing WCT at Cabinet Gorge Dam into Montana waters.	1	Short-term
Lake Pen Oreille tributaries	Core	Identify source migratory cutthroat trout populations to enable targeted habitat enhancement.	2	Short-term
Pend Oreille drainage	Core	Manage with conservative regulations to ensure angling mortality does not have detrimental impacts to cutthroat trout population.	2	Ongoing

Introgression represents an additional significant risk to the adfluvial population. Much of the sport fishery in Lake Pend Oreille is focused on non-native Gerrard rainbow trout. Prior to and following the introduction of Gerrard strain rainbow trout, coastal rainbow trout were stocked throughout the drainage for several decades. The primary spawning and rearing streams for Gerrard rainbow trout are thought to be Lightning Creek, Grouse Creek, and the Upper Pack River. Extensive electrofishing surveys throughout the drainage have documented rainbow trout in several other streams, where Gerrard rainbow trout are not known to spawn, such as Twin, Strong, and Trestle creeks. Considering the history of stocking in the drainage, many of these populations are likely from coastal stocks. Coastal rainbow populations likely pose the greatest hybridization risk to cutthroat trout, and do little to enhance the sport fishery in Lake Pend Oreille. For these reasons, IDFG has initiated an effort to better understand the distribution and genetic characteristics of rainbow trout spawning throughout the drainage. Ideally, rainbow trout distribution could be confined to the limited number of streams needed to support the trophy Gerrard rainbow trout fishery in Lake Pend Oreille, and the remaining streams would be reserved for cutthroat trout.

Restoring connectivity on both a large and small scale basis will ensure retention of adfluvial and fluvial life history forms, and maintain genetic diversity and integrity (Table 33). Conservation of key habitats through easements or acquisition, and restoration projects on important spawning and rearing streams will continue to be a focus of the CFSA mitigation program. Ultimately, fish passage facilities over Albeni Falls and Cabinet Gorge dams will help restore diverse life history forms.

Upper Spokane River GMU

Most of the streams in the Upper Spokane River GMU are limited by stream flow and fine sediments. Not independent of these factors, brook trout are dominant in many of the streams. In those streams with flows that terminate in the Rathdrum Aquifer (Sage, Lewellyn, and Lost creeks), restoration of cutthroat trout would likely require chemical eradication of brook trout. A thorough inventory of the streams is needed to evaluate potential and prioritize management actions. In streams connected to lakes (Fish Creek, Brickel Creek, Hayden Lake tributaries), eradication of brook trout is unlikely, given the high probability of recolonization. Nevertheless, an inventory of fish populations and distribution is needed to evaluate management alternatives (Table 34).

Coeur d'Alene Basin GMU

Improving the WCT populations in the Coeur d'Alene River system will require watershed-level restoration efforts (Table 35). An estimated 1,592 stream miles are in the Coeur d'Alene River system of which 1,519 miles (~95%) are occupied by WCT. This system has been destabilized by a combination of historical fires, intensive logging, mining, and road/railroad construction over the last 100+ years. The result is an unstable river system with large amounts of gravel and cobble moving out of many of the tributary streams into the mainstem river, causing an aggradation or build-up of the river-bed, and generally unstable substrate material that has filled in many of the pools. Even with active restoration, portions of the drainage, such as Prichard Creek, may require 100+ years of vegetative re-growth to restore the large woody debris and associated channel stability.

Table 34. Conservation actions for WCT in the Upper Spokane River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Hayden Lake	Hybridized	Manage cutthroat trout as wild population and periodically assess abundance and genetic integrity of spawning population.	2	Ongoing
Hayden Lake	Hybridized	Manage northern pike and smallmouth bass with liberal regulations to encourage harvest.	3	Ongoing
Upper Spokane GMU, drainage-wide	Conservation/ hybridized	Work with land managers through technical comment process to minimize detrimental impacts associated with development, timber harvest and road construction.	2	Ongoing
Sage, Lewellyn, and Lost creeks	Core	Complete inventory of fish populations and distribution in these drainages.	2	Long-term
Brickel and Fish creeks	Conservation/ hybridized	Complete inventory of fish populations and distribution in these drainages.	2	Long-term

Table 35. Conservation actions for WCT in the Coeur d'Alene Basin GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Coeur d'Alene Basin, drainage-wide	Conservation/ core	Use Asarco, Hecla, and Avista mitigation funds to identify, acquire, and or improve key cutthroat trout habitats within the drainage.	1	Long-term
Coeur d'Alene Basin, drainage-wide	Conservation/ core	Provide liberal harvest opportunity on rainbow trout and brook trout to minimize risk of introgression and competition.	2	Ongoing
Coeur d'Alene Basin, drainage-wide	Conservation/ core	Manage with conservative regulations to ensure angling mortality does not have detrimental impacts to populations.	1	Ongoing
Coeur d'Alene Basin, drainage-wide	Conservation/ core	Improve public understanding of cutthroat trout identification and importance of habitat through Avista public outreach program.	2	Long-term
Coeur d'Alene Basin, drainage-wide	Conservation/ core	Work with land managers through technical comment process to minimize detrimental impacts associated with recreational property development, timber harvest and road construction.	2	Ongoing
Coeur d'Alene River, SF Coeur d'Alene River, St. Joe River	Conservation/ core	Monitor trends in abundance through periodic snorkel surveys at established transects.	1	Ongoing
Coeur d'Alene Lake	Conservation	Work with the Coeur d'Alene Tribe and University of Idaho to assess impacts of non-native predators on cutthroat trout in Coeur d'Alene Lake.	2	Short-term
Coeur d'Alene Lake, lower St. Joe River and lower Coeur d'Alene River	Conservation	Provide liberal harvest opportunity on northern pike and smallmouth bass to encourage harvest.	3	Ongoing
Marble Creek	Core	Provide fish passage over uppermost splash dams to restore genetic interchange and expression of life history forms.	1	Short-term
Coeur d'Alene and St. Joe River drainage	Core	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	2	Ongoing

Protecting the lower reaches of the St. Joe and Coeur d'Alene rivers from floodplain development will be important in maintaining and restoring a functional riparian corridor and providing the shade needed to help stabilize water temperatures and provide for thermal refuges. Key areas near the mouths of tributary streams and side channels with adjoining wetlands provide the thermal refuges important for larger migratory cutthroat trout in the Coeur d'Alene River. In much of the Coeur d'Alene River system, water temperatures can fluctuate over 10^{o}C on a day/night cycle and exceed 24^{o}C during mid-summer. The mean weekly temperature maximums will need to be reduced to less than 18^{o}C and the daily fluctuations to less than 10°C to improve cutthroat production. In addition to the watershed restoration mentioned above, this will require restoring a healthy vegetative corridor on river-banks. Temperature modeling of the mainstem river system may provide some guidance on the amount of vegetation and width/depth ratios needed to reduce the extremes during mid-summer.

Metal concentrations still limit invertebrate and fish populations in sections of the South Fork Coeur d'Alene River. As natural processes are restored in the watershed, combined with site-specific clean-up efforts, fish productivity is expected to continue to improve. Fish can now move through most of the river system under certain flow conditions. Many confined areas along the South Fork Coeur d'Alene River will not naturally stabilize because of the loss of floodplain and loss of natural river meanders. The interstate highway, mining impacts, and commercial and residential development has so restricted the river corridor that natural floodplains and natural river meander patterns can no longer be established. Much of the South Fork Coeur d'Alene River will require artificial energy dissipation structures to provide pools, manage bedload movement, and provide stable areas for cottonwoods and willows to reestablish.

Headwaters of the St. Maries River drainage generally have suitable water temperatures for cutthroat trout, but lower areas in the drainage become marginally warm. Road construction is significant in the St. Maries River drainage, with culverts blocking access on several tributary streams. Because of the low gradient and private land ownership, improving streams in the lower part of the drainage will require working with private landowners on timber and grazing management.

Non-native fish impacts in the GMU are primarily being managed through rules and promotion of harvest. In Coeur d'Alene Lake, liberal rules encourage harvest of smallmouth bass and northern pike. Though angler exploitation seems effective at maintaining northern pike at relatively low densities, anglers have little impact on smallmouth bass. Because of age-at-maturity and fecundity, active suppression efforts are unlikely to be effective.

Brook trout are present throughout much of the GMU but do not appear to be expanding their range and most populations have established in altered habitat. As habitat conditions are restored, efforts to reduce or eliminate brook trout from mountain lakes may assist in restoring cutthroat trout in high gradient streams below the lakes. Brook trout are managed with liberal bag limits, although angler exploitation is not believed to be a significant factor in affecting populations. It is expected that cutthroat trout will continue to increase in abundance in the mainstem river and larger tributaries as habitat conditions stabilize.

In the Coeur d'Alene River, the IDFG has promoted harvest of rainbow trout with liberal rules. Until recently, IDFG also encouraged harvest of hybrid trout through liberal rules and descriptions in the rule book; however, using anglers to selectively harvest hybrid trout has been problematic. In the 2011 genetic assessment, biologists and/or officers classified each of the 170 *Oncorhynchus* spp. as a cutthroat trout, rainbow trout, or hybrid trout based on phenotypic traits prior to genetic analysis. All fish classified as rainbow trout were genetically rainbow trout or hybrids, with 0% pure cutthroat trout. Fish classified as cutthroat trout were genetically cutthroat trout 96% of the time, hybrids 4% of the time, and rainbow trout 0% of the time. Trout that were genetically hybrids were misidentified 100% of the time, being called cutthroat trout 38% of the time, and misidentified as rainbow trout 62% of the time. These data illustrate the difficulty of phenotypically identifying hybrid trout in the North Fork Coeur d'Alene River. As a result, in 2013 IDFG modified the rules in the Coeur d'Alene and St. Joe river drainages to require release of all trout with a red or orange slash under the jaw.

Clearwater River Basin

Lower and Upper North Fork Clearwater GMU

The Lower and Upper North Fork Clearwater GMU support several healthy WCT populations. In general, habitat and cutthroat trout populations in that portion of the GMU above Dworshak Reservoir are in relatively good condition. At present, the mainstem North Fork Clearwater, Kelly Creek, and the Little North Fork all support healthy, viable cutthroat trout populations that shows every indication of stable or increasing trends. Primary management actions will focus on continued long-term monitoring of the populations on three to four year intervals (Table 36). Improvements/maintenance of quality habitat would most effectively entail working with land managers to minimize detrimental impacts associated with streamside timber harvest and road construction (Table 36).

The lower portion of the GMU, including Dworshak Reservoir and tributaries, has been far more affected by sedimentation and localized watershed disturbances, and non-native species. Brook trout are widely distributed throughout the tributaries. Because of the inaccessibility of the streams and extent of brook trout distribution, mechanical or chemical removal is not practical. Furthermore, many streams dominated by brook trout in the lower portion of the GMU are limited by sediment and water temperature.

Past stocking efforts of non-native rainbow trout into this GMU are believed to have led to limited introgressive hybridization with cutthroat trout in this area. Native populations of cutthroat trout and redband trout have coexisted in this watershed, but no studies have evaluated how much introgression is a result of native versus introduced redband/rainbow trout. Currently, no rainbow trout are being stocked into this drainage.

Clearwater and Middle Fork Clearwater GMU

Cutthroat trout spawning and rearing populations only occur upstream of Lolo Creek, although fluvial populations historically occurred seasonally throughout the Clearwater and Middle Fork Clearwater rivers. The abundance of WCT within this GMU is believed to be depressed, although their distribution is similar to what it once was. Declines in the fluvial populations are believed due to overharvest, construction of Dworshak Dam on the North Fork Clearwater River (blocked downstream movement and altered downstream hydrograph and water temperatures), and depressed populations in the South Fork Clearwater River (less downstream movement). For improvements in the abundance of fluvial cutthroat trout to occur in the Clearwater River, actions that address all three of these issues will be required (Table 37). Past stocking efforts of non-native rainbow trout into the Clearwater River may have led to genetic introgression of those fish that utilize this area. It is difficult to assess the genetic integrity of Clearwater River cutthroat trout because so few actually utilize the mainstem. Cutthroat x rainbow hybrids are occasionally caught.

Cutthroat trout populations are also considered depressed in the tributaries due to past land management practices (logging, mining, and grazing) that have increased sediment loading, impaired riparian habitat, increased stream temperatures, blocked access to tributaries (culverts), and reduced stream complexity. Brook trout and smallmouth bass also occur in this GMU. These fishes have been found to impact cutthroat trout through competition/predation, although efforts to control their numbers have met with little success.

Table 36. Conservation actions for WCT in the Upper and Lower North Fork Clearwater GMUs.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Entire NF Clearwater watershed	Core/ conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	1	Ongoing
Entire NF Clearwater watershed	Core/ conservation	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	1	Ongoing
Entire NF Clearwater watershed	Core/ conservation	Work with land management agencies and private landowners to utilize best management practices that will not impair fish habitat.	1	Ongoing
Entire NF Clearwater watershed	Core/ conservation	Manage brook trout with liberal harvest rules to encourage harvest.	3	Ongoing
Dworshak Reservoir	Conservation	Better understand effects of introduced species and water level fluctuations on cutthroat trout.	2	Long-term
LNF Clearwater mainstem	Core/ conservation	Continue to monitor population status.	2	Ongoing
NF Clearwater mainstem	Conservation	Continue to monitor population status.	2	Ongoing
NF Clearwater mainstem	Conservation	Manage smallmouth bass with liberal harvest rules to encourage harvest.	3	Ongoing
Kelly Creek	Core/ conservation	Continue to monitor population status.	2	Ongoing

Table 37. Conservation actions for WCT in the Clearwater and Middle Fork Clearwater GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Clearwater River and MF Clearwater River	Hybridized	Manage with fish rules that can allow the fluvial population to grow.	1	Ongoing
Clearwater River and MF Clearwater River	Hybridized	Educate anglers about cutthroat trout fish rules.	2	Ongoing
Clearwater River and MF Clearwater River	Hybridized	Manage smallmouth bass with liberal harvest rules.	3	Ongoing
Clearwater River and MF Clearwater River tributaries	Core/ conservation	Stock only fish species in flowing waters that will not adversely impact long-term persistence of cutthroat trout.	1	Ongoing
Clearwater River and MF Clearwater River tributaries	Core/ conservation	Support habitat restoration efforts to improve fish habitat and fish passage.	1	Ongoing
Clearwater River and MF Clearwater River tributaries	Core/ conservation	Work with land management agencies and private landowners to utilize best management practices that will not impair fish habitat.	2	Ongoing
Clearwater River and MF Clearwater River tributaries	Core/ conservation	Manage brook trout with liberal rules and encourage their harvest.	3	Ongoing

Lochsa River GMU

Cutthroat trout are believed to occur throughout the Lochsa River drainage where sufficient flow and gradient occurs, and overall this population is considered to be strong and stable. Because the majority (80%) of this GMU is under some protective status (wilderness area or designated roadless) and there are restrictive fishing rules in place, threats to this cutthroat trout population are limited. This cutthroat trout population is considered to be strong and stable. However, it is believed that declines in anadromous fish runs have reduced productivity (loss of marine derived nutrients) in the system that in turn has influenced the abundance and/or size structure of these cutthroat trout from what they were historically. Continuing to track the status of cutthroat trout in this watershed is important to understand how this fish population is responding to different fish rules, changes in the environment, and changes in weather patterns (Table 38). In the portion (80%) of this watershed that is under federal protective status, risks from land use activities are minimal and aren't considered to be a risk to the long term persistence of cutthroat trout in this basin. In the 20% of the watershed under private ownership, the land management activities that occur there are believed to limit fish populations in areas through sedimentation, poor instream cover, and impacts from upland disturbances.

Table 38. Conservation actions for WCT in the Lochsa River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Entire Lochsa watershed	Core/ conservation	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	1	Ongoing
Entire Lochsa watershed	Core/ conservation	Support habitat restoration efforts to improve fish habitat and fish passage.	1	Ongoing
Entire Lochsa watershed	Core/ conservation	Work with land management agencies/owners to utilize best management practices that will not impair fish habitat.	2	Ongoing
Entire Lochsa watershed	Core/ conservation	Support actions that will increase returns of anadromous fish and primary productivity.	2	Ongoing
Lochsa River	Conservation	Continue to monitor population status.	1	Ongoing
Lochsa River	Conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	1	Ongoing
Lochsa River	Conservation	Manage smallmouth bass with liberal harvest rules to encourage harvest.	3	Ongoing
Lochsa River tributaries	Core/ conservation	Continue to monitor population status.	1	Ongoing
Lochsa River tributaries	Core/ conservation	Manage brook trout with liberal harvest rules to encourage harvest.	3	Ongoing

Past stocking efforts of non-native rainbow trout into the Lochsa River are believed to have led to limited introgressive hybridization with cutthroat trout. Native populations of cutthroat trout and redband trout have coexisted in this watershed, but no studies have evaluated how much redband/rainbow trout introgression is a result of native versus introduced rainbow trout. Currently, no rainbow trout are being stocked into this drainage. Brook trout and smallmouth bass also occur in this GMU. These fishes have been found to impact cutthroat trout through competition/predation, although efforts to control their numbers have met with little success. Currently, these fish are not considered to be a high risk to cutthroat trout as their distribution in the watershed is limited.

Lower and Upper Selway River GMU

Cutthroat trout are believed to occur throughout the Selway River drainage where sufficient flow and gradient occurs, and overall this population is considered to be strong and stable. Because the majority (95%) of this GMU is under some protective status (wilderness area or designated roadless) and it has restrictive fishing rules, threats to this cutthroat trout population are limited. However, it is believed that declines in anadromous fish runs have reduced productivity (loss of marine derived nutrients) in this system that in turn has influenced the abundance and/or size structure of these cutthroat trout from what they were historically. Being able to track the status of cutthroat trout in this watershed is important as it provides a long term data set of what can be expected in a relatively intact watershed and how natural environmental regimes can influence fish populations (Table 39).

Table 39. Conservation actions for WCT in the Upper and Lower Selway GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Entire Selway watershed	Core/ conservation	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	1	Ongoing
Entire Selway watershed	Core/ conservation	Work with land management agencies to utilize best management practices that will not impair fish habitat.	2	Ongoing
Entire Selway watershed	Core/ conservation	Support actions that will increase returns of anadromous fish and primary productivity.	2	Ongoing
Selway River	Core/ conservation	Continue to monitor population status.	1	Ongoing
Selway River	Core/ conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	1	Ongoing
Selway River	Core/ conservation	Better understand movement of cutthroat trout past Selway Falls.	3	Long-term
Selway River	Core/ conservation	Manage smallmouth bass with liberal harvest rules to encourage harvest.	3	Ongoing
Selway River tributaries	Core	Continue to monitor population status.	1	Ongoing
Selway River tributaries	Core	Manage brook trout with liberal rules to encourage harvest.	3	Ongoing

Because of the current federal land management strategy that occurs in this drainage, risks from land use activities are minimal and not considered to be a risk to the long term persistence of cutthroat trout. Actions in the future should strive to maintain the protective nature of this watershed.

Past stocking efforts of non-native rainbow trout into the lower 30 km of the Selway River is believed to have led to limited introgressive hybridization with cutthroat trout in this area. In the upper drainage, IDFG believes cutthroat trout introgression with introduced rainbow trout is essentially non-existent due to the distance from stocked populations. Brook trout and smallmouth bass also occur in this GMU. These fishes have been found to impact cutthroat trout through competition/predation, although efforts to control their numbers have met with little success. Currently, these fish are not considered to be a high risk to cutthroat trout as their distribution in the watershed is limited.

South Fork Clearwater River GMU

The cutthroat trout population in the South Fork Clearwater is considered to be depressed, especially the fluvial life history. Habitat modifications from past mining operations have had the most significant effect on fish habitat in this drainage, although timber management and grazing practices have also had their impacts in places. Actions that address these impacts are needed in certain watersheds if improvements in cutthroat trout abundance are to occur (Table 40).

Table 40. Conservation actions for WCT in the South Fork Clearwater GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Entire SF Clearwater watershed	Core/ conservation	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	1	Ongoing
Entire SF Clearwater watershed	Core/ conservation	Support habitat restoration efforts to improve fish habitat and reduce barriers.	1	Ongoing
Entire SF Clearwater watershed	Core/ conservation	Work with land management agencies and landowners to utilize best management practices that will not impair fish habitat.	2	Ongoing
Entire SF Clearwater watershed	Core/ conservation	Support actions that will increase returns of anadromous fish and primary productivity.	2	Ongoing
SF Clearwater River	Core/ conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	1	Ongoing
SF Clearwater River	Core/ conservation	Educate anglers on new fish rules.	1	Ongoing
SF Clearwater River	Core/ conservation	Continue to monitor population status.	2	Ongoing
SF Clearwater River	Core/ conservation	Manage smallmouth bass with liberal harvest rules to encourage harvest.	3	Ongoing
SF Clearwater River tributaries	Core/ conservation	Continue to monitor population status.	2	Ongoing
SF Clearwater River tributaries	Core/ conservation	Manage brook trout with liberal harvest rules to encourage harvest.	3	Ongoing

The South Fork Clearwater River has received high angling effort over the years largely due to the steelhead and salmon fisheries that have occurred there. Although these anglers most often did not target cutthroat trout specifically, when they were caught they were often kept. Recent rule changes now require all cutthroat trout to be released on the South Fork Clearwater River to help reduce these impacts. However, the South Fork Clearwater River is a popular river to recreate on during the summer, and many of these people are casual anglers. Conservation officers have expressed concern that many of these anglers are unaware of fishing rules and likely harvest cutthroat trout unintentionally. Actions to further address angler exploitation may be necessary for this population to increase (Table 40). In addition to past land management practices and angler exploitation, it is believed that declines in anadromous fish runs have reduced productivity (loss of marine derived nutrients) in the system that in turn has influenced the abundance and/or size structure of these cutthroat trout from what they were historically. Continuing to track the status of cutthroat trout in this watershed is important to understand how this fish population is responding to changes in fish rules and habitat improvement projects (Table 40).

Past stocking efforts of non-native rainbow trout into the South Fork Clearwater River drainage are believed to have led to limited introgressive hybridization with cutthroat trout in this area. Currently, it is unknown what level of introgression exists, although the majority of cutthroat trout sampled (~95%), phenotypically look pure. Brook trout and smallmouth bass are believed to occur in this GMU. These fishes have been found to impact cutthroat trout through competition/predation, although efforts to control their numbers have met with little success. Currently, these fish are not considered to be a high risk to cutthroat trout as their distribution in the drainage is limited.

Salmon River Basin

Lemhi River GMU

The WCT population in the mainstem Lemhi River is considered depressed. Fragmented tributary habitat is the largest challenge facing cutthroat trout populations in the GMU. Fish migration to and from the tributaries of the Lemhi River is impeded in many of the tributaries by dewatering due to irrigation withdrawal, degraded riparian habitats, irrigation diversion dams, and in some circumstances, by road crossings. These fragmented habitats also deny fish access to thermal refugia during the summer and early fall when temperatures in the mainstem river are elevated and unsuitable for cutthroat trout. These fragmented conditions have led to isolated fish populations that are at a higher risk of extirpation due to stochastic events (e.g., landslides, fire, and disease). Populations of migratory cutthroat trout likely have been severely depressed by migration blockages where stocks cannot exhibit fluvial life history strategies. The IDFG prioritizes reconnecting mainstem tributaries and modifying barrier structures to provide for unimpeded movement by WCT (Table 41). Reconnections can be realized through a variety of measures including improving irrigation water conveyance systems, constructing siphons at stream intercepts, consolidating ditches, or converting to more efficient irrigation systems. Removing structural barriers (culverts/diversions) that impede migration is a priority (Table 41). Working with irrigators to develop cooperative agreements that improve water delivery systems and ensure that water is dedicated to in-stream flows using either easements or water-banking should also be a priority.

It is believed that declines in anadromous fish runs have reduced productivity (loss of marine derived nutrients) in the system that, in turn, has influenced the abundance and/or size structure of cutthroat trout from what they were historically.

More than 95% of the mainstem Lemhi River is privately owned, and access to the fishery is relatively restricted. Nonetheless, since 1996 cutthroat trout harvest in the mainstem has been closed to protect what few individuals still remain in the Lemhi River.

Historic stocking of non-native rainbow trout and non-native cutthroat trout into the Lemhi River GMU may have led to limited introgressive hybridization with WCT in this area. Currently, it is unknown what level of introgression exists. Brook trout occur in this GMU. These fishes have been found to impact cutthroat trout through competition/predation. Currently, brook trout are not considered to be a high risk to cutthroat trout as their distribution in the watershed is limited.

Table 41. Conservation actions for WCT in the Lemhi River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Lemhi River mainstem upper river	Core/ conservation	Work with irrigators to mimic natural hydrographs to ensure adequate flows are available for natural channel function and fish migration.	1	Ongoing
Lemhi River mainstem and Hayden Creek	Core/ conservation	Protect existing intact riparian habitat, and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	2	Ongoing
Lemhi River tributaries	Core/ conservation	Mimic natural hydrographs in key cutthroat tributaries to ensure adequate base flows are available for fluvial fish migration.	1	Long-term
Entire Lemhi watershed	Core/ conservation	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence.	2	Ongoing
Lemhi River tributaries	Core/ conservation	Evaluate the population level impact of cutthroat trout entrainment at key water diversions.	2	Long-term
Entire Lemhi watershed	Core/ conservation	Support actions that will increase returns of anadromous fish and primary productivity.	2	Ongoing
Lemhi River tributaries	Core/ conservation	Work with irrigators to reconnect tributaries by improving/modifying irrigation practices and removing or retrofitting structural barriers.	1	Ongoing
Entire Lemhi watershed	Core/ conservation	Continue to monitor population status.	3	Ongoing
Lemhi River tributaries	Core/ conservation	Manage cutthroat trout with fishing rules to maintain a stable population and quality size structure.	3	Ongoing
Entire Lemhi watershed	Core/ conservation	Manage brook trout with liberal fishing rules and encourage their harvest.	3	Ongoing
Entire Lemhi watershed	Core/ conservation	Work with land management agencies/owners to utilize best management practices that will not impair fish habitat.	1	Ongoing
Entire Lemhi watershed	Core/ conservation	Seek adequate mitigation for the development of additional water resources that would impair flows for fish.	1	Ongoing

Pahsimeroi River GMU

Fragmented tributary and mainstem river habitat is the largest challenge facing WCT populations in the Pahsimeroi River GMU. Fish movement in every tributary of the Pahsimeroi River is impeded by dewatering due to irrigation withdrawal, degraded riparian habitats, irrigation diversion dams, and in some circumstances by road crossings. These obstacles result in the failure of tributaries to seed historically utilized spawning and rearing habitats. The fragmented habitats also deny fish access to thermal refugia during the summer and early fall when temperatures in the mainstem river are at their maximum, above that suitable for cutthroat trout. These fragmented environments have led to isolated fish populations that are at higher risk of extirpation due to stochastic events (e.g., landslides, fire, and disease). Populations of migratory cutthroat have likely been severely depressed by passage barriers as these stocks cannot exhibit fluvial life history strategies. The IDFG promotes reconnecting mainstem tributaries and modifying barrier structures to provide for unimpeded WCT movement (Table 42). Reconnections can be realized through a variety of measures including improving irrigation water conveyance systems, constructing siphons at stream intercepts, consolidating ditches, or converting to more efficient irrigation systems. Removing structural barriers (culverts/diversions) that impede migration is a priority (Table 42). Working with willing irrigators, IDFG will develop cooperative agreements that improve water delivery systems and ensure that water is dedicated to in-stream flows using easements or water-banking.

Upper Salmon River GMU

WCT in tributaries of the mainstem Salmon River within the Upper Salmon River GMU occur at various densities and are well distributed where healthy habitat, sufficient flow, and moderate gradient is present. The cutthroat trout populations in tributaries are considered to be strong and stable; however, many of these populations are permanently or seasonally isolated due to habitat fragmentation, which could impair their long term persistence. Fish migration to and from tributaries of the Salmon River is impeded at numerous locations by dewatering due to irrigation withdrawal, tributaries that are intercepted by mainstem irrigation complexes, irrigation diversion dams, culverts, and other structures. This habitat fragmentation has resulted in the loss of fish access to critical thermal refugia and high quality spawning and rearing habitats. To be successful, any effort to restore viable fluvial cutthroat trout populations would entail improving access to tributary streams and improving mainstem habitat (Table 43).

The cutthroat trout population in the mainstem Salmon River is considered to be depressed. Habitat modifications from flood control structures (rip-rap and dikes), dredge mining, highway construction, and agricultural and water development have all had negative effects on floodplain function and fish habitat. Cottonwood galleries which provide shading, large woody debris recruitment, and bank stability, have been removed and reduced throughout this GMU. Dikes and other barriers have isolated historic side channels and spring habitats, and resulted in the loss of critical thermal refugia and key rearing areas. Actions that address these impacts are needed if improvements in cutthroat trout abundance are to occur (Table 43).

Another limiting factor is the declines in marine derived nutrients that were traditionally brought in to the Upper Salmon River GMU by anadromous fish runs. The decline in the number of anadromous fish returning to the upper drainage over the past several decades has reduced the amount of nutrients available for cycling through the aquatic food chain within a system that is naturally nutrient deprived. It is believed that the loss of these marine derived nutrients has influenced changes in the abundance and/or size structure of cutthroat trout from historic levels.

Much of the mainstem Salmon River is very accessible as it flows adjacent to U.S. Highway 93 and State Highway 75. As such, it is important to maintain restrictive harvest rules for cutthroat trout in the very accessible mainstem to protect and help restore populations.

Table 42. Conservation actions for WCT in the Pahsimeroi River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Pahsimeroi River mainstem	Core/ conservation	Work with irrigators to mimic natural hydrographs to ensure adequate flows are available for natural channel function and fluvial fish migration.	1	Ongoing
Pahsimeroi River mainstem	Core/ conservation	Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	2	Ongoing
Pahsimeroi River mainstem: mouth to headwaters	Core/ conservation	Use approaches designed to reduce, prevent, or ameliorate sedimentation such as riparian corridor exclusion and riparian pastures.	2	Ongoing
Tributaries	Core/ conservation	Work with irrigators to reconnect tributaries by improving water conveyance systems, removing or retrofitting structural barriers (culverts/ diversions), and conversion to more efficient irrigation systems.	1	Ongoing
Tributaries	Core/ conservation	Evaluate the population level impact of cutthroat trout entrainment at water diversions in reconnected tributaries; where the entrainment impacts are unacceptable, pursue funding for fish screens.	1	Long-term
Entire Pahsimeroi River watershed	Core/ conservation	Seek adequate mitigation for the development of additional water resources that would impair flows for fish.	1	Ongoing
Entire Pahsimeroi River watershed	Core/ conservation	Stock only fish species in mountain lakes that will not adversely impact long-term persistence.	2	Ongoing
Entire Pahsimeroi River watershed	Core/ conservation	Support actions that will increase returns of anadromous fish and primary productivity.	2	Ongoing
Entire Pahsimeroi River watershed	Core/ conservation	Continue to monitor population status.	3	Ongoing
Entire Pahsimeroi River watershed	Core/ conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	3	Ongoing

Table 43. Conservation actions for WCT in the Upper Salmon River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Tributaries and Salmon River headwaters	Core/ conservation	Use approaches designed to reduce, prevent, or ameliorate sedimentation such as riparian corridor exclusion, riparian pastures. Identify and treat legacy effects from mining and fire related sedimentation.	3	Ongoing
Salmon River mainstem, upper	Core/ conservation	Work with irrigators to mimic natural hydrographs to ensure adequate flows are available for natural channel function and fish migration.	1	Ongoing
Mainstem Salmon River, Valley Creek to headwaters and mouth of subbasin to East Fork confluence, includes mainstem Yankee Fork and East Fork	Core/ conservation	Protect existing intact riparian habitat and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function. Work with water users and landowners to reopen isolated side channels and spring sources to provide flows to the historic floodplain. Restore riparian vegetation via planting native vegetation in locations requiring shading and bank stability.	2	Ongoing
Tributaries	Core/ conservation	Mimic natural hydrographs in key cutthroat tributaries to ensure adequate base flows are available for fluvial fish migration.	1	Long-term
Entire Upper Salmon River GMU	Core/ conservation	In flowing waters and mountain lakes, stock only fish species that will not adversely impact long-term persistence of cutthroat trout.	2	Ongoing
Tributaries & Salmon River headwaters	Core/ conservation	Evaluate the population level impact of entrainment at key water diversions.	2	Long-term
Entire Upper Salmon River GMU	Core/ conservation	Support actions that will increase returns of anadromous fish and primary productivity.	2	Ongoing
Tributaries & Salmon River headwaters	Core/ conservation	Work with irrigators to reconnect tributaries by improving/modifying irrigation practices, and removing or retrofitting structural barriers.	1	Ongoing
Entire Upper Salmon River GMU	Core/ conservation	Continue to monitor population status.	3	Ongoing
Entire Upper Salmon River GMU	Core/ conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	3	Ongoing

Middle Salmon River-Panther Creek GMU

WCT in Salmon River tributaries occur at various densities and are well distributed throughout the GMU where healthy habitat, sufficient flow, and moderate gradient occur. The cutthroat trout populations in the tributaries are considered to be stable. However, many of these populations are permanently or seasonally isolated due to habitat fragmentation, and continued isolation could impair their long term persistence. Fish migration to and from the tributaries of the Salmon River is impeded at numerous locations by dewatering due to irrigation withdrawal, tributaries that are intercepted by mainstem irrigation complexes, irrigation diversion dams, culverts, and other structures. This habitat fragmentation has resulted in the loss of fish access to critical thermal refugia and high quality spawning and rearing habitats. To be successful, any effort to restore viable fluvial cutthroat trout populations would entail improving access to tributary streams and improving mainstem habitat (Table 44).

The cutthroat trout population in the mainstem Salmon River is considered to be depressed. Habitat modifications from flood control structures (rip-rap and dikes in the Salmon area), dredge mining (North Fork), highway construction, and agriculture and water development have all had a negative effect on floodplain function and fish habitat. Cottonwood galleries which provide shading, large woody debris recruitment, and bank stability have been removed and reduced throughout this GMU and have isolated historic side-channels and spring habitats, resulting in the loss of critical thermal refugia and key rearing areas. Actions that address these impacts are needed if improvements in cutthroat trout abundance are to occur (Table 44).

It is believed that declines in anadromous fish runs have reduced productivity (i.e., loss of marine derived nutrients) in the system. The loss of marine derived nutrients may influence the abundance and/or size structure of these cutthroat trout from what they were historically, particularly in the North Fork and Panther Creek watersheds.

Much of the mainstem Salmon River is very accessible as it flows adjacent to U. S. Highway 93 and the Salmon River Road below North Fork. As such, it is important to maintain restrictive harvest rules in the Salmon and North Fork Salmon rivers to protect and help restore the mainstem fluvial cutthroat trout population.

Middle Fork Salmon River GMU

The Middle Fork Salmon River GMU has not had any significant fish stocking except in mountain lakes. Some non-native species and coastal strain rainbow trout were stocked in these lakes in the past. Management has shifted to using hatchery produced WCT in the last 20 years. Future stockings will use only native or sterile fishes into mountain lakes. Fishing rules have been conservative in the drainage with catch-and-release rules having been in effect for decades. The drainage is now completely covered by catch-and-release rules. Long-term trend data on cutthroat trout has been collected in the mainstem and will continue to be a priority (Table 45). Genetic and fish density sampling in tributary streams will also continue (Table 45). Wilderness designation provides excellent habitat protection of the drainage except for a few headwater streams. Fishery managers need to continue improvements to fish passage barriers on road systems and sediment control on road systems in the non-wilderness headwaters (Table 45).

Table 44. Conservation actions for WCT in the Middle Salmon River-Panther Creek GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Tributaries – select locations	Core/ conservation	Work with irrigators to mimic natural hydrographs to ensure adequate flows are available for natural channel function and fish migration.	1	Ongoing
Mainstem Salmon River, primarily in the 12 Mile Creek to Tower Creek reach	Core/ conservation	Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	2	Ongoing
Mainstem North Fork Salmon River	Core/ conservation	Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function.	1	Ongoing
Mainstem Salmon River and Tributaries	Core/ conservation	Use approaches designed to reduce, prevent, or ameliorate sedimentation such as riparian corridor exclusion or riparian pastures.	3	Ongoing
Tributaries	Core/ conservation	Work with irrigators to reconnect tributaries by improving water conveyance systems, removing or retrofitting structural barriers (culverts/ diversions), and converting to more efficient irrigation systems.	1	Long-term
Tributaries	Core/ conservation	Evaluate the population level impact of entrainment at water key.	2	Long-term
Tributaries	Core/ conservation	Seek adequate mitigation for the development of additional water resources.	1	Ongoing
Mainstem Salmon River	Core/ conservation	Manage smallmouth bass with liberal harvest rules to encourage harvest.	3	Ongoing
Mainstem Salmon River and mainstem North Fork Salmon River	Core/ conservation	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	3	Ongoing

Table 45. Conservation actions for WCT in the Middle Fork Salmon River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Entire GMU	Core	Stock only fish species that will not adversely impact long-term persistence of cutthroat trout.	1	Ongoing
Entire GMU	Core	Increase fish sampling to better define distribution.	2	Short-term
Entire GMU	Core	Manage cutthroat trout with catch and release rules to maintain a stable population and quality size structure.	1	Long-term
Bear Valley Creek drainage		Replace fish passage barriers on road systems; road sediment control.	2	Ongoing
Entire GMU	Core	Continue to monitor population status.	3	Ongoing
Entire GMU	Core	Manage brook trout with liberal rules and encourage their harvest.	1	Long-term

South Fork Salmon River GMU

The only current fish stocking occurring within the South Fork Salmon River GMU is Chinook salmon and non-hybridizing salmonids in the mountain lakes. An emphasis will be placed on collecting better baseline information on the cutthroat trout distribution and genetic status (Table 46). From review of historical mountain lake stocking records, the IDFG suspects the potential for introgressive hybridization in the GMU from hybridizing species, such as non-native rainbow trout and non-native cutthroat trout, should be extremely low. Densities of WCT are relatively low in the major waters, and with the popularity of the area for recreation, catch-and-release fishing rules should continue. The South Fork Salmon River drainage has experienced major wildfire events in recent decades and likely will in the future. These very large, non-typical wildfires burn significant acreages of land, denuding them of vegetation, and leading to very unstable soil and slope conditions. These conditions, combined with increasing recreational use, may cause chronic sediment release to the system. The USFS has implemented road and drainage/fish passage improvements including rehabilitation of old logging roads back to natural contours. Emphasis on rehabilitation and drainage (fish passage) improvements need to remain a high priority (Table 46). The Stibnite Mining District in the headwaters of the East Fork South Fork Salmon River could become a major gold mining area again given recent proposals and exploration activities. Legacy mining impacts continue to affect native fish habitat, and renewed interest in gold mining suggests that future IDFG involvement in planning, mitigation, and reclamation may be warranted.

Middle Salmon River-Chamberlain Creek GMU

This GMU spans two IDFG administrative regions (Southwest and Salmon) and since little data on the current fish population status is available, emphasis will be placed on collecting baseline population and genetic information (Table 47). Since the GMU is largely within federally designated wilderness areas, the lands have the highest levels of administrative protection to anthropogenic disturbance.

Table 46. Conservation actions for WCT in the South Fork Salmon River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Whole GMU	Core	Stock only genetically pure or sterile WCT in mountain lakes.	1	Ongoing
Whole GMU	Core	Increase fish sampling to better define distribution and genetic status.	2	Short-term
Whole GMU	Core	Maintain catch and release management on WCT.	1	Long-term
Whole GMU	Core	Work with land management agencies to reduce road impacts to streams.	2	Ongoing
East Fork South Fork Salmon River drainage	Core	Monitor the progress of mining proposals, exploration, and development in the Stibnite Mining District.	2	Ongoing

Table 47. Conservation actions for WCT in the Middle Salmon River-Chamberlain Creek GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Whole GMU	Core	Stock only genetically pure or sterile westslope in mountain lakes or other non-hybridizing fish species.	1	Ongoing
Whole GMU	Core	Increase fish sampling to better define distribution and genetic status.	2	Short-term
Whole GMU	Core	Maintain restrictive harvest rules for cutthroat trout.	1	Long-term

Little Salmon River GMU

The majority of the Little Salmon River GMU is likely on the edge of the historical range for WCT due to its lower elevation and warmer stream temperatures. WCT were historically blocked by a series of falls on the mainstem Little Salmon River near the confluence with Smokey Boulder Creek. Redband trout occur above the falls throughout the upper watershed. Likely, cutthroat trout established in the lower watershed after formation of these geologic barriers resulting in the current distribution. Cutthroat trout are documented from a couple of tributaries above the barrier falls, but they are the result of stocking efforts in mountain lakes. Shepard et al. (2003) split the drainage into two WCT conservation populations because of the fish collection barrier at the Rapid River Fish Hatchery. Rapid River has little road access and thus has been lightly sampled for fish. No stocking has been undertaken except in a few mountain lakes. More fishery investigations are warranted (Table 48).

Table 48. Conservation actions for WCT in the Little Salmon River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Rapid River	Conservation	Stock only genetically pure or sterile WCT in mountain lakes.	2	Ongoing
Rapid River	Conservation	Increase fish sampling to better define distribution and genetic status.	2	Short-term
Little Salmon River mainstem	Hybridized	Continue riparian restoration work with willing landowners.	2	Ongoing
Little Salmon tributaries	Hybridized	Work with land management agencies to reduce road impacts to tributaries.	2	Ongoing
Little Salmon tributaries	Hybridized	Increase fish sampling to better define distribution.	2	Short-term

The documented distribution in the Little Salmon River drainage above Rapid River is heavily influenced by the falls at Round Valley Creek which are a barrier to anadromous species and also most likely to cutthroat trout. No reports of cutthroat trout have been made to the IDFG above this barrier. Sterile rainbow trout continue to be stocked by the IDFG in the Goose Creek drainage and into the Little Salmon River at New Meadows. There was a long history of rainbow trout stocking in the Little Salmon River. The system is impacted by poor water quality and a TMDL is in place for sediment and temperature. Improvements in water quality will benefit cutthroat trout populations.

Lower Salmon River GMU

The Lower Salmon River GMU occurs on the edge of WCT range due to its lower elevation and warmer temperatures. As a result, cutthroat trout only occur in the upper half of this GMU, and spawning and rearing populations are mostly found in the headwaters of streams where cooler water temperatures occur. As a result, conservation actions need to be targeted to those stream reaches currently occupied by cutthroat trout since water temperatures are favorable (Table 49). The IDFG believes that agricultural practices (stream channelization, conversion of wetland habitat, degradation of riparian habitat, streams diversions), grazing, road development, and competition with brook trout have all impacted cutthroat trout abundance and distribution in this GMU.

Non-native rainbow trout have been stocked into several of the tributaries in this GMU that are known to support cutthroat trout. However, due to the short time span of past stocking efforts and the relatively isolated nature of the cutthroat trout populations, it is believed that introgressive hybridization with introduced rainbow trout is minimal. This should be assessed, however (Table 49).

Table 49. Conservation actions for WCT in the Lower Salmon River GMU.

Stream name	Population status (core, conservation, hybridized)	Conservation actions	Priority (1, 2, 3)	Time table (ongoing, short-term, long-term)
Entire GMU	Core	Stock only fish species in flowing waters and mountain lakes that will not adversely impact long-term persistence of cutthroat trout.	2	Ongoing
Entire GMU	Core	Work with land management agencies and private landowners to utilize best management practices that will not impair fish habitat.	2	Ongoing
Salmon River	Core	Manage cutthroat trout with rules to maintain a stable population and quality size structure.	2	Ongoing
Salmon River	Core	Manage smallmouth bass with liberal harvest rules.	3	Ongoing
Salmon River tributaries	Core	Support habitat restoration efforts to improve fish habitat and fish passage.	2	Ongoing
Salmon River tributaries	Core	Manage brook trout with liberal harvest rules.	3	Ongoing
Salmon River tributaries	Core	Assess the genetic integrity of core cutthroat trout populations.	2	Long-term

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