ESA Recovery Plan for Snake River Idaho Spring/Summer Chinook Salmon and Steelhead Populations

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COAST
REGION

CHAPTER 6

Idaho Snake River Steelhead Status and Recovery

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Chapter 6. Idaho Snake River Basin Steelhead Status and Recovery Contents

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6. Idaho Snake River Basin Steelhead Status and Recovery

This chapter describes a strategy for improving the status of the two Idaho Snake River Basin steelhead major population groups: the Clearwater River MPG and the Salmon River MPG. Each MPG contains a group of individual populations that share similar genetic, geographic (hydrographic) and/or habitat characteristics. By strategically targeting recovery efforts hierarchically at the population and MPG levels, and at each life stage, we can improve viability for the Idaho MPGs, thereby contributing to recovery of the Snake River Basin steelhead Distinct Population Segment (DPS), the scale at which listing and delisting occurs under the ESA.

Discussions in this chapter for each MPG identify:

1. Viable scenarios - where we need to go to get to recovery;
2. Current status - where we are today based on the ICTRT's (2007a) viability criteria discussed in Chapter 3;
3. Limiting factors and threats - conditions that hinder viability and need to be addressed;
4. Recovery strategies and actions - activities designed to improve the status of the species by addressing the limiting factors; and
5. Population-level summaries of needs - recovery needs and actions specific to each population within an MPG.

The chapter describes the factors that affect the Idaho's Snake River Basin steelhead MPGs and populations throughout their life cycle. Section 6.1 summarizes the regional-level issues for the Idaho steelhead populations that apply to all of the MPGs and populations in a similar manner because they occur in shared downstream environments, such as the mainstem Snake and Columbia Rivers, the estuary, and the ocean. Sections 6.2 and 6.3 describe the local-level issues that affect Idaho steelhead and present strategies and actions to address them. The local-level actions are generally tailored to specific, population-level problems that lend themselves to case-by-case solutions. Local-level limiting factors, recovery strategies and actions are discussed in Section 6.2 for the Clearwater River steelhead MPG and Section 6.3 for the Salmon River steelhead MPG. It is important that the regional and local factors are addressed in concert, and in an integrated way, because of the steelhead's complex life cycle and the many changes that have taken place in the environment.

For full detail of the recovery strategies for Snake River Basin steelhead populations in Oregon and Washington, please see their respective management unit plans or the comprehensive ESA Recovery Plan for Snake River Spring and Summer Chinook Salmon and Snake River Basin Steelhead.

6.1 Issues across Idaho Snake River Basin Steelhead MPGs

The following issues generally apply to all Idaho Snake River Basin steelhead MPGs and populations in a similar manner. Regional issues that affect all Snake River Basin steelhead populations and Snake River spring/summer Chinook salmon populations in the mainstem Snake and Columbia Rivers, the estuary, and the ocean are discussed in Chapter 4. The larger ESA recovery plan for the species and the Estuary, Hydro, Harvest, and Ocean Modules provide more detail on these issues.

6.1.1 Estuary and Plume Habitat

Over the years, human land and water management activities ─ combined with the effects of the hydropower/flood control system ─ have modified estuarine habitat conditions, resulting in a loss of habitat quality, food supplies, and access to off-channel habitats. These conditions affect salmonid abundance, productivity, spatial structure, and diversity. Chapter 4 describes the general effects of this habitat loss on the Idaho Snake River spring/summer Chinook salmon and steelhead populations. This section focuses exclusively on the Idaho Snake River Basin steelhead MPGs and populations.

The loss and degradation of estuarine areas has likely had a larger impact on juvenile ocean-type salmonids (such as fall Chinook salmon) than on Snake River Basin steelhead and other stream-type juveniles. Snake River Basin steelhead rear in freshwater habitats and leave as smolts to travel to the ocean. Most of the steelhead smolts migrate very rapidly (less than five days) through the estuary and into the ocean and are present in the immediate mouth of the river for a very short period (hours to days). Residence time at the mouth of the river is very short and increases slightly as the season progress (Fresh et al. 2014). Consequently, habitat loss and alteration in the estuary and plume may have a minimal effect on the fish, compared to the effects on juveniles that reside for more time. Nevertheless, individual fish show considerable variation in residence times in different habitats and timing of estuarine and ocean entry. Such variation may be important and may affect survival at later life stages and help provide resilience to the ESU and DPS (McElhany et al. 2000; Holsman et al. 2012; Fresh et al. 2014).

6.1.2 Mainstem Columbia and Snake Rivers Hydropower System

Idaho Snake River Basin steelhead pass eight mainstem Columbia and Snake River dams as they make their way to the ocean, and again as they return to the Salmon and Clearwater Rivers. These dams are part of the Federal Columbia River Power System (FCRPS), which includes 31 federally owned multipurpose projects on the Columbia River and its tributaries. Salmon and steelhead survival is affected by the operation and configuration of the FCRPS. While impacts on the species from hydropower system development and operations on the Columbia and Snake Rivers have been significantly reduced in recent years, especially for steelhead, they continue to affect salmon and steelhead viability. Specific limiting factors that impact viability include mortality and delayed upstream passage (adults), direct and indirect mortality on downstream migrants (juveniles), alteration of the hydrograph (mainstem and estuary flow regime), depletion of historically available nutrients, degraded rearing and food resources for both presmolts and smolts in the Columbia River, elevated water temperatures that can delay upstream passage of adult steelhead, and increased migrant vulnerability to predation in the Columbia River.

Migrating Adults

Generally, adult passage facilities at the eight mainstem dams are considered effective, but fish are still lost while traveling between Bonneville and Lower Granite Dams (Table 6.1-1). Recent (2012 to 2016) PIT-tag detections indicate that, after accounting for natural straying and authorized harvest, approximately 87.9 percent of adult Snake River Basin steelhead that pass Bonneville Dam arrive at Lower Granite Dam. This is an increase from the 2008-2012 survival rate estimates (NMFS 2017). However adult steelhead migrants in the mainstem corridor are still lost and the causes for these losses remain unclear.

Table 6.1-1. Adult Snake River Basin steelhead survival estimates after correction for harvest and straying based on PIT tag conversion rates from Bonneville (BON) Dam to McNary (MCN) Dam, McNary to Lower Granite (LGR) Dam, and Bonneville to Lower Granite Dam. Source: http://PTAGIS.org. Note: 2016 Harvest estimate unavailable, so 2011-2015 average harvest rate was used to correct the 2016 survival estimate.

Species	Years	BON to MCN	MCN to LGR	BON to LGR
SR Steelhead	2012-2016 Avg	93.2%	94.3%	87.9%

More information is needed to aid managers in determining why and where these adult losses occur between Bonneville and Lower Granite Dams (e.g., adult fallback at spillways, unauthorized harvest, injuries from pinniped attacks, etc.) and in developing potential remedies.

Altered seasonal flows and temperature regimes in the mainstem Columbia and Snake Rivers continue to affect adult passage survival in some years. The effect of hydropower and water storage project operations on river temperatures, however, is complicated. Large storage projects like Brownlee or Grand Coulee Dams, because of their thermal inertia, generally increase winter minimum temperatures, delay spring warming and reduce maximum summer temperatures; but they also delay fall cooling, resulting in higher late summer and fall water temperatures (NMFS 2017).

Migrating adult steelhead are particularly susceptible to potential high water temperatures in the mainstem Columbia and lower Snake Rivers. Most recently, in 2013, a combination of low summer flows, high air temperatures and little wind created thermally stratified conditions in Lower Granite reservoir and the adult ladder during September. The event disrupted steelhead passage for about a week. The U.S. Army Corps of Engineers responded to the situation by modifying dam operations and pumping cooler water from deeper in the forebay to reduce water temperatures in the fish ladder. The changes, along with cooler weather, allowed the fish to resume passage at the dam. Still, the event resulted in an estimated 12 percent of migrating Snake River Basin steelhead failing to pass Lower Granite Dam (NMFS 2017). To address the issue, the U.S. Army Corps of Engineers recently constructed a structure at Lower Granite Dam to move cooler, deeper water (from Dworshak Dam releases) up to the entrance of the Lower Granite Dam adult fishway in time for the 2016 migration. This structure will minimize temperature differentials within the fishway to improve adult passage conditions during periods of high temperatures.

Steelhead Kelts

Passage of steelhead kelts continues to remain a concern. A small fraction of Snake River Basin steelhead, termed “kelts,” do not die after spawning and attempt to migrate back to the ocean. Currently, few kelts survive downstream passage and ocean travel to return as repeat spawners. High mortality rates would be expected in a free-flowing river because the energy reserves of the outmigrating kelts are substantially depleted; however, fisheries managers suspect that survival is lower because turbine bypass systems were not designed to safely pass adult fish (NMFS 2017).

Already, actions taken to improve juvenile passage have also benefited kelts, especially the installation of spill weirs and other surface passage routes at each of the mainstem FCRPS dams. Studies conducted in 2012 and 2013 by Colotelo et al. (2013, 2014) estimated that about 40 percent of the kelts released at or above Lower Granite Dam survived to river kilometer 156 (downstream of Bonneville Dam) in 2012, while 27.3 percent of released kelts survived to river kilometer 126 in 2013. In both study years, spillway weirs were the primary route of passage for steelhead kelts in the Snake River and survival estimates of kelts that passed via spillway weirs were higher than for kelts that passed using other routes (Colotelo et al. 2014). These survival rates are an improvement over estimated survival rates of about 4 to 16 percent in 2001 and 2002. The median travel time for the kelts from Lower Granite to Bonneville Dam was also much faster than in 2001 and 2002 (NMFS 2017). Currently, the Bonneville Power Administration (BPA) and U.S. Army Corps of Engineers are developing additional strategies to increase kelt survival through the hydropower system.

Migrating Juveniles

The hydropower system can affect migrating juvenile Snake River Basin steelhead by delaying downstream juvenile migration and increasing direct and indirect mortality. Juvenile steelhead can be killed while migrating through the mainstem dams, both directly through collisions with structures and abrupt pressure changes during passage through turbines and spillways, and indirectly, through non-fatal injury and disorientation which leave fish more susceptible to predation and disease, resulting in delayed mortality.

A number of actions in recent years have improved passage conditions in the migration corridor for all listed Columbia River salmon and steelhead species. By 2009, each of the eight mainstem lower Snake and lower Columbia River dams was equipped with a surface passage structure (spillbay weirs, powerhouse corner collectors, or modified ice and trash sluiceways) to improve passage of smolts, which primarily migrate in the upper 20 feet of the water column in the lower Snake and Columbia Rivers. Other improvements include the relocation of juvenile bypass system outfalls to avoid areas where predators collect, changes to spill operations, installation of avian wires to reduce juvenile losses to avian predators, and changes to reduce dissolved gas concentrations that might otherwise limit spill operations. Nevertheless, while these and other changes have improved smolt survival in recent years (96 percent is the juvenile dam passage standard in the 2008 FCRPS BiOp), dam passage impacts remain.

Continued monitoring is needed to gain a better understanding of smolt migration timing and mortality rates through the lower Snake and Columbia Rivers, including the effects of spring and summer spill operations on juvenile migrants. We need a better understanding of juvenile mortality in the migration corridor between John Day Dam and the Columbia River estuary. We also need a better understanding of juvenile mortality that occurs before the fish reach the head of Lower Granite Dam reservoir and the FCRPS system: Monitoring indicates that substantial mortality of in-river migrating juveniles occurs between natal streams and the hydropower system (Faulkner et al. 2015).

Chapter 4 of this Plan, the larger ESA recovery plan for the species, and the 2017 Hydro Module provide more information on impacts of the mainstem hydropower system on steelhead and actions underway or proposed to address them.

6.1.3 Hatchery Programs

Hatchery programs across the Columbia River basin can affect Idaho Snake River Basin steelhead. Hatcheries have produced fish in the Columbia River basin for more than one hundred years. Today, fish produced in hatcheries comprise the vast majority of annual returns to the Columbia Basin (CBFWA 1990; NMFS 2010). In the Snake River basin, artificial propagation of steelhead generally began in the late 1940s and early 1950s with sporadic stocking. Production increased in scale and frequency during the 1970s and 1980s in response to major dam construction on the Snake River basin and throughout the region. Today, hatchery production in the Snake River basin exceeds natural production due to the species’ depressed status. The Lower Snake River Compensation Plan (LSRCP), the largest of three mitigation programs associated with dam construction in the Snake River basin, has a mitigation goal of annually returning 55,000 adult steelhead to the river upstream of Lower Granite Dam.

Currently there are eight steelhead hatchery programs in Idaho: five programs in the Salmon River basin (not including the Shoshone-Bannock Tribes egg-box program) and two hatchery programs in the Clearwater River basin. Together the programs release just under seven million fish. The steelhead are raised at Dworshak, Clearwater, Niagara Springs, Magic Valley, and Hagerman National Hatcheries and released in various drainages and locations throughout the Clearwater and Salmon River basins (Table 6.1-2).

Table 6.1-2. Current summer steelhead hatchery releases in Idaho. Programs are operated by Idaho Department of Fish and Game (IDFG), Nez Perce Tribe (NPT), and Shoshone-Bannock Tribes (SBT). Based on 2016 IDFG planning.

Population	Broodstock Source	Release site (# released)	Operator	Year Program Began	Primary Rearing Site*	Program Type
Lower Mainstem Clearwater	NF Clearwater	Clear Creek (300,000)	USFWS	1969	DNFH	Isolated harvest
North Fork Clearwater	NF Clearwater	North Fork Clearwater (1,200,000)	USFWS	1969	DNFH	Isolated harvest
Lolo Creek	NF Clearwater	Lolo Creek (200,000)	USFWS/ NPT	1969	DNFH	Isolated conservation
South Fork Clearwater	NF Clearwater / SF Clearwater	SF Clearwater (619,000), Meadow Cr. (501,000), Newsome Cr. (123,000)	USFWS/ IDFG	1969	DNFH/CFH	Isolated harvest(Red House/Meadow)/ isolated conservation (Meadow/Newsome)
Lochsa River	n/a	No releases, very little hatchery influence	n/a	n/a	none	n/a
Selway River	n/a	No releases, very little hatchery influence	n/a	n/a	none	n/a
Little Salmon River	Pahsimeroi/ NF Clearwater/ Oxbow	Little Salmon (853,000)	IDFG	1962-1983	MVFH/NSFH	Isolated harvest
Lemhi River	Pahsimeroi	Salmon River (93,000)	IDFG	1983	MVFH	Isolated harvest
Pahsimeroi River	Pahsimeroi/ Upper Salmon B/ NF Clearwater	Salmon River (186,000), Pahsimeroi River (1,048,000)	IDFG	1983	MVFH/NSFH	Isolated harvest/ unmarked broodstock
East Fork Salmon River	Sawtooth /EF Natural	Salmon River (130,000), EF Salmon (60,000)	IDFG	1985/2000	HNFH	Integrated conservation
Upper Mainstem Salmon	Sawtooth; Upper Salmon B/ NF Clearwater	Salmon River (1,370,00), Squaw Creek (124,000), Yankee Fork (496,000), YF egg box (500,000)	IDFG/	1985	HNFH/MVFH	Isolated harvest/ Isolated conservation egg box program
Upper MF Salmon River	n/a	No releases, very little hatchery influence	n/a	n/a	n/a	n/a
Lower MF Salmon River	n/a	No releases, very little hatchery influence	n/a	n/a	n/a	n/a
SF Salmon River	n/a	No releases, very little hatchery influence	n/a	n/a	n/a	n/a
Secesh River	n/a	No releases, very little hatchery influence	n/a	n/a	n/a	n/a
Chamberlain Creek	n/a	No releases, very little hatchery influence	n/a	n/a	n/a	n/a
North Fork Salmon	Pahsimeroi	Indian Creek (500,000)	SBT	1995	n/a	Isolated conservation egg box program
Panther Creek	Pahsimeroi	Beaver Creek (500,000)	SBT	1995	n/a	Isolated conservation egg box program
Hells Canyon	Oxbow	Snake River (550,000)	IDFG	1962	NSFH	Isolated harvest

* DNFH (Dworshak National Fish Hatchery), CFH (Clearwater Fish Hatchery), MVFH (Magic Valley Fish Hatchery), NSFH (Niagara Springs Fish Hatchery), HNFH (Hagerman National Fish Hatchery).

One of the primary risks of hatchery programs to the recovery of wild populations is the genetic consequences of the interbreeding of hatchery-origin and natural-origin fish, especially on the spawning grounds. Stray hatchery fish that spawn with natural-origin steelhead pose a risk to the productivity and genetic characteristics of the natural populations. Hatchery fish also affect natural populations by competing for limited food and habitat, and by transferring diseases. The situation is complex, however, because several populations may have expired without the help of hatchery supplementation. Further, the existence of locally derived hatchery stocks may help the natural populations bridge periods of adverse environmental conditions (as occurred in the 1990s).

In addition, several hatchery practices in the DPS pose additional risk. The most prominent:

1. The use of non-local B-run[1] steelhead in areas where they are not native. The Middle Fork Salmon River, South Fork Salmon River, and Clearwater River drainages support wild B-run steelhead, but historically the upper Salmon River was largely composed of A-run steelhead populations (see Table 2-3). Approximately one million of the hatchery fish currently released into the Salmon River basin are B-run, and these are released into predominately A-run populations. The B-run hatchery steelhead that escape fisheries and interbreed with natural-origin fish on spawning grounds change the natural life history diversity at both the population and MPG scale.
2. Mainstem releases of nonacclimated fish. Unacclimated fish have little time to imprint, and if released into mainstem rather than tributary areas, what imprinting that occurs will be imprecise. Therefore, the fish are more likely to stray to other areas.
3. The risk posed by natural spawning of returning hatchery fish is currently impossible to quantify because of a poor understanding of current population sizes. It has been estimated that overall less than 10 percent of the returning hatchery fish stray, but in small populations hatchery strays could be a substantial portion of the natural spawners.

Chapter 4 provides more information on the different types of hatchery programs, and their risks and benefits to natural-origin steelhead and salmon populations. Sections 6.2.3.2 and 6.3.3.2 focus on the steelhead hatchery programs that specifically affect Idaho Snake River Basin steelhead in the Clearwater River MPG and Salmon River MPG. Accompanying each section is a table that further defines the limiting factors, threats, and strategies for each population within the MPG. Further details on specific strategies and actions related to those strategies will occur through the development of Hatchery and Genetic Management Plans (HGMPs) and associated consultations.

6.1.4 Fishery Management

Snake River Basin steelhead encounter fisheries in the ocean, Columbia River estuary, mainstem Columbia, Snake River, and Salmon and Clearwater Rivers as they migrate from the ocean to natal streams. Fisheries managers classify the Columbia River summer-run steelhead into aggregate groups based on ocean age and return, adult size at return, and migration timing. Steelhead passing Bonneville Dam from July through October are categorized as A-run or B-run steelhead based on date of passage,

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[1] New research on Snake River Basin steelhead indicates that some populations support A-run and B-run types. NMFS recently updated the Snake River Basin steelhead population life history designations based on initial results from genetic stock identification studies of natural-origin returns. Using this new information, we designated the steelhead populations as either A-run or B-run based on length (less or more than 78 cm), but further assigned the B-run populations to different categories reflecting mixtures of A-run and B-run steelhead.

with A-run fish passing Bonneville before August 26. Later in their upstream migration the two groups are differentiated by fork length, with A-run steelhead < 78 cm and B-run steelhead ≥ 78 cm. B-run steelhead primarily return to tributaries in Idaho’s Salmon and Clearwater Rivers, while A-run steelhead return to tributaries throughout the Columbia and Snake basins. The Idaho Snake River Basin steelhead MPGs support both A-run and B-run steelhead. Due to differences in adult size at return and migration timing, the two groups experience different levels of fishing mortality.

Fisheries affect the viability of Snake River Basin steelhead populations by causing mortality to naturally produced adult fish. They also influence population traits and life history diversity (selectively removing fish based on size, age, sex, distribution, or run timing depending on gear, timing and location of a fishery), and reduce nutrients and carrying capacities in freshwater ecosystems. These effects are discussed in detail in Chapter 4, Regional Concerns and Strategies across Species and Populations, and the Harvest Module.

Steelhead Life History Diversity

Snake River Basin steelhead populations have traditionally be categorized as either A-run or B-run. Genetic analyses, however, show that while almost all A-run steelhead populations have no or negligible B-run returns, the B-run populations actually support a mix of A-run and B-run fish. The Northwest Fisheries Science Center (NWFSC) (2015) assigned B-run populations to one of the three different B-run categories reflecting the percentage of adult fish meeting the B-run size criteria of more than 78 cm in length (High >40%, Moderate 15 to 40%, Low <15%).

It remains unclear how life history and body-size differences observed in groups observed at Bonneville Dam are correlated to wild steelhead in the Snake River (at Lower Granite Dam and in spawning reaches). Genetic analyses suggest that B-run populations in the Snake River are polyphyletic; that is, B-run populations are more closely related to geographically proximate A-run populations than they are to distant B-run populations. Genetic analysis allows a much more specific estimation of fishery impacts because the B-run populations are genetically distinct. Within the Snake River basin, a sampling program at Lower Granite Dam allows estimation of abundance and diversity characteristics (age, sex ratio, genetic diversity) of 10 different stock groups based on genetic stock identification.

The life history portfolio of Snake River Basin steelhead is quite diverse; therefore, genetic analysis found broad overlap among populations in several respects. There is a gradient in life history characteristics rather than a sharp dichotomous break. All populations produce adults <78 cm and adults returning to Bonneville Dam after August 25. Currently, median lengths of B-run populations are close to the criterion that was supposed to be a defining characteristic. In contrast, few A-run populations produce many adults >78 cm. The median passage date at Bonneville Dam of Snake River A-run populations is before August 26. The median passage dates of B-run populations are after the medians of the A-run populations, ranging from August 19 (Big Creek) to September 11 (Lolo Creek). Average percentage of two-ocean fish is approximately 50 percent for A-run populations and 80 percent for B-run populations. Years spent in freshwater and saltwater are positively correlated such that average age at spawning is greater in populations that produce older smolts. Total ages at spawning broadly overlaps among populations but the average age at spawning shows a continuum of age structures, ranging from 4.1 years (Pahsimeroi River) to 6.1 years (Secesh River). Average age of A-run populations was younger than, but continuous with, average age of B-run steelhead populations. Sex ratio is female biased and older populations have greater percentages of females. With regard to date at Bonneville Dam and length structure, Lolo Creek is similar to other B-run populations.

Mainstem Columbia and Snake River Fisheries

Past fishing pressure, and resulting mortalities, particularly on the lower Columbia River, contributed significantly to the decline of Snake River Basin steelhead and other Columbia River basin salmon and steelhead runs (NRC 1996). Past commercial harvest and effects on steelhead abundance, productivity and diversity led to the prohibition on commercial harvest of steelhead in non-treaty Columbia River fisheries since 1975. From 1938 through the mid-1960s, the annual commercial catch of steelhead ranged from 100,000 to nearly 300,000 fish. From the mid-1960s until 1975, when commercial harvest of steelhead in non-treaty commercial fisheries was closed, approximately 50,000 steelhead were caught annually (WDFW and ODFW 2002). These were essentially wild fish since hatchery production of steelhead was still relatively limited at the time.

Fishery management changes in the 1980s further reduced harvest impacts on Snake River Basin steelhead. Since 1986, recreational anglers in the Columbia Basin have been required to release unmarked, wild steelhead. Additional restrictions took place with the development of the Columbia River Fish Management Plan in 1988. Fishery-related mortality of Snake River Basin steelhead declined again with ESA listings for Snake River fall Chinook salmon (1992) and Snake River Basin steelhead (1997) and subsequent fishery management changes.

Today, fishery-related mortality of Snake River Basin steelhead occurs due to incidental harvest in commercial, recreational, and ceremonial and subsistence fisheries in the mainstem Columbia River from the mouth upstream to McNary Dam (Zones 1-6) that target hatchery steelhead or other species. Steelhead are not legal for harvest in Columbia River commercial non-treaty fisheries, and except for limited incidental mortality in commercial salmon fisheries, are allocated entirely to recreational fisheries. Recreational steelhead fisheries are mark-selective, allowing retention of fin-clipped hatchery fish only. Treaty steelhead harvest is not mark-selective. Non-treaty fisheries are subject to a 2 percent harvest rate limit on wild steelhead during winter, spring and summer fisheries, as well as a 2 percent harvest rate limit during fall-season fisheries. As a result, the total annual harvest rate for A-run steelhead in non-treaty fisheries is 4 percent. The yearly incidental catch of A-run steelhead in non-treaty fisheries, however, is much lower than this allowed rate, and has averaged 1.6 percent since 1999. Fishery managers implement time, area, and gear restrictions to minimize encounters of steelhead in non-treaty commercial fisheries.

Most harvest impacts on Snake River Basin steelhead occur in Columbia River fisheries directed at fall Chinook salmon, including treaty gillnet and platform fisheries. B-run Snake River Basin steelhead experience higher harvest rates during these fisheries than A-run steelhead because they are larger and more susceptible to catch in the treaty gillnet gear, and because their timing coincides with the return of fall Chinook salmon. Treaty fall-season fisheries are subject to a 15 percent harvest rate limit on B-run steelhead. Most of the take of A-run steelhead in *U.S. v. Oregon* fisheries also occurs in the fall season, although some mortality of A-run steelhead also occurs in treaty spring and summer season fisheries, which extend through July 31. In recent years, the total exploitation rates on A-run steelhead have been stable at around 5 percent, while exploitation rates on B-run steelhead have generally been in the range of 15 to 20 percent (Ford 2011).

Table 6.1-3 shows the most recent abundance-based harvest rate schedule under the *U.S. v. Oregon* Management Agreement for managing harvest rates on summer steelhead encountered during fall-season treaty and non-treaty fisheries. The schedule allows the treaty harvest on B-run steelhead to vary from the fixed rate of 15 percent depending on the abundance of B-run steelhead and upriver fall Chinook salmon. The non-treaty fall-season fishery harvest rate remains fixed at 2 percent. The schedule shown in the table addresses only those impacts on B-run steelhead. Recent harvest rates for A-run steelhead in the Columbia River mainstem are generally less than 10 percent annually. The Columbia River mainstem fisheries are under constant monitoring on an annual basis consistent with the *U.S. v. Oregon* Management Agreement.

Table 6.1-3. Fall Management Period Steelhead Harvest Rate Schedule under the 2008-2017 *U.S. v. Oregon* management agreement (TAC 2008).

Forecast Bonneville Total B Steelhead Run Size*	River Mouth URB Run Size	Treaty Total B Harvest Rate	Non-Treaty Natural-Origin B Harvest Rate**	Total Harvest Rate
<20,000	Any	13%	2.0%	15%
20,000	Any	15%	2.0%	17%
35,000	>20,000	20%	2.0%	22%

*B Run Steelhead are defined as steelhead measuring ≥ 78 cm & passing Bonneville Dam during July 1 and October 31.

**This harvest rate schedule applies to fall season fisheries only. These fisheries include all mainstem fisheries below the mouth of Snake River from August 1 through October 31 and for mainstem fisheries from The Dalles Dam to the mouth of the Snake River from November 1 through December 31. Also included are fall-season treaty fisheries in Drano Lake and tributary mouth fisheries in Zone 6 that impact Snake River Basin steelhead.

Some mortality related to illegal, unreported or unregulated harvest may also affect the recovery of Idaho Snake River Basin steelhead. The level of this harvest remains unknown because of the lack of adequate resources to monitor fisheries and stop illegal harvest in closed areas and during closed seasons. Illegal, unreported or unregulated harvest, however, is not related to harvest management. It is an illegal practice, and a threat related to the ability to control activity outside of fishery management guidelines and regulations.

Since 2011, genetic analysis has allowed estimation of the stock composition of steelhead harvested during fisheries in the Columbia River and lower Snake River. Steelhead from the Snake River basin hatcheries make up approximately 60-70 percent of the Columbia River sport harvest downstream of Bonneville Dam, 80-85 percent of the clipped Zone 6 tribal harvest and 10-25 percent of the unclipped Zone 6 tribal harvest. Snake River basin wild fish make up at least 15 percent of the unclipped steelhead and 6 percent of the total steelhead caught in the Zone 6 tribal fishery. The Snake River hatchery stocks make up a larger percentage of the harvest as the season progresses in the Columbia River sport fishery downstream of Bonneville Dam and in the tribal Zone 6 fishery.

Still, more information is needed to assess the impacts of different fisheries on various components of the DPS. For example, it is assumed that the harvest rate estimates for A-run steelhead apply to the A-run populations of the Snake River Basin steelhead DPS; however, there may be some differential harvest impacts to various A-run steelhead populations. The information necessary to assess possible differences in harvest impacts for different populations is not currently available (NMFS 2008a; NMFS 2016).

Tributary Fisheries

State of Idaho recreational steelhead fisheries in the Snake River and its tributaries currently occur in areas where there is a surplus of hatchery-origin fish. Steelhead fisheries in the Salmon and Clearwater basins generally take place in mainstem and major tributary locations and target hatchery-origin fish. State regulations require that all caught natural-origin steelhead be released; however, some incidental mortality of natural-origin steelhead can occur in fisheries directed on hatchery fish, or on resident species. In areas where incidental capture of natural-origin steelhead is possible, the Idaho Department of Fish and Game (IDFG) implements special rules that restrict harvest of trout to the period from Memorial Day weekend through November. Nearly all adult steelhead have spawned and are not present in streams during that period (NMFS 2005).

Tribal fisheries conducted by the Shoshone-Bannock Tribes and Nez Perce Tribe occur in the Snake River and its tributaries, including several natural production areas where the tribes continue traditional fishing practices. The tribes conduct some ceremonial and subsistence fisheries targeting Idaho Snake River Basin steelhead. The Shoshone-Bannock Tribes and Nez Perce Tribe are developing Tribal Resource Management Plans for steelhead fisheries.

The Harvest Module (NMFS 2014) describes fishery policies, programs, and actions affecting Snake River Basin steelhead and other fish species covered by the Snake River Recovery Plan. The Harvest Module is available on the NMFS web site: http://www.westcoast.fisheries.noaa.gov/publications/recovery_planning/salmon_steelhead/domains/interior_columbia/snake/harvest_module_062514.pdf. Limiting factors and threats specific to individual Idaho Snake River Basin steelhead MPGs are discussed in Sections 6.2.5 through 6.2.9 (Clearwater River MPG) and Sections 6.3.5 through 6.3.16 (Salmon River MPG).

6.1.5 Climate Change

Likely changes in temperature, precipitation, wind patterns, and sea level height due to climate change have profound implications for survival of Idaho Snake River salmon and steelhead populations in both their freshwater and marine habitats. While the magnitude and timing of resulting biological effects are poorly understood at present ─ and specific effects are likely to vary among populations ─ the biological consequences are generally predicted to be negative, including changes in distribution, behavior, growth, migration characteristics, and survival.

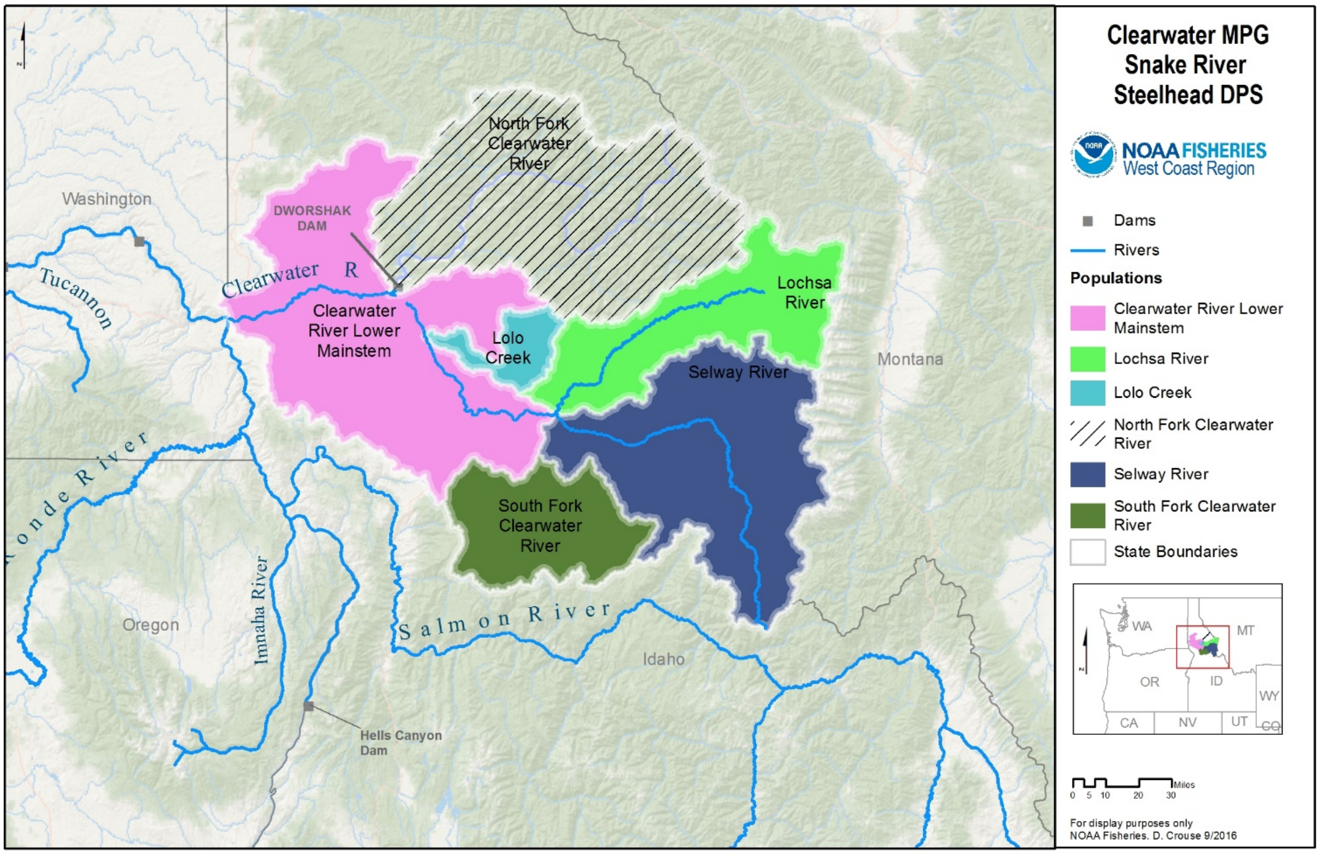
In the Salmon and Clearwater basins, habitat conditions may be most affected by climate change in lower elevation streams that are wide, shallow and lack riparian vegetation and in narrow, confined streams that are sensitive to flow changes. Streams located higher in the watersheds that historically provided good habitat may no longer be accessible in summer due to low flows if snowpack is reduced, thus limiting available spawning and rearing habitat, and access to thermal refugia for adult and juvenile steelhead. Higher water temperatures will also favor non-salmonid species that are better adapted to warmer water, including potential predators and competitors. Increased water temperatures could also affect migrating adult steelhead by increasing the metabolic cost of swimming and holding prior to spawning, which can increase prespawn mortality and reducing spawning success (Crozier 2012). Tributary habitat projects that protect or restore areas that function as thermal refugia, or ensure that steelhead have access to these areas, would help alleviate potential negative impacts associated with climate change.

Climate change is also affecting the mainstem, estuarine, and marine environments. Potential impacts in these environments, discussed in Chapter 4, are expected to have negative consequences by restricting available habitat, reducing food sources, altering prey survival and productivity, and possibly altering salmon and steelhead migration patterns, growth, and survival. The larger ESA Recovery Plan for Snake River spring/summer Chinook salmon and steelhead provides more detail on the potential impacts from climate change.

All other threats and conditions remaining equal, future deterioration of water quality, water quantity, and/or physical habitat due to climate change can be expected to cause a reduction in the number of naturally produced adult steelhead returning to populations across the DPS. This possibility reinforces the importance of maintaining habitat diversity and achieving survival improvements throughout the entire range and life cycle. Chapter 4 identifies strategies and actions to address potential climate change impacts in freshwater, mainstem, estuarine and ocean environments. Strategies and actions identified in this chapter at the population level will further protect and restore habitat conditions to safeguard against potential negative consequences from climate change.

6.2 Clearwater River MPG

The Clearwater River MPG includes six independent steelhead populations: (1) Lower Mainstem Clearwater River, (2) Lolo Creek, (3) South Fork Clearwater River, (4) Lochsa River, (5) Selway River, and (6) North Fork Clearwater River (Figure 6.2-1). Five of the steelhead populations in the MPG are extant populations and one is a historical population that is now extirpated, the North Fork Clearwater River, whose habitat was blocked by the construction of Dworshak Dam. The ICTRT defined steelhead in this basin as a single major grouping based on geography (basin topography) and several scattered genetic samples. Nevertheless, the Clearwater River MPG includes substantial life-history diversity because it supports populations classified as supporting both A-run and B-run life history expressions. Characteristics of the populations as defined by the ICTRT (2005) are listed in Table 6.2-1.



For display purposes only
NOAA Fisheries. D. Crouse 9/2016

Figure 6.2-1. Clearwater River Steelhead MPG and Independent Populations.

A number of dams built in the Clearwater River drainage, beginning probably in the late 1890s, blocked or impaired anadromous fish migration. Lewiston Dam, built in 1927 on the Clearwater River near RM 4, operated until its removal in 1973. Steelhead were able to maintain access to the Clearwater River basin during the dam's existence and are included in the DPS. However, the dam was thought to be a partial barrier to adult steelhead migration and reduced escapement to areas above the dam. During the course of its operation, modifications were made to Lewiston Dam to facilitate fish passage. The effects of Lewiston Dam extended to all populations in the MPG. The population-specific effects of other dams that were constructed in the basin are discussed in later sections.

Table 6.2-1. Clearwater River steelhead MPG population characteristics. Minimum abundance and productivity values represent levels needed to achieve viable status (95% probability of persistence over 100 years.)

Population	Dominant Life History[1]	Size[2]	Minimum Abundance Threshold[3]	Current Abundance[4]	Minimum Productivity Threshold[5]	Current Productivity[6]
Lower Mainstem	Low B-Run	Large	1,500	2,099 (0.15)	1.56	2.36 (0.16)
NF Clearwater R. (blocked)	High B-Run	Large	-	1,650 (0.17)	-	NA
Lolo Creek	High B-Run	Basic	500		1.27	NA
Lochsa River	High B-Run	Intermediate	1,000		1.14	2.33 (0.18)
Selway River	High B-Run	Intermediate	1,000		1.14	
South Fork	High B-Run	Intermediate	1,000		1.14	NA

[1] B-run population category designations reflect relative contributions of fish exceeding B-run size threshold (High >40%, Moderate 15-40%, Low <15%) NWFSC 2015).

[2] Population size categories: Basic – 500 spawners; Intermediate – 750, Large – 1,000.

[3] Minimum Abundance Threshold is based on estimated historical tributary spawning and rearing habitat available to a population.

[4] Geometric mean 2005-2014 natural-origin abundance, standard error in parentheses (from NWFSC 2015).

[5] Minimum Productivity Threshold is derived from the ICTRT population viability curves, where the intrinsic productivity value on the curve corresponds to the population's minimum abundance threshold. A population's intrinsic productivity represents the geometric mean of estimates associated with low to moderate parent escapements.

[6] Geometric mean 1999-2008 brood years; standard error in parentheses (from NWFSC 2015).

Migration timing of steelhead in the Clearwater River MPG, and the entire DPS, has changed because of anthropogenic impacts. Water releases from Dworshak Reservoir have caused adults to hold in the mainstem Clearwater River downstream of the North Fork Clearwater River for longer periods. Construction and operation of the lower Snake River dams and reservoirs have changed temperature and flow patterns, which in turn affects both juvenile and adult migration. Upstream migration of adults in the late summer and fall is often delayed because of warm mainstem temperatures. Smolt entry into the estuary has been delayed relative to historic conditions; passage through the reservoirs requires longer migration times.

6.2.1 Viable MPG Scenarios

The ICTRT incorporated the viability criteria (ICTRT 2007a) into viable recovery scenarios for each MPG. The criteria, which are explained in detail in Chapter 3, Recovery Goal and Delisting Criteria, should be met for a MPG to be considered viable, or low risk, and thus contribute to the larger objective of species' viability. These criteria are:

1. At least one-half the populations historically present (minimum of two populations) should meet viability criteria (5% or less risk of extinction over 100 years).
2. At least one population should be highly viable (less than 1% risk).

3. Viable populations within a MPG should include some populations classified as “Very Large’” or “Large,” and “Intermediate” reflecting proportions historically present.
4. All major life history strategies historically present should be represented among the populations that meet viability criteria.
5. Remaining populations within an MPG should be maintained (less than 25% risk) with sufficient abundance, productivity, spatial structure and diversity to provide for ecological functions and to preserve options for species’ recovery.

The criteria suggest several viable MPG scenarios for the Clearwater River MPG:

- At least three of the MPG’s six populations must be viable, and one of these populations must be highly viable for the MPG to meet the criteria.
- Because the North Fork Clearwater population is extirpated, the only Large-size population left is the Lower Mainstem Clearwater River, and it must achieve viability to meet this criteria. At least two of the three Intermediate-size populations must also attain viable status.
- All life histories must be present. Initially the ICTRT believed that Lolo Creek was the only population that represented both the A- and B-run life history in a single population. Recent data assessed by the Northwest Fisheries Science Center, however, indicates that the A- and B-run life history is expressed in at least four, if not all, of the Clearwater River MPG steelhead populations (NWFSC 2015).
- All remaining populations should at least achieve maintained status.

6.2.2 Current MPG Status

The NWFSC (2015) recently completed independent population viability assessments for five of the six populations in the Clearwater River steelhead MPG. It used these assessments and applied the MPG-level viability criteria to determine the current status of the MPG. This section summarizes these assessment results. Sections 6.2.5 through 6.2.9 provide more detailed discussions for each independent population. The NWFSC did not assess the status of the North Fork Clearwater River population since Dworshak Dam currently blocks access to the entire historical habitat area.

Currently, the Clearwater River steelhead MPG does not meet the MPG-level viability criteria. All five extant populations are presently at moderate (Lower Mainstem Clearwater, Selway, and Lochsa Rivers) or high risk (Lolo Creek, South Fork Clearwater River) of extinction within 100 years, primarily due to moderate or high abundance and productivity risk (Table 6.2-2). As discussed in Section 6.2.1, at least three of the MPG’s populations must be viable and one must be highly viable for the MPG to meet the viability criteria.

Table 6.2-2. Viable Salmonid Population (VSP) risk matrix for independent populations in the Clearwater River steelhead MPG with current status, as determined from ICTRT population viability assessments (ICTRT 2008).

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Lo. Mainstem Clearwater Selway R Lochsa R.	M	HR
	High (>25%)	HR	HR	HR Lolo Creek SF Clearwater R.	HR

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

The assessment of abundance/productivity risk for steelhead populations is problematic because of the lack of population-level abundance data for most populations. Genetic stock identification for adults sampled at Lower Granite Dam and PIT-tag arrays installed at the mouths of major rivers, however, are now allowing some population-specific abundance and productivity estimates, such as those reported in NWFSC (2015). Abundance/productivity assessments in this recovery plan will be updated once this population-specific information becomes available.

6.2.3 MPG Limiting Factors and Threats

Many limiting factors and threats affect the viability of Idaho’s Snake River Basin steelhead during their complex, wide-ranging life cycle. NMFS defines limiting factors as the biological and physical conditions that limit a species’ viability (e.g., high water temperature) and threats as those human activities or natural processes that cause the limiting factors. While the term ‘threats’ may carry a negative connotation, these are often legitimate and necessary human activities that may at times have unintended negative consequences on fish populations. Adjusting such activities can often minimize or eliminate the negative impacts.

This section summaries the impacts on Clearwater River steelhead populations from natal habitat alteration, hatchery programs and fishery management. Chapter 4 summarizes the regional-level limiting factors and threats that affect all Snake River Basin steelhead and spring/summer Chinook salmon populations. Section 6.1 summarizes factors specific to all Idaho Snake River Basin steelhead populations. Limiting factors and threats specific to individual Clearwater River steelhead populations are discussed in the Population Summaries in Sections 6.2.5 through 6.2.9.

Photo credit: J. Myers.

6.2.3.1 Natal Habitat

Habitat conditions in the Clearwater River MPG span a wide range of quality due to various combinations of natural and anthropogenic factors. Significant intrinsic differences in habitat quality exist among Clearwater tributaries due local climatic conditions that vary with elevation and vastly different geologic settings that influence channel form and basin hydrology. Basins dominated by Columbia River basalts tend to have flashy hydrographs and low baseflows due to the highly porous nature of basaltic types of bedrock. Many lower Clearwater River tributaries that are important for steelhead production have intermittent flows due to the underlying basalt geology. Metamorphic and granitic bedrock geologies become more prevalent in the upper Clearwater River basin. Streams in metamorphic and granitic geologies tend to have higher baseflows, and intermittent flows are not as common in steelhead-producing streams in the upper basin.

Both historic and present-day land uses have significantly altered steelhead habitat in portions of the Clearwater River basin. Steelhead habitat has fewest alterations at higher elevations that are managed primarily as forestlands, and in steeper canyons that are poorly suited for development. Steelhead habitat with the least amount of human alteration in the Clearwater River MPG lies in the Selway River population area and parts of the Lochsa River population area. The Selway-Bitterroot Wilderness covers nearly all of the Selway River population area and some higher elevations in the Lochsa River drainage, providing protection from human impacts associated with roads. The Selway and Lochsa Rivers are also designated wild and scenic rivers. A large portion of the upper Lochsa River drainage outside the wilderness boundary has a “checkerboard” land-ownership pattern with alternating sections of U.S. Forest Service lands and private lands intensively managed for timber production.

Habitat conditions for the Lolo Creek, South Fork Clearwater River, and Lower Mainstem Clearwater River populations contain a mix of public and private lands. Habitat conditions are not assessed for the North Fork Clearwater River steelhead population, which was extirpated by the construction of Dworshak Dam. While all of the extant population areas continue to contain some high quality steelhead habitat, habitat degradation in many reaches has resulted from agricultural use, livestock grazing, timber harvest, road development and past mining activities. In some areas, these land uses have reduced riparian function and floodplain connectivity, increased sediment loading, created passage obstructions, elevated summer water temperatures and reduced instream habitat complexity. Habitat modification is greatest along valley bottoms in developed areas and in areas under intensive agricultural or timber management. Presently, many degraded areas are on an improving trend due to ongoing habitat restoration efforts. Table 6.2-3 identifies the primary habitat-related limiting factors in the different population areas. Sections 6.2.5 through 6.2.9 discuss the population-level limiting factors and threats in more detail.

Table 6.2-3. Primary habitat-related limiting factors in Clearwater River Steelhead MPG.

Population	Primary Habitat-related Limiting Factors						
	Excess Sediment	Riparian Condition	Passage Barriers	Summer Flow	High Water Temperatures	Channel Condition & Complexity	Floodplain Connectivity
Lower Mainstem	√	√	√	√	√	√	√
Selway River	√	√	√		√		
Lolo Creek	√	√	√		√	√	
Lochsa River	√	√	√		√	√	
South Fork Clearwater R.	√	√	√		√	√	√
North Fork Clearwater R.	This population is extirpated. Habitat conditions were not assessed for recovery planning purposes.						

6.2.3.2 Hatchery Programs

Hatchery releases occur in three of the Clearwater River MPG’s five steelhead populations: Lower Mainstem Clearwater River, South Fork Clearwater River and Lolo Creek. Virtually all of the hatchery fish are released in the Lower Clearwater River and South Fork Clearwater River populations, with about half the releases occurring in each area. Together, hatchery programs within this MPG currently release approximately three million fish (all B-run) annually (Table 6.2-4). Most hatchery programs in this MPG are related to isolated harvest programs. No hatchery releases occur in the Selway River and Lochsa River. The natural-origin North Fork Clearwater River steelhead population was extirpated when Dworshak Dam was built in 1969.

Hatchery programs for steelhead in the Clearwater River basin are based on North Fork Clearwater B-run steelhead stock, which was trapped at the foot of Dworshak Dam when the project blocked access to the North Fork Clearwater River. Dworshak National Fish Hatchery (NFH), located at the mouth of the North Fork Clearwater River at approximately Clearwater River mile 40, has produced 2.3 million steelhead smolts annually in most years since the early 1970s. About 1.2 million smolts are released directly from the hatchery into the North Fork Clearwater River and the remaining 0.9 million are released in Clear Creek, Lolo Creek and the South Fork Clearwater River. The Clearwater Hatchery produces about 1.7 million smolts. Fish from the Clearwater Hatchery are released in the South Fork Clearwater River (including Meadow and Newcome Creeks) for fishery mitigation and in an attempt to reestablish a natural spawning population in an area that had been blocked by dams in the last century. Clearwater Hatchery is transitioning to a local isolated broodstock collected in the South Fork Clearwater River by angling. Hatchery-origin steelhead are rarely observed in the important steelhead production areas of the Lochsa and Selway Rivers, or in the lower Clearwater River tributaries, and are not believed to influence these natural populations. Recent genetic analysis supports this observation. The only current release site within the Lower Mainstem population is in Clear Creek, near the upstream fringe of the population.

Hatchery and Genetics Management Plans (HGMPs) for the hatchery programs describe program operations and actions taken to support recovery and minimize ecological or genetic impacts, such as straying and other forms of competition with naturally produced fish. The FCRPS Biological Opinion (NMFS 2008a) requires the hatchery operators and the action agencies to provide NMFS with updated HGMPs describing site-specific applications of the “best management practices” for the hatchery programs as described in Appendices C and D of the Supplemental Comprehensive Analysis of the FCRPS (NMFS 2008b) for those mitigation hatchery programs funded by the FCRPS action agencies. The HGMPs are the basis for NMFS’ biological opinions on hatchery programs under ESA sections 7 and 10 and the 4(d) rule, which all relate to incidental and direct take of listed species.

With the exception of the Lower Clearwater, the MPG is composed of high-proportion (>40%) B-run populations. The lower Clearwater River steelhead population consists predominantly of A-run fish but also contains a low mix (<15%) of B-run fish.

Summary of Hatchery-Related Limiting Factors and Threats

The large number of hatchery-origin steelhead (all B-run) released in the MPG relative to the likely size of natural production poses risks to the natural-origin steelhead populations they influence. However, several hatchery practices in the MPG pose additional risk. The most prominent:

1. The use of B-run steelhead in areas where they are not the predominate life history for the population. Currently, approximately half of the releases in the MPG are into an A-run dominated population. To the extent that B-run hatchery fish escaping the fishery are successfully interbreeding with natural-origin fish in the MPG, they are changing the natural occurring life history diversity.

2. Use of a single hatchery stock for releases. Traditionally, the B-run releases were from broodstock at Dworshak National Fish Hatchery. The original broodstock for this hatchery is from the North Fork Clearwater River. Still, to the extent that hatchery fish escaping the fishery are interbreeding with natural-origin fish in the MPG, they may be decreasing among-population B-run diversity.
3. Mainstem releases of nonacclimated fish. Unacclimated fish have little time to imprint, and if released into mainstem rather than tributary areas, what imprinting that occurs will be imprecise. Therefore, the fish are more likely to stray to other areas.

Historic and current hatchery-related limiting factors and threats that affect the natural-origin steelhead populations within the Clearwater River MPG are found in Table 6.2-4 below.

Table 6.2-4. Clearwater River Steelhead MPG hatchery programs, limiting factors and threats, and recovery strategies.

Population	Summary/Description	Current		Hatchery Influence		Hatchery Effects on Population Viability (+ denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability)	Recovery Strategy
		Limiting factors	Threats	Current	Historical		
Lower Mainstem Clearwater River	Hatchery steelhead have been stocked upstream and within the fringes of the population as currently defined. Genetic analysis shows downstream tributaries remain distinct from the rest of the MPG. Studies by USFWS (1999-2002) found most residuals within 4 km of the hatchery.	Competition for food and space; Reduced genetic adaptiveness; Demographic Changes; Life History Changes	Incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish; Non-local broodstock; high pHOS and low pNOB	Clear Creek	Clear Creek	- high pHOS* could reduce long-term productivity.	Monitor for strays; Use mix, as appropriate of acclimated release, local broodstock, selection of release sites to minimize risk. Developed through HGMP process.
South Fork Clearwater River	Efforts by Idaho Department of Fish and Game (IDFG) to reintroduce steelhead to the Clearwater drainage began in the 1960's. Over the course of the early reintroduction program, there was little evaluation of the different outplants or measurement of production of indigenous fish	Competition for food and space; Reduced genetic adaptiveness; Demographic Changes Life History Changes	Incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish; Out-of-population broodstock; Operation of weir; high pHOS and low pNOB	Smolt releases	Since 1960s	- continued low pNOB and high pHOS could reduce long-term productivity.	Monitor for strays; Use mix, as appropriate of acclimated release, local broodstock, selection of release sites to minimize risk. Developed through HGMP process.
North Fork Clearwater River	Dworshak Dam was completed in the late 1960's and completely blocked all anadromous fish migration into the North Fork Clearwater. The dam eliminated 60 percent of the highest quality habitat for steelhead in the Nez- Perce-Clearwater National Forest. The broodstock for Dworshak fish hatchery was developed from the native North Fork Clearwater steelhead run; currently, no natural-origin fish are used for broodstock.	Dworshak Dam	NA	Smolt releases	Since 1960s	NA	NA

Population	Summary/Description	Current		Hatchery Influence		Hatchery Effects on Population Viability (+ denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability)	Recovery Strategy
		Limiting factors	Threats	Current	Historical		
Lolo Creek	Artificial propagation programs for steelhead in the Clearwater River basin are based on the North Fork Clearwater B-run stock that was trapped at the base of Dworshak Dam when the dam was constructed on the North Fork in 1969. This stock has been outplanted into the Lolo Creek population intermittently since 1977. Currently, a Lolo Creek supplementation program operates out of the Clearwater Hatchery using Dworshak NFH B-run steelhead stock. Broodstock is collected at the Dworshak NFH and no natural-origin adults are spawned.	Reduced genetic adaptiveness; Demographic Changes Life History Changes	Out-of-population broodstock	Smolt releases	Since 1977	- continued low pNOB could reduce long-term productivity	Use mix, as appropriate of acclimated release, local broodstock, selection of release sites to minimize risk. Developed through HGMP process.
Selway River	Hatchery steelhead have not been stocked in the drainage. Natural production maintains the run.	None	None	None	?	No effect	Monitor for strays; Manage for natural production.
Lochsa River	Hatchery steelhead have not been stocked in the drainage. Natural production maintains the run.	None	None	None	1973-1990	No effect	Monitor for strays; Manage for natural production.

* Proportion of hatchery-origin spawners (pHOS); proportion of natural-origin broodstock (pNOB).

6.2.3.3 Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Clearwater River and tributary reaches continue to pose a threat to the abundance, productivity and diversity of the Clearwater River steelhead MPG. The Clearwater River steelhead MPG supports a mix of A-run and B-run steelhead. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead populations; however, the ICTRT has determined that no phenotypic traits appear to be at substantial risk because of harvest activities (ICTRT 2010).

Mainstem Columbia and Snake River Fisheries

Most harvest-related mortality for steelhead returning to the Clearwater River MPG occurs on the mainstem Columbia River in fisheries directed at fall Chinook salmon. Clearwater B-run steelhead experience higher harvest rates than the A-run steelhead because of their later run timing and larger size. In recent years, total exploitation rates on A-run steelhead have been stable at around 5 percent, while exploitation rates on B-run steelhead have generally been in the range of 15 to 20 percent (Ford 2011). The ICTRT (2010) and NFWSC (2015) determined that these rates present a low risk for the Snake River Basin steelhead populations, but cautioned that the rating could increase to moderate if future harvest rates increase and the fishery continues to be selective on the B-run steelhead. As discussed in Chapter 4, mainstem Columbia River fisheries targeting Snake River Basin steelhead are managed under an abundance-based annual harvest schedule under the jurisdiction of the *U.S. v. Oregon* Management Agreement for 2008-2017 and the associated biological opinion. The Columbia

River mainstem fisheries are under constant monitoring on an annual basis consistent with the *U.S. v. Oregon* Management Agreement.

Tributary Fisheries

Fishery-related mortality of natural-origin steelhead in the Clearwater River MPG is currently not considered a threat to the steelhead populations. No state fisheries directly target natural-origin steelhead. All recreational fisheries on steelhead are largely confined to mainstem and major tributary locations and target hatchery-origin fish. State regulations require that all caught natural-origin steelhead be released unharmed; however, incidental mortalities can occur in fisheries directed on hatchery fish, or resident fish. In areas where incidental capture of natural-origin steelhead is possible, IDFG implements special rules that restrict harvest of trout to the period from Memorial Day weekend through November, when nearly all adult natural-origin steelhead have already spawned (NMFS 2005).

Tribal fisheries for steelhead occur in the mainstem Salmon River and in the Clearwater River MPG in natural production areas as the tribes continue traditional fishing practices. The tribal fisheries are managed in accordance with approved Tribal Resource Management Plans to exert a level of impact on natural-origin steelhead populations commensurate with recovery.

Summary of Fishery-related Limiting Factors and Threats

Historical and Current Limiting Factors

- Direct mortality associated with fisheries that target specific stocks.
- Indirect mortality of fish harvested incidentally to targeted species or stock.
- Delayed mortality of fish that encounter gear but are not landed, or that die after being caught and released.
- Selective effects on timing, size, age (including larger, older fish) and/or distribution due to type of gear or fishing technique and/or location.
- Reduced marine-based nutrient supply and carrying capacity.

Historical Threats

- Past Columbia and Snake River mainstem fisheries.

Current Threats

- Fisheries targeting harvestable hatchery steelhead, fall Chinook salmon, or other species
- Indirect mortality of fish harvested incidentally to targeted species or stock.
- Harvest methods and timing.
- Illegal harvest (poaching).

6.2.3.4 Other Threats and Limiting Factors

Steelhead populations in the Clearwater River MPG are also affected by threats posed by the Columbia and Snake River hydropower system, predation and competition, estuarine habitat alterations, and climate change. Chapter 4 and Section 6.1 summarize the factors that affect all Idaho Snake River Basin steelhead populations.

6.2.4 MPG Recovery Strategy

6.2.4.1 Proposed Population Status

The recovery strategy for the Clearwater River MPG includes achieving a proposed status for each population within the MPG. There are multiple viable MPG scenarios for the Clearwater River, as described above in Section 6.2.1. To provide focus for this recovery plan, NMFS and the state of Idaho have selected a proposed status for each population, matching one of the viable MPG scenarios. The selections are described below and in Table 6.2-5. It is important to note, however, that the recovery scenario remains flexible and will be updated depending on how the populations respond to changes over time. Any viable MPG scenario satisfying the criterion in Section 6.2.1 is acceptable for achieving the recovery goal.

Table 6.2-5. Viable Salmonid Population (VSP) risk matrix for independent steelhead populations in the Clearwater River MPG. This scenario illustrates one way to achieve a viable MPG.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV Lochsa or Lower Clearwater	V	M
	Low (1-5%)	V	V Selway, Lower Clearwater or Lochsa	V	M
	Moderate (6 – 25%)	M	M	M Lolo Creek SF Clearwater	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

Lower Mainstem Clearwater River

The Lower Mainstem Clearwater River population is the only Large-size population and must attain viable status to meet the ICTRT size criterion. It also must be selected because it is the only predominately A-run population, with a low (<15%) B-run contribution (NWFSC 2015). The proposed status for the Lower Mainstem Clearwater population is ***Viable***, with low (1 to 5%) risk of extinction over 100 years. However, it may be possible for the population to reach ***Highly Viable*** status, with very low (less than 1%) risk of extinction, based on recent abundance/productivity estimates (NWFSC

2015) suggesting the population is relatively robust. Large-scale habitat improvement projects are planned in the future which could further increase population abundance and productivity.

Selway River

The Selway River population supports a high (>40%) B-run life history and is one of three Intermediate-size populations, two of which must achieve viable status. There is very little hatchery influence on this population and the habitat is in very good shape, with much of it protected by the Selway-Bitterroot Wilderness. The proposed status for the Selway River Population is ***Viable***, with low extinction risk.

Lochsa River

The Lochsa River population supports a high B-run life history and is one of three Intermediate-size populations in the MPG, two of which must achieve at least viable status. There is very little hatchery influence on this population and habitat is in good shape in sections of the population, with some streams falling in roadless areas or the Selway-Bitterroot Wilderness. The proposed status for the Lochsa River population is ***Highly Viable***, with very low (less than 1%) risk of extinction over 100 years. The Lochsa population was chosen to achieve highly viable status over the equally well-protected Selway River because it is more accessible than the Selway River for data collection. However, because habitat is already in relatively good shape in much of the Lochsa River watershed, and there is limited opportunities to restore degraded habitats, significant improvement in population abundance and productivity from habitat restoration is unlikely. If the Lower Mainstem Clearwater population can achieve Highly Viable status, then ***Viable*** status is an acceptable option for this population.

Lolo Creek

The Lolo Creek population supports a high B-run life history and is a Basic-size population. The habitat has been more impacted by land uses than the Selway or Lochsa populations. The proposed status for the Lolo Creek population is ***Maintained,*** with only a moderate (25% or less) risk of extinction over 100 years.

South Fork Clearwater River

The South Fork Clearwater River population supports a high B-run life history and is one of three Intermediate-size populations, two of which must achieve viable status. This population‘s habitat has been more impacted by land uses than the other intermediate populations and a state highway runs along much of the mainstem river. The South Fork Clearwater also has a higher degree of hatchery fish influence than the other Intermediate-size populations. The proposed status for the South Fork Clearwater River population is ***Maintained,*** with only moderate risk.

North Fork Clearwater River

The North Fork Clearwater River population was blocked by the construction of Dworshak Dam, and currently serves only as a hatchery population. Therefore, the North Fork Clearwater River population is not included in any viability scenarios for the MPG.

If each population achieves its proposed status, shown in Table 6.2-5, the Clearwater River MPG will be viable. Other combinations of population viability, however, could also achieve MPG-level viability. Thus, we will continue to monitor the status of the populations and adjust the MPG-level recovery scenario over time based on how the populations respond to recovery efforts.

6.2.4.2 Recovery Strategies and Priority Actions

The recovery strategy for the Clearwater River MPG increases abundance and productivity for all populations. The VSP risk matrix (Table 6.2-2 and Table 6.2-5), shows that each population requires a decrease in abundance/productivity risk to reach its proposed status of highly viable (very low risk), viable (low risk), or maintained (moderate risk). The current spatial structure/diversity risk for each population is acceptable for each population to achieve its proposed status. Thus, the recovery strategy for this MPG is to prevent any further impacts to spatial structure or diversity.

Increases in population abundance and productivity will come from the cumulative positive impacts of recovery actions targeting every life stage. This recovery plan groups recovery actions in the following categories: natal habitat, hatchery programs, mainstem Snake and Columbia Rivers and hydropower system, fisheries management, Columbia River estuary and plume, competition and predation, and climate change. Because all of the populations in this MPG are currently at high or moderate risk, recovery actions to increase survival will be needed from all categories.

Natal Habitat

The Selway River population is well protected, with much of its habitat falling in the Selway-Bitterroot Wilderness. The Lochsa River population also has some degree of protection, with many streams in either designated wilderness or roadless areas. However, a state highway runs along the mainstem Lochsa River. The remaining three populations in the MPG (Lower Mainstem Clearwater, Lolo Creek, and South Fork Clearwater) are in managed landscapes and habitat has varying levels of anthropogenic influence.

The priority spawning and rearing habitat recovery actions in this MPG are diverse and they vary among populations. Habitat actions specific to certain populations are identified in the population-level recovery plans in Sections 6.2.5 through 6.2.9.

Hatchery Programs

The intent of the hatchery recovery strategy for the Clearwater River steelhead MPG is to reduce the fitness and diversity risks that hatchery programs may present. This will be especially important for the Lower Mainstem Clearwater River population, which is targeted to achieve a proposed status of Viable to support MPG recovery. Key aspects of the population-specific hatchery recovery strategies for this MPG include: (1) Continue to limit releases to the South Fork Clearwater River, Lower Mainstem Clearwater River, and Lolo Creek; (2) Reduce ecological and genetic risk associated with hatchery programs by releasing acclimated fish from locally adapted broodstocks at sites where these risks can be minimized or managed.

Key hatchery strategies to support recovery:

- Manage the MPG for natural production in areas and streams.
- Increase portion of releases of fish from locally adapted broodstock.
- Preserve and protect North Fork Clearwater stock.
- Ensure that all hatchery fish are genetically marked (e.g. fin clip, genetic marking, internal or CWT).
- Encourage transition of programs to integrated supplementation programs to reduce potential risks to MPG-level viability.
- Customize release sites to minimize interactions with wild fish.
- Intensively monitor for stray rates and sources; if needed, develop actions to reduce straying.

Fishery Management

The overall harvest strategy for the Clearwater River MPG is to continue the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead. Fishery opportunities provided for steelhead will continue to be sensitive to annual population abundance and promote recovery, while remaining consistent with tribal trust responsibilities and formal agreements like *U.S. v. Oregon*. Based on the fishery management protocols under *U.S. v. Oregon* agreements, as well as the guidelines and constraints of the ESA, the fishery mortality rates for natural-origin steelhead will be managed at levels intended to support the recovery of natural-origin steelhead populations belonging to this MPG. Tributary fisheries for Snake River Basin steelhead will continue to be managed to support natural production and not reduce the likelihood of survival and recovery of the DPS.

The harvest strategy also calls to refine monitoring and research efforts. More data are needed to monitor and manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries.

Specific elements of the harvest strategy include:

- Mark all hatchery-origin juveniles (e.g., fin clips, genetic marking, internal or coded wire tags).
- Where possible, develop a population-specific sliding scale for harvest management based on natural-origin returns and designed to minimize impacts to natural-origin fish.
- Coordinate harvest among all co-managers to ensure that the collective impacts to each population are consistent with recovery goals.
- Implement and improve creel surveys or other monitoring of fisheries to assess and manage impacts on natural-origin returns.
- Continue implementation of parental-based tagging and/or genetic stock identification to determine population-specific impacts from mainstem Columbia River fisheries.

Additional Out-of-MPG Threats

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Clearwater River MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary, and ocean and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan provide additional direction.

An important part of the recovery strategy for populations in this and other MPGs in the Snake River Basin steelhead DPS is continuing to develop accurate population-specific estimates of annual abundance, and obtaining information on the relative distribution of hatchery spawners at the population level (ICTRT 2010). Results from the genetic stock composition monitoring at Lower Granite Dam beginning with the 2008-2009 cycle year and the systematic PIT-tag program are providing finer-scale geographic estimates of steelhead returns (NWFSC 2015).

6.2.5. Lower Mainstem Clearwater River Steelhead Population

The Lower Mainstem Clearwater River steelhead population is currently rated as maintained, with a tentative moderate risk rating for abundance and productivity. Its targeted proposed status is viable, which requires a minimum of low abundance/productivity risk, or highly viable, which requires a very low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Viable or Highly Viable

This section identifies a number of actions framed to move the population towards achieving its proposed status. Reaching the proposed status, however, will require the implementation of actions throughout the population’s entire range and life cycle, particularly in the mainstem Snake and Columbia River migration corridors. These additional actions are described in Chapter 4 and Section 6.1.

Population Status

This section of the recovery plan compares the Lower Mainstem Clearwater River population’s current status to its proposed status. The population’s current status is based on the ICTRT’s population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015), which identify population risk in terms of four viability parameters: abundance, productivity, spatial structure, and diversity. This section focuses primarily on population abundance (the total number of adults) and productivity (the ratio of returning adults to the parental spawning adults). It also summarizes spatial structure (the amount and nature of available habitat) and diversity (genetic traits) concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

This population includes tributaries to the lower mainstem Clearwater River, lower South Fork Clearwater River, and lower Middle Fork Clearwater River (ICTRT 2003, Figure 6.2-2). Steelhead returning to these lower elevation tributaries were once assumed to be all A-run (spending one year in the ocean), and were thus differentiated based on life-history pattern from the B-run fish (two years in the ocean) returning to the upper South Fork Clearwater River, Lochsa River, and Selway River. NWFSC (2015), however, determined that a low (<15% of returning adults) B-run component occurs with the A-run fish in this population. Steelhead display a diversity of life history strategies in the Lower Clearwater population. In the Potlatch River, a major tributary, IDFG reports at least nine different phenotypes, with steelhead spending one, two, or three years in the ocean and one to three years in freshwater (Bowersox et al. 2011).

The population does not include the North Fork Clearwater River or Lolo Creek drainages. A break in habitat characteristics separates this population from the North Fork Clearwater River, and access to the North Fork Clearwater River is blocked by Dworshak Dam. Lolo Creek supports both A-run and B-run steelhead (>40%), and has been considered an independent population from the Lower Mainstem Clearwater River, partly for that reason. Clear Creek, a tributary to the lower Middle Fork Clearwater River, presumably supported A-run steelhead historically (due to habitat similarity to other Lower Mainstem Clearwater River A-run tributaries), but has had recent hatchery influence from Dworshak and Kooskia Hatchery B-run fish. It was grouped with the Lower Mainstem Clearwater River population based on its assumed historical life history and a lack of data that would include it in any other population.

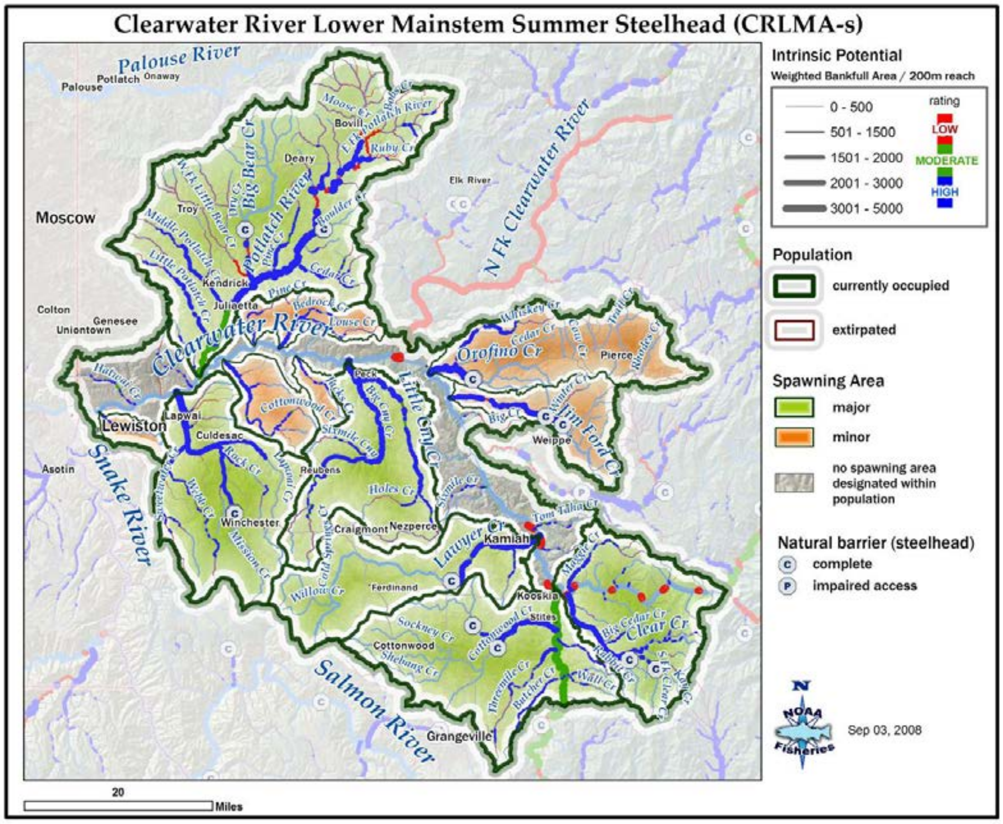


Figure 6.2-2. Lower Mainstem Clearwater River steelhead population, with major and minor spawning areas based on modeled habitat intrinsic potential. The intrinsic potential model, based on stream width and gradient, may overestimate potential habitat value in some streams in this population, such as Lawyer Creek. [Note: This map does not reflect the current spawning activity in the area. Several streams outside of major or minor spawning areas (e.g. Tom Taha Creek) currently support steelhead spawning.]

The ICTRT classified the Lower Mainstem Clearwater River population as "Large" in size and complexity based on historical habitat potential (ICTRT 2007a). The mainstem Clearwater River does not support steelhead spawning and is primarily a migration corridor. A steelhead population classified as Large has a mean minimum abundance threshold of 1,500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (low risk) of extinction over a 100-year timeframe.

Abundance and Productivity

Direct estimates of current abundance (total number of adults spawning in natural production areas) are not available for this population. There are no weirs, traps, or surveys to count adult abundance across the entire population. Surveys of juvenile density or abundance are conducted in some stream reaches, IDFG surveys adult spawners in some select tributaries to the Potlatch River and operates PIT-tag arrays on the Potlatch River. The Nez Perce Tribe operates PIT-tag arrays in the Lapwai Creek drainage. In addition, a subset of returning wild adult steelhead are PIT-tagged at Lower Granite Dam; adult abundance estimates for watersheds with PIT-tag arrays near the mouth can be estimated based on PIT-tag expansion. Overall, however, the numerous dispersed tributaries and potential spawning reaches make population-wide abundance estimates difficult. Furthermore, large numbers of hatchery-origin steelhead from upstream hatchery programs pass through the population in the mainstem Clearwater River, both as juveniles and adults. It is unknown how many migrating juvenile steelhead cease their migration and become freshwater residents in this population, or the number of upstream migrating adults that stop short of the release locations and spawn in the population. These hatchery fish add uncertainty in estimating the abundance of the natural-origin population.

The adult steelhead sampling program at Lower Granite Dam allows estimation of abundance and diversity characteristics (age, sex ratio, genetic diversity) of 10 different stock groups based on genetic stock identification. The genetic stock composition analysis supports partitioning out Lower Clearwater River returns from the aggregate natural return at Lower Granite Dam, but this single population stock group has a higher potential rate of misclassification than the rest of the MPG. Based on genetic stock identification, NWFSC (2015) estimated 10-year (2005-2014) geometric mean abundance for the population at 2,099 and 20-year geometric mean intrinsic productivity at 2.36 adult progeny per parent. Although this combination of abundance and productivity estimates exceeds the minimums for a viable population, NWFSC (2015) tentatively rated this population at moderate abundance/productivity risk due to the uncertainty in the estimates.

The NWFSC produced a memo in August 2016 ─ which is included with this recovery plan as Appendix A ─ that describes new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for this and other populations. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The ICTRT has identified six major spawning areas (Lapwai Creek, Potlatch River, Big Canyon Creek, Clear Creek, Lawyer Creek, and Lower South Fork tributaries) and five minor spawning areas (Orofino, Jim Ford, Cottonwood, Bedrock, and Lindsay Creeks[2]) within this population, based on modeled historic habitat potential. A minor spawning area is capable of supporting between 50 and 500 spawners, and a major spawning area is capable of supporting at least 500 spawners. Current spawning is distributed widely across the population and is presumed to occur in all major and most minor

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[2] Lindsay Creek is not occupied due to a passage barrier at the stream mouth (Nez Perce Tribe, personal communication, July 2012).

spawning areas, including all major tributaries and numerous small tributaries. However, redd count data for the population is very limited, especially with respect to the number and frequency of surveys. Based on the extensive branching of currently occupied habitat, the spatial structure risk for this population is very low, which is adequate for this population to reach its proposed status (NWFSC 2015).

Diversity

Genetic data for Lower Mainstem Clearwater River steelhead show differentiation among sub-components within the population and clustering of those sub-components within a larger group of Clearwater River MPG samples. Additionally, Lower Clearwater River genetic samples showed no similarity to the single hatchery sample available, suggesting very low genetic risk for the population. Although there is no within-population hatchery program in this population, nor is there an A-run hatchery program in the MPG, large numbers of hatchery fish swim through the population as out-migrating juveniles or as adults returning to their original release site. It is unknown how many migrating juvenile steelhead cease their migration and become freshwater residents in this population or the number of upstream migrating adults that stop short of the release locations and spawn in the population. There is some diversity risk associated with the high degree of uncertainty regarding the contribution of those fish to natural spawning. The cumulative diversity risk for this population is low, but the risk rating could be increased to moderate, pending a more in-depth assessment of the potential hatchery-origin component of natural spawners and of impacts from recreational harvest. A low diversity risk is adequate for this population to reach its proposed status (NWFSC 2015).

Summary

The Lower Mainstem Clearwater River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance and productivity, based on the NWFSC (2015) assessment. Increased certainty in the population abundance and productivity estimates is necessary to determine whether the population has reaches its proposed status of viable or highly viable. Population-specific abundance data will be necessary to increase the certainty of the abundance/productivity rating. The overall spatial structure and diversity rating of low risk is sufficiently low for this population to reach its proposed status. Table 6.2-6 summarizes the population’s abundance/productivity and spatial structure/ diversity risks.

Table 6.2-6. Viable Salmonid Population parameter risk ratings for the Lower Mainstem Clearwater River steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V ↑	V	M
	Moderate (6 – 25%)	M	M Lower Mainstem Clearwater River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The drainage area occupied by the Lower Mainstem Clearwater River population encompasses 6,848 km^2 (2,644 mi^2). The drainage area has 2,426 km of streams, with about 69 percent (1,677 km) occurring downstream from natural barriers and accessible to anadromous fish. The landscape within this area is diverse, from forested mountains and hillsides to rolling prairies, with steep canyons cutting through the rolling uplands down to the mainstem Clearwater River. The region is mostly arid, with annual precipitation ranging from roughly 175 mm (7 inches) at the lowest elevations, and roughly 750 mm (30 inches) at higher elevations. Elevations within the basin range from 213 meters (700 feet) at the mouth of the Clearwater River to more than 1,830 meters (6,000 feet). Watershed elevation has a significant effect on the hydrology of the tributaries due to differences in the amount of precipitation and the proportion of the precipitation that occurs as snow.

Land ownership within the population is primarily private, with Nez Perce Tribal lands, U.S. Forest Service, Bureau of Land Management (BLM), and state lands making up the remaining 23 percent.

U.S. Forest Service and state lands are located in the upper reaches of the Potlatch River, Jim Ford Creek, Orofino Creek, Maggie Creek, and Clear Creek. BLM lands are generally smaller tracts scattered along the mainstem Clearwater River, while private land is dominant throughout most of the watersheds. Nez Perce tribal lands are interspersed within mostly private lands along many of the western drainages within this population. The dominant land uses are agriculture (grains), livestock grazing, timber harvest, and rural development. Due to the steep topography, most road and housing development is concentrated in valley bottoms and on the prairie plateaus. Many streams and rivers have adjacent roads built in the valley bottom. Buildings and roads in developed areas commonly encroach on stream channels and floodplains.

The diversity of landforms creates several types of hydrologic regimes in the Lower Mainstem Clearwater River basin (Table 6.2-7). The precipitation at higher elevations tends to occur primarily as snow; a mix of rain and snow occurs at mid-elevations; and precipitation in the lower elevations tends to be predominantly rain. Watersheds with relatively high topographic relief tend to have a mix of rain and snow driven stream flows, with extreme year-to year-variation in flows. Winter rain-on-snow events are common at mid-elevations. Rain-on-snow generates flashy storm runoff, and the flashiness is intensified by road ditches and farm field drainage that generate surface runoff much faster than the natural vegetation. The flashiness is also intensified by levees, which prevent floodwaters from dispersing onto the floodplain and thereby reducing sheer stress. Flashy stream flows tend to scour the steeper stream channels and maintain a chronic state of streambed instability.

In the snow-dominated areas, accumulated snow acts as a natural reservoir that stores winter precipitation and releases it during the spring. Water from snowmelt tends to shift peak flows later into spring or early summer, and it tends to extend relatively high base-flows into the summer. None of the streams in the Lower Mainstem Clearwater River basin have an entirely snow-driven flow regime, but the East Fork Potlatch River and Clear Creek have regimes that are more snow-driven than rain-driven.

Table 6.2-7. Basin elevations and hydrologic characteristics of major streams in the Lower Mainstem Clearwater River basin.

Stream	Elevation Class	Mid-Point elevation (feet)	Elevation at Mouth (feet)	Relief (feet)	Hydrology
Catholic Creek	Low Elevation	1842	785	2115	• Mostly rain-driven flow regime • Prone to intermittent flows in summer unless there is a significant groundwater influence
Big Creek		2092	1035	2114	
Fivemile Creek		2177	1075	2205	
Cottonwood (Clearwater)*		2192	840	2705	
Pine Creek		2194	1368	1652	
Tom Taha Creek		2262	1180	2165	
Bedrock Creek	Moderate Elevation	2505	870	3270	• Mixed snow and rain flow regime tending toward rain
Lapwai Creek		2560	800	3520	
Big Canyon Creek**		2590	960	3260	

Stream	Elevation Class	Mid-Point elevation (feet)	Elevation at Mouth (feet)	Relief (feet)	Hydrology
Lawyer Creek		2996	1170	3652	• Summer flows vary with size of snow pack, spring rains, and timing of snow melt; sometimes intermittent
Little Bear Creek	High Elevation	3440	2720	1440	• Mixed snow and rain flow regime tending toward snow • Summer flows rarely intermittent
Orofino Creek		3535	1017	5036	
Clear Creek		3615	1262	4706	
EF Potlatch River		3638	2672	1933	

*Generally maintains continuous flow, except for one 2-mile reach.

**Contains a 9-mile reach that is annually dewatered (Rasmussen et al. 2009).

Climatic conditions in the basin are generally warmer and drier than most of the watersheds occupied by Snake River basin steelhead. Hot dry summers are common with summer air temperatures frequently reaching over 100 °F in the lower elevations of the basin. Most of the streams in the Lower Mainstem Clearwater River basin are prone to summer drought. Stream segments in the bedrock canyons sometimes have an influx of water from springs. The cool-water refugia created by springs may function as core areas for steelhead production in drier years. The availability of cool-water refugia is likely to be one of the more significant natural limiting factors.

Major watersheds accessible to steelhead include Lapwai Creek, Potlatch River, Orofino Creek, Big Canyon Creek, Cottonwood Creek, and Lawyer Creek on the main Clearwater River; Cottonwood Creek on the South Fork Clearwater River; and Clear Creek on the Middle Fork Clearwater River. Numerous smaller tributaries also provide steelhead habitat. Several tributaries with steep canyon reaches, such as Orofino Creek, Jim Ford Creek, and Big Bear Creek, have falls or cascades that are natural impediments to steelhead migration. The barrier in Orofino Creek is likely passable at some streamflows.

Steelhead habitat conditions in the Lower Mainstem Clearwater River basin span a wide range of quality, with moderate to high amounts of impairment in many watersheds (Chandler et al. 2013). Habitat modifications are greatest in watersheds where there is a concentration of urban and rural developments in the valley bottoms, intensive crop production, or intensive timber management. Habitat conditions are modified the least in watersheds with large amounts of mature forest or lightly roaded lands at higher elevations, and in many of the steep canyons that have bedrock-controlled stream channels and undeveloped side slopes. Some of the more significant habitat modifications affecting steelhead include reduction in habitat complexity and reductions in summer stream flows. Many of the streams in the basin also do not meet various Idaho water quality standards (IDEQ 2014), with widespread problems with sediment, high temperatures, and nutrient enrichment. Water quality impairments tend to be greatest in drainages with municipal water treatment plants, large amounts of runoff from croplands, or in stream segments downstream from livestock pens located in riparian areas.

High quality spawning and rearing habitats are scattered throughout the basin. Most streams have at least a few areas of high quality habitat, even when the stream as a whole has relatively poor habitat conditions. High quality habitat areas typically occur in stream reaches that have an influx of groundwater or high rates of exchange between surface and subsurface flows and step-pool morphology, similar to settings described by Torgersen et al. (1999) and Nielsen et al. (1994). These high quality areas comprise a small fraction of the habitat area, but they may account for the majority of steelhead production in the Lower Mainstem Clearwater River basin. The number and extent of high quality areas have likely been reduced from activities that have altered stream channel morphology, reduced woody debris recruitment, or increased flashiness. High quality areas are focal points that can occur in streams that have mostly poor habitat, and the significance of these areas is often not apparent without a comprehensive habitat inventory.

Current Habitat Limiting Factors

Steelhead production in the Lower Mainstem Clearwater River basin is likely limited by the availability of high quality rearing habitats. Recent fish surveys and habitat inventories by the Nez Perce Tribe and various agencies typically find many stream reaches with very few juvenile steelhead, and a lesser number of reaches with very high juvenile steelhead densities (Banks and Bowersox 2012; Bowersox 2008; Bowersox and Brindza 2006; Bowersox et al. 2007, 2009, 2011; Chandler 2004, 2009, 2013; Chandler and Parot 2003; Chandler and Richardson 2005, 2006a). Although juvenile steelhead are widespread in virtually all streams that are large enough for adult steelhead to spawn, a large proportion of the juveniles appear to be concentrated in a small number of high quality areas.

High quality rearing habitats are those that have habitat complexity from features such as pools, perennial stream flow, favorable water temperatures, normative channel morphology, and instream cover from wood, rocks, undercut banks, overhanging vegetation, or turbulence. High quality habitats are created and maintained from natural channel-forming processes that are dependent on the rate of sediment supply, annual hydrograph (timing and volume of flows), cycles of floodplain inundation, and riparian vegetation. The processes creating high quality habitats have been altered from land uses that increase sediment and runoff flashiness; decrease stream flows, riparian shade, and large wood recruitment; or directly alter stream channels by levees, channelization, and straightening streams. Water quality problems and impassable culverts are occasionally limiting factors at a local scale. Table 6.2-8 summarizes habitat attributes that are limiting steelhead production, describes the mechanisms by which each limiting factor affects steelhead, and lists management objectives for addressing each limiting factor.

Table 6.2-8. Attributes of high quality habitats that are limiting steelhead in the Lower Mainstem Clearwater River basin and management objectives for increasing high quality habitats.

Habitat Attribute	Effects on Salmonids	Management Objectives to Address Limiting Factors
Water Temperature	Excessive temperature in summer precludes use of many streams that could otherwise be used by steelhead. Steelhead cannot survive in warmer streams unless they can find pools that have an influx of cool water from springs or seepage through gravels. In areas where steelhead are incapable of finding thermal refugia in summer, they are subjected to temperature stress that results in lower growth rates and higher mortality.	Reduce thermal inputs by increasing shade. Increase heat capacity of streams by increasing stream flows that are reduced by water use. Increase heat dissipation to groundwater by restoring processes that create pool and gravel bar formation. Consider substituting pool-forming structures only when circumstances preclude restoration of natural processes within the foreseeable future. Restore wetlands and increase floodplain storage to contribute cool water to streams during summer base flows.
Instream flow	Many streams that were historically perennial now often have discontinuous surface flows during the summer. Low stream flows reduce the amount of area available for invertebrate production and steelhead rearing. Steelhead in disconnected streams can become trapped in isolated pools that kill fish through temperature stress, starvation or exposure to predators.	Identify possible surface water users and work with the users to find for opportunities to increase stream flows. Possible solutions include switching domestic water supply to deep wells, xeriscaping, and reducing water use with devices such as timers, sprinklers, and moisture meters to optimize water use. Restore wetlands in order to increase stream flow at base flows.
Flow timing	Cultivated fields, paved surfaces, drainage tiles, and road drainage systems decrease water infiltration, and accelerate runoff. The combined effect of these alterations is extreme flow variation, a reduction in the amount of water stored in soils, and ultimately a reduction in base stream flows.	Uncouple artificial drainage systems from natural drainage systems. Increase ground cover on croplands by methods such as retaining stubble, planting alternative crops, and reducing tillage. Restore wetlands to reduce extreme peak flows, increase soil storage, and increase base flows.
Sediment supply	Runoff from croplands and road drainage ditches deliver sediment to stream channels in excessive amounts and at times when sediment inputs are not coupled with stream flows capable of transporting the sediment. Excess sediment likely impairs spawning success and reduces invertebrate production.	Systematically reduce sediment by: (1) Inventory sediment sources; (2) prioritize areas for sediment reduction; and (3) contact landowners to identify and implement steps to reduce erosion and sediment delivery.
Floodplain connectivity Riparian vegetation	Naturally functioning floodplains remove fine sediments, reduce the energy of floods, and provide a reservoir of large woody debris in a stream. Streams that lose their floodplains become simplified by channel incision. Riparian vegetation provides a variety of functions such as shade, instream cover from overhanging plants, tree roots, and woody debris that falls into the stream, streambank stability, and food from insects that fall from overhanging plants. Riparian functions have been lost or extensively	Remove levees that are unnecessary or not functioning; or move desired levees farther away from the stream. Restore incised channels to reestablish a functioning floodplain. Offer incentives and assistance to landowners to reduce activities in riparian areas that affect riparian vegetation.

Habitat Attribute	Effects on Salmonids	Management Objectives to Address Limiting Factors
	altered throughout the basin from a myriad of land use activities and floodplain development.	Restore riparian vegetative communities. Reintroduce beaver communities and install beaver dam analogues.
Habitat complexity	Habitat simplification is an overarching problem limiting steelhead production in the Lower Mainstem Clearwater River basin. Complex habitats support higher diversity and production of invertebrate species, and they are capable of supporting higher densities of steelhead.	Where reduced habitat complexity cannot be improved by fixing other habitat elements in this table, where natural processes are precluded by roads or other developments, or where natural recovery would occur too slowly, substitute artificial rock or log structures for natural features.
Migration Barriers	Many stream segments historically used by steelhead are likely to be inaccessible to steelhead due to culverts or bridges that block upstream fish movements during some or all times.	Inventory culverts and bridges to identify existing barriers. Replace bridges or culverts impeding fish passage by offering assistance to landowners.

1. Elevated Water Temperature

There is an abundance of published and unpublished water temperature data collected by numerous entities in the Clearwater River basin (IDFG, Idaho Department of Environmental Quality (IDEQ), Nez Perce Tribe, U.S. Forest Service, BLM, University of Idaho, and Latah, Lewis, Clearwater, and Nez Perce county soil and water conservation districts) that shows widespread temperature problems. Stream temperature impairment occurs in almost all major and minor spawning areas within the Lower Clearwater Figure 6.2-3).

The U.S. Forest Service used some of the Clearwater temperature data sources to model mean stream temperatures for month of August. The model shows that mean monthly temperatures are 15 °C or higher throughout the Lower Clearwater River basin (Figure 6.2-3). With stream temperatures commonly varying by +/- 5 °C or more from the mean each day, maximum temperatures are likely to frequently approach or exceed the thermal tolerance of steelhead in many locations where the mean August temperature is 15 °C. Nearly every stream supporting steelhead in the Lower Clearwater River basin has segments where water temperatures are stressful to steelhead in summer, and at least a few segments where relatively cool waters exist. Steelhead rely on the cool-water areas as refugia from excessive temperatures during the summer. Restoration and protection of cool-water refugia is essential to the recovery of steelhead in the Lower Clearwater River basin.

Excessive stream temperatures in the Lower Clearwater River basin are partly a natural phenomenon, but the problem is worsened by land use practices such as grazing, agriculture, timber harvest, water use, and floodplain development. Land use practices have contributed to higher water temperatures in summer by increasing solar heat inputs from reduced shade; reducing the heat capacity of streams where stream flows are reduced by water withdrawals; reducing heat losses to the ground by altering mechanisms that promote the exchange of surface and hyporheic waters that is maximized in channels that have an abundance of clean gravels, pools and gravel bars; and reducing the availability of thermal refugia through channel and floodplain alterations that reduce channel complexity.

The importance of flow regime and characteristics of riparian areas and stream channel conditions on water temperatures is illustrated by fish and habitat surveys in 23 streams in the Lower Clearwater River basin by Chandler (2013). The surveys showed that elevation had a strong influence on stream temperatures as expected, with cooler temperatures more prevalent in upper portions of a watershed, and warmer temperatures in lower reaches. However, site-specific conditions sometimes had an over-riding effect on temperature. Cooler water temperatures tended to occur in stream segments that had relatively high baseflows, stable channels, high canopy cover, and high levels of channel complexity, regardless of elevation or position within the watershed. The over-riding effect of site-specific habitat conditions on water temperatures highlights key environmental factors that are important for maintaining or lowering water temperatures.

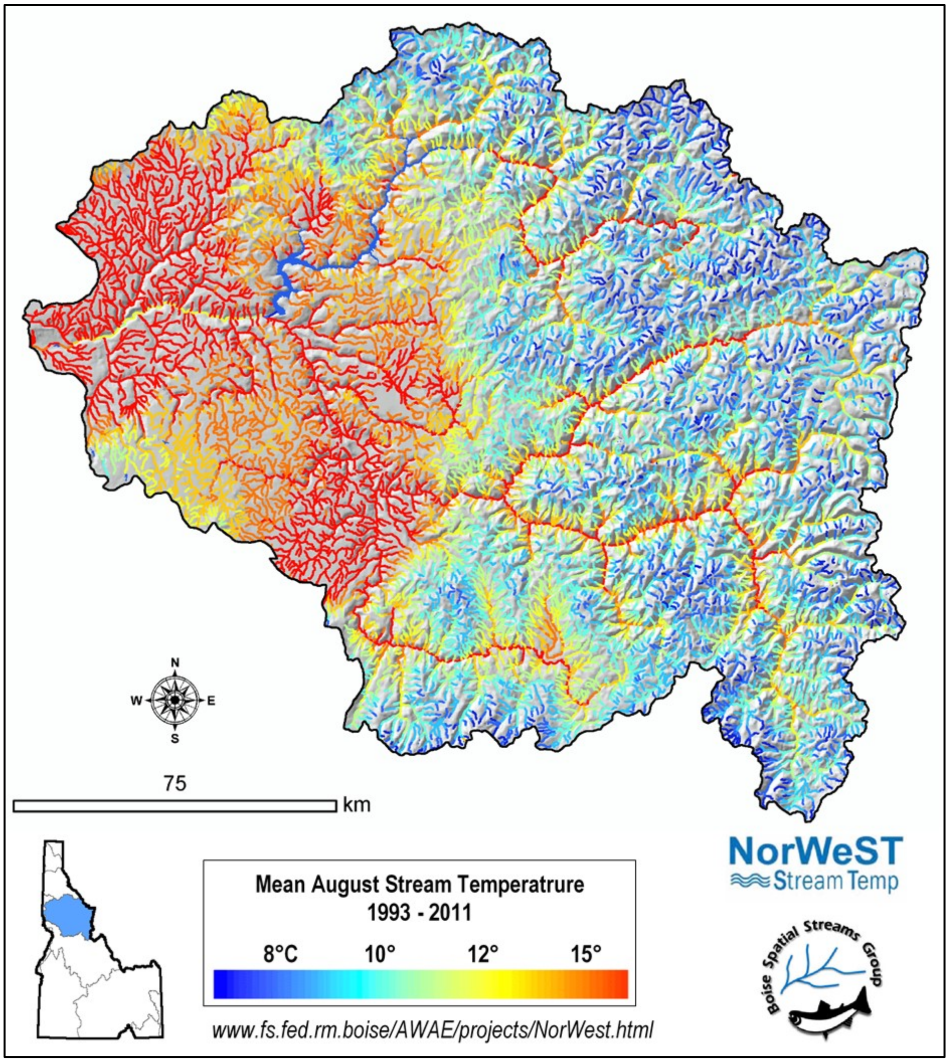


Figure 6.2-3. August mean stream temperatures in the Clearwater River basin from 1993-2011. Source: U.S. Forest Service, Rocky Mountain Research Station. Boise, Idaho.

Excessive water temperatures in the summer adversely affect salmonid growth and development, and may alter life history patterns and cause delayed or direct mortality (Spence et al. 1996). Water temperatures in Lower Clearwater River tributaries commonly reach levels that can cause stress-related fatalities if fish are unable to find pockets of cooler water that serve as thermal refugia. Thermal refugia are likely to be crucial areas limiting steelhead survival in many streams within the Lower Mainstem Clearwater River basin. Thermal refugia have been lost from reduced channel complexity and reduced stream flows. Excessive summer stream temperatures are a widespread problem in the Lower Mainstem Clearwater River tributaries that potentially reduces abundance and productivity of steelhead throughout much of the population. Although temperature problems are widespread, pockets of thermal refugia apparently exist in most streams since juvenile steelhead have been recorded throughout the population, albeit at very low densities in some streams. Restoring thermal refugia should be a primary restoration goal in streams with excessive summer temperatures.

Riparian habitat and stream channel restoration will be needed to reduce the effects of high summer stream temperatures on steelhead. Available water temperature data and modeling can be used to develop action plans for reducing water temperatures. Modeling can show where significant decreases in water temperature are needed and feasible. Where significant temperature changes appear to be unlikely for a water body as a whole, restoration efforts can be focused on maintaining or restoring stream segments that can function as cold-water refugia. Practices helpful for lowering temperature might include increasing riparian shade, restoring pool and gravel bar formations that force the exchange of surface and subsurface flows, and efforts to reduce surface water withdrawals. One notable example of altered stream temperatures exists in Sweetwater Creek. Sweetwater Creek likely functioned in the past as an important cold-water refuge due to the unique characteristics of the Twenty One Ranch Spring that provides a substantial amount of surface discharge. The spring outputs water with temperatures averaging around 10 °C. Flows from the spring have been reduced by manipulation of water levels in Lake Waha, and much of the flow is diverted out of the basin by the Bureau of Reclamation. Restoring the role of Sweetwater Creek as a cold-water refuge is an important recovery action. Restoration of thermal refugia throughout the lower Clearwater River is likely to be necessary to achieve significant increases in steelhead production in this population.

2. *Reduced Flow during Critical Periods*

Anecdotal historical accounts of people residing in the area typically describe higher summer flows in decades past, including examples where people used to fish in streams that today are completely dry in summer. Many of the small and intermediate-size streams that support steelhead in this population develop intermittent or discontinuous surface flows during summer. Low stream flows are a cumulative effect of watershed alterations, climatic conditions, and water usage. Low flows are problematic throughout the population area, but are most prevalent in populated valleys at low elevations and watersheds with significant amounts of cultivated lands. In populated areas, consumptive water use likely has a significant effect on stream flow through withdrawals of surface water for irrigation and wells that are hydrologically connected to surface flows. In agricultural areas, conversion of natural prairies and meadow systems to cultivated fields has likely reduced the amount of water infiltration and storage from these important areas.

In the Lapwai Creek drainage, the Bureau of Reclamation diverts a significant amount of surface water out of the basin, including flows from the Twenty One Ranch Spring. The supply of abundant cold water from the Twenty One Ranch spring in summer is likely to have made Sweetwater Creek and a portion of Lapwai Creek important refuges from high water temperatures in times of drought and hot weather, when other nearby streams would be dry. Sweetwater Creek likely once had abundant surface flows capable of supporting juvenile steelhead throughout the entire stream below the spring in hot dry years. Under the same weather conditions, similar streams were likely capable of supporting steelhead only in scattered areas with local groundwater influence. The Twenty One Ranch spring provides a unique buffer to drought-prone conditions that are common in the Lower Clearwater River Basin. Improvements to instream flows have restored surface connectivity in Sweetwater and Webb Creeks, but the water losses continue to contribute to flow problems in Lapwai Creek.

Data regarding surface flows and water use are lacking for nearly all streams in the population area. Water users are not required to monitor or report actual water usage. The degree to which water usage is affecting streamflows is unknown, except in the Lapwai Creek drainage where multiple stream gages are used to monitor stream flows and water usage by the Bureau of Reclamation. Sporadic stream gage records are available for stream gages in the Potlatch River drainage. Strategies to improve instream flows should include initial efforts to estimate water usage and its effects on surface flows.

Restoration of instream flows is a challenging problem in this basin since the demand for domestic water usage likely stems primarily from residential developments and non-commercial irrigation. Water usage of this nature is widely distributed among multiple users. The Bureau of Reclamation, Nez Perce Tribe, Lower Clearwater Exchange Project, and Lewiston Orchards Irrigation District are cooperating in a continuing effort to develop deep wells that will produce water to be exchanged for surface water diversions out of Sweetwater and Webb Creeks. The goal of this effort is to re-establish year-round flows in Sweetwater and Webb Creeks that are similar to historic flows that were augmented by the Twenty One Ranch spring. Gains in surface flows can be obtained if existing water users find ways to use less water. Recovery efforts should be focused on raising water user’s awareness of stream flow problems and assisting water users with developing ways of reducing water use. Stakeholders interested in increasing instream flows could offer to landowners a voluntary “water audit” as a preliminary means of assessing water usage and identifying specific measures that would reduce water usage. Groups with technical expertise such as the Nez Perce Tribe, IDFG, Idaho Department of Water Resources (IDWR), Natural Resources Conservation Service, and county soil and water conservation districts would be well-suited to providing technical advice and assisting landowners obtain any grants or financial assistance that is available for water conservation.

3. Altered Hydrology, Flow Timing

Streamflows vary naturally with seasonal patterns in precipitation, including periods when precipitation occurs as snow or rain. In the population area, precipitation is generally greatest from November through January, lowest in July and August, and intermediate in the remaining months. Winter precipitation is roughly three to four times greater than in summer. Under natural conditions, native vegetation and snow accumulation retard the movement of water into streams. The time lag from the point when precipitation falls to the point when it enters a stream may be delayed up to several months from accumulation of snow and movement through soils. The majority of land use practices in this population area reduce the lag time and create “flashy” stream flows that rapidly change with storm events. Alterations in vegetative cover from farming, forestry, grazing, roads, and urbanization generally decrease the amount of water that infiltrates into soils, and increase the volumes and rates of runoff from snowmelt and rainfall. Prominent hydrologic alterations include creation of impervious surfaces from buildings, paved roads, and parking lots; drainage tiles in agriculture fields that remove water from the soil; channelized streams that drain water more readily than natural channels with connected floodplains; diminished floodplain inundation; alteration of vegetative cover that slows water delivery to the ground; and road ditches that capture surface runoff and infiltrated water which flows directly into streams instead of moving through soils.

The combination of low elevation, snow accumulation, rain, and rain-on-snow events makes the timing of annual peak flows highly variable, ranging from early December through late May. This variability has likely increased from warmer winters that have become more common in recent decades. The annual hydrograph for some streams has changed to one that reflects higher spring runoff peaks, flashy storm-related stream flows, and lower summer and base flows. Ecovista et al. (2003) reported that flow variations in the lower Clearwater River basin are greatest in tributaries to the Camas Prairie where minimum mean monthly discharge can be expected to comprise less than 10 percent of the mean annual discharge. Extreme flow variations in the dry grassland environments of the Camas Prairie may be somewhat natural although this can be exacerbated by watershed disturbance. Loss of riparian vegetation and replacement of perennial grasses with annual crops in prairie and meadow environments has resulted in more overland flow and less infiltration, which translates at a watershed level to higher peak flows that subside more quickly than in the past (Black et al. 2003).

Drainage networks develop over time in response to precipitation and runoff patterns. The shift toward flashier runoff creates floods that would not normally occur; it increases the sediment transport capacity of streams and leads to unstable channels; and makes streams more susceptible to summer drought. Increased flood frequency and flood magnitudes causes stream channels to become larger, which makes summer flows more shallow than normal because the streamflows are spread over a wider area. The shallow water is then heated by the sun, contributing to temperature problems and low stream flows from increased evaporation. With increased flashiness, summer droughts become more frequent and more severe since the water from spring rains and snowmelt is carried out of the drainage system long before late summer when stream flows are at their lowest. In natural systems, water from spring rains and snowmelt that infiltrates soils often continues to seep into streams during summer.

Large flood flows increase the sediment transport capacity of streams making them prone to scouring and unstable channel structures. Flashiness has reduced fish habitat complexity in many streams where scouring has created unstable pools and riffles, and increased flows wash away logs that stabilize channels, create pools, and provide cover for fish.

IDEQ (2014) currently lists over 900 stream miles for stream flow alterations, and additional “unlisted” stream are also negatively impacted by such flow alterations (e.g. Big Canyon Creek, per Rasmussen et al. 2009). In general, these streams are within the Potlatch River, Lawyer Creek, Lapwai Creek, Pine Creek, Jim Ford Creek, and Lower South Fork Clearwater River tributaries. The Potlatch River watershed management plan, for example, lists hydrograph modification as a limiting factor for salmonids (RPU 2007). In the Potlatch River drainage, the natural hydrograph has been altered by timber management practices, agriculture practices, mining activities, and urbanization, all of which have resulted in changes to vegetative cover, soil compaction, channel modifications, and changes in storage capacity (BLM 2000, as cited in ISCC 2010). The current hydrograph reflects a flashy system where runoff occurs quickly with instantaneous discharges of 8,000 cfs in winter and early spring followed by late summer flows less than 10 cfs. The Idaho Soil Conservation Commission (ISCC) (2010) summarizes modeling work estimating that a five-year storm event with a peak flow of 2,980 cfs today would have had a peak flow of only 850 cfs under pre-settlement ground cover and canopy conditions. Flashy run-off can lead to high movement in bedload, suspended sediment, and organic debris, resulting in pool filling, channel erosion, and an overall loss in aquatic diversity (BLM 2000, as cited in RPU 2007).

Stream flashiness is likely to be permanently higher than normal as long as existing land uses and developments continue. Few efforts have been made to reduce flashiness. Efforts to minimize alteration in flow timing and flashiness should be focused on raising the awareness of landowners and local governments about hydrologic modifications, and assisting interested parties with developing actions to reduce flashiness. Flashiness can be reduced in many areas by disconnecting artificial drainage systems from natural drainage systems, reducing the amount of impervious surfaces, and increasing vegetative cover on agricultural fields. Flashiness may also be diminished trough maximizing floodplain storage from runoff events. Increased inundation of low gradient floodplains may attenuate high spring flow events while increasing groundwater stored for summer baseflow. Beyond levee removal and incised channel restoration, this might best be addressed through reintroduction of beaver colonies and strategic application of beaver dam analogues to appropriate mid and upper stream reaches.

4. Excess Sediment

Elevated sediment delivery to streams is prevalent throughout the population area, but sediment accumulation in streams is likely to be a limiting factor largely in low-gradient stream reaches. Elsewhere, sediment is likely to be a secondary problem at this time since sediment transport capacity has been increased in many streams (as described above) to the extent that there is little deposition of fine sediment. If flashiness is reduced, sediment deposition in stream channels is likely to increase. In short, accumulation of fine sediment in stream channels can be a significant problem for anadromous fish since it fills voids in gravels that are used by anadromous fish for egg deposition and incubation, and cover, and it eliminates gravel surfaces used by aquatic invertebrates.

The general effects of fine sediment deposition on steelhead and other salmonids are well established in scientific studies. There is extensive scientific literature on sediment transport, erosion, and biological effects, with an excellent review by Waters (1995). Fine sediment deposition fills the spaces between gravel particles, which diminish the space that would otherwise be used by fish for cover and for production of invertebrate prey species. Excessive amounts of fine sediment in spawning gravels reduces survival of eggs in redds, and in rearing areas, excess sediment reduces the growth and survival of juvenile steelhead.

Prominent sediment sources in this population area include farm fields and roads. Roads generate erosion from unpaved surfaces, unvegetated cuts, fills, and drainage ditches. Sediment delivery to streams can be reduced by decreasing soil erosion, or by routing sediment-laden runoff away from streams and onto land surfaces where the sediment can accumulate. Efforts to reduce sediment should be focused initially on identifying streams where sediment is presently a limiting factor and identifying sediment sources. Once sediment sources have been identified, site-specific plans to reduce erosion or to reduce sediment delivery to streams should be developed and implemented. Sediment reduction practices are well established and pertinent information is available from sources such as county extension offices, local soil and water conservation districts, Natural Resources Conservation Service, and through the internet or libraries.

5. Reduced Floodplain Connectivity and Incised Stream Channels

Many streams in the population area lack functioning floodplains due to construction of levees or deepening channels for flood control, or incidental effects of filling floodplains to accommodate building, roads, parking lots, and other developments. Floodplains play an important role in the processes that create stream channels and many physical features important to aquatic organisms such as steelhead. Naturally functioning floodplains remove fine sediments from streams, reduce the energy of floods, and provide a reservoir of large woody debris (LWD) and other organic materials. Floodplains also function partly as short-term reservoirs that store water during floods, hold waters, and slowly release the water to the stream. When streamflows are prevented from flowing onto floodplains by levees or deepening stream channels, the erosive energy of the stream is significantly increased during floods. The excess energy in confined streams causes streams to erode the banks or stream bottom.

Recovery efforts should focus on preventing additional floodplain losses and improving floodplain functions where feasible. Restoration opportunities exist in circumstances where unnecessary floodplain fills can be removed; where levees are ineffective for flood control or levees can be set back a greater distance from the stream; and where new floodplains can be established channels within incised channels.

6. Degraded Riparian Conditions

Riparian functions have been lost or extensively altered throughout the basin from a myriad of land use activities and structures that have replaced or eliminated the natural vegetation. In Clean Water Act Total Maximum Daily Loads (TMDLs) developed to improve stream temperature conditions, IDEQ regularly establishes target levels for riparian vegetation to increase stream shade. In Lapwai Creek, IDEQ (1999a) indicated that a 38 to 87 percent increase in shade would be necessary in order to attain and maintain state water quality standards. In Lapwai Creek, riparian conditions were impaired by active and unstable channels, logging and grazing activities, and levee and road prism encroachment (Chandler and Richardson 2006b). In Jim Ford Creek, IDEQ et al. (2000) estimated that a 52 percent increase in shade was necessary to meet current water quality criteria. Locally developed watershed restoration plans include actions to improve riparian and floodplain functions. For example, the Potlatch Watershed Management Plan calls for riparian and floodplain restoration to provide shade, increase LWD recruitment, reduce streambank erosion, increase instream habitat complexity, and maintain adequate stream discharge (RPU 2007, VII p. 11-68). For the mainstem Potlatch River, there is essentially no streamside cover provided by vegetation in the lower watershed because of high, scouring spring runoff, which precludes the establishment of riparian habitat (Johnson 1985, as cited in RPU 2007).

7. Reduced Habitat Complexity

The structural complexity of the stream environment influences the number of species that can live in the stream and it often influences the productivity of those species (Smokorowski and Pratt 2006). Complex habitats have a wide array of structural features that come from variability in characteristics such as water depth and velocity; stream width; angle of the streambank; size, shape, and arrangement of streambed materials; and sheltered areas created by logs, rocks, turbulent water, and overhanging vegetation. Structural diversity is needed to create the types of environments that are required by different phases of salmonid growth and development in streams. Adults require sufficient depth to reach spawning areas. Spawning areas require physical features such as meander bends, rock or log steps, and scour pools to create deposits of suitably sized gravels and hydraulic conditions that keep water flowing through redds. Fry require shallow, slow-moving water with abundant cover during their first summer. As juveniles increase in size, they require deeper, faster water, and low-velocity resting places created by rocks, LWD, or pools. During winter, juveniles require hidden spaces between rocks, or under logs or undercut banks that have low velocities and an influx of ground water that stays above freezing. Altered stream channels often lack the important habitat components that are needed to sustain the abundance and productivity of steelhead. Where habitat complexity is reduced, fish growth and survival may be reduced from exposure to harsher conditions and scarce food resources.

Reduced habitat complexity is a widespread concern throughout many watersheds of this population. Reduced complexity is caused by the cumulative effects of alterations to stream flows, stream channels, floodplains, sediment supply, and riparian vegetation, but in some locations, it is a direct result of intentionally channelizing and straightening streams to accommodate floodplain development or for flood control. Habitat complexity varies substantially in the population area, with the highest complexity in forested streams with low road density, and a nearly complete loss of complexity in streams that have been converted into uniformly shaped drainage ditches. In general, losses of habitat complexity mirror the amount of development in the floodplains, and all major streams in the population area have suffered losses in habitat complexity wherever floodplain development exists.

As an example, land use and watershed development in the Lapwai Creek drainage have changed stream temperature and flow regimes (BLM 2000; Chandler and Richardson 2004; Chandler and Richardson 2006), and altered the shape, size, and gradient of many streams. Changes in flow regime have reduced habitat complexity by increasing the intensity and frequency of stream channel scouring (BLM 2000). Much of lower Lapwai Creek from the mouth upstream above the confluence of Mission Creek, is confined by U.S. Highway 95, a railroad line, and multiple U.S. Army Corps of Engineers levees (Chandler and Richardson 2004). The straightened channel lacks meanders and pools, and the streambed has become a uniform assortment of gravel sizes rather than a series of distinct habitat units that are distinguished by changes in gradient, depth, sinuosity, and substrate size that occur in a naturally functioning stream. In upper Lapwai Creek, the stream flows through a narrow canyon where U.S. Highway 95 is built, and the highway forces the stream into a straighter, steeper stream than would naturally exist. The stream has lost the ability to carve meander bends. Removal of riparian trees in the road right-of-way also reduced large wood recruitment that could improve stream channel complexity.

Strategies to restore habitat complexity should focus primarily on changing the activities or circumstances that have caused the losses in complexity. In conjunction with these strategies, which may take years to reap desired benefits, shorter-term habitat restoration actions, such as placing logs and installing artificial structures to improve stream structure can increase habitat complexity more quickly. Artificial structures may be a particularly useful tool when roads, buildings or other permanent alterations preclude restoration of processes that create and maintain structural complexity in streams. A systematic evaluation of watershed conditions should be performed to identify the activities or circumstances that have reduced habitat complexity before planning restoration projects of this nature. Locally developed restoration plans already exist for the Potlatch River, Lapwai Creek, and Big Canyon Creek watersheds (RPU 2007; Richardson et al. 2009; Rasmussen et al. 2009). An excellent source of guidance for evaluating watershed conditions and planning restoration activities is available online at the following location: http://www.restorationreview.com.

8. Migration Barriers

Many known migration barriers have been fixed, but there are still miles of potential steelhead habitat in the population area blocked entirely or partially by artificial migration barriers. Artificial migration barriers in the population area are often caused by impassable culverts at road crossings and dry stream channels caused by water use. Restored access to this habitat provides a definable and immediate benefit that can rapidly increase steelhead abundance and productivity, and while many of the known passage barriers in the population area have repaired, a full inventory of passage barriers would be very beneficial. Road densities displayed in Ecovista (2003, p. 94-95) show a fairly high road density throughout much of the Lower Mainstem Clearwater River steelhead population. Estimated culverts counts appear to be relatively high (26-75/subwatershed) throughout this population particularly in the Potlatch River drainage, lower Clearwater River tributaries and South Fork Clearwater tributaries (Ecovista 2003, p. 354).

Migration barriers were identified as a limiting factor in three watershed assessments (Lapwai Creek, Potlatch River, and Big Canyon Creek) and it is likely they limit access to potential steelhead habitat throughout the population. In the Potlatch Watershed Management Plan four natural fish migration barriers exist within the watershed (RPU 2007). The natural barrier falls exist on Boulder Creek (RM 1.2), Middle Potlatch Creek (RM 8.0) and Big Bear Creek (RM 5.6). The last barrier is the result of a rockslide that occurred in 1980 at river mile 2.5 on Little Potlatch Creek (Johnson 1985, as cited in RPU 2007). Other migration barriers indicated in the Potlatch Watershed Management Plan occur from a constructed dam on upper West Fork of Little Bear Creek (which was removed in 2013) and a box culvert under the railroad grade on Corral Creek near the town of Helmer (which was removed in 2007). The Plan also indicated, but did not list the many road culverts throughout the Potlatch River watershed that may act as migration barriers throughout low flow periods (RPU 2007). Some of the culvert barriers exist upstream from the natural barriers mentioned, which would indicate that they are not a priority in steelhead recovery. A total of 18 fish passage barriers were removed within the Potlatch River watershed between 2013 and 2015.

In the Lapwai Creek and Big Canyon Creek watersheds, numerous potential and known migration barriers were identified (Taylor 2005; Christian and Taylor 2004). There were 123.4 miles of stream surveyed within the Lapwai Creek watershed evaluating 208 sites for barrier status. Taylor (2005) estimated that 60 percent (72.6 miles) of the stream miles were blocked by barrier structures. During the survey, different types of barriers were noted representing transient, seasonal, and permanent migration barriers. Temporary barriers varied from handmade wood dams to culverts plugged with debris at the inlet. Based on this report, the Nez Perce Tribe, in cooperation with the Nez Perce County Road Division and the Nez Perce Soil and Water Conservation District, fixed the Herndon barrier on Lapwai Creek and the Webb Ridge Road barrier on Sweetwater Creek, opening up 9.3 miles and 5.7 miles of blocked habitat, respectively. The Nez Perce Tribe is also working with the Idaho Transportation Department to fix barrier culverts on Highway 95 along Lapwai Creek in Culdesac Canyon, and with the Lower Clearwater Exchange Project to return passage associated with the Bureau of Reclamation infrastructure in the Sweetwater Creek watershed.

Christian and Taylor (2004) surveyed 119.6 miles evaluating 79 sites for barrier status within the Big Canyon Creek watershed. They determined that nearly 30 percent (35.8 mile) of the stream miles were currently blocked by barrier structures. Christian and Taylor (2004) also expressed concerns that many culverts may need replacement because they are too small. Larger culverts designed to pass more flow (100-year storm event) and debris would reduce the risk of road failure.

Summary of Current Habitat Limiting Factors and Threats

Critical habitat in the Lower Mainstem Clearwater River basin population has been altered by a wide array of past and present land use activities such as agriculture, timber harvest, and livestock grazing, and developments such as housing, roads, railroads, and flood control structures. Habitat problems vary in different locations, but in general, elevated summer water temperatures, low summer stream flows, and loss of habitat complexity are likely to be the most significant factors affecting steelhead production in the population area as a whole. Individual streams often have other problems as well, and restoration activities in any particular stream should be tailored to the primary causes of habitat alterations that are identified though an analysis of watershed conditions.

Potential Habitat Limiting Factors and Threats

Several habitat concerns have not yet risen to the level of limiting factors at the population level, but may have local effects that need to be managed to protect spawning and rearing habitat, and to allow any degraded habitat to recover.

1. Degraded floodplain connectivity and function from expanding road network. Expansion of the road networks includes widening roads that already encroach on streams or floodplains and development of new roads. Most major highways are located in valley bottoms where there is little room to increase road width without further encroachment on streams or floodplains.

2. Degraded floodplain function and connectivity from development. Expansion of floodplain development from new housing, barns, corrals, feedlots, and commercial buildings. Housing development is highly restricted by the county land use ordinance in the Latah County portion of Potlatch River watershed.

3. Reduced flow in critical times due to increased surface water consumption. In this largely rural setting, new floodplain developments generally require wells, which are sometimes connected to surface flows. New lawns and gardens are also often irrigated with surface waters pumped from streams.

4. Spread of invasive weeds into new areas. Invasive weeds are present in many parts of the population, and their spread could increase soil erosion and negatively affect native grasses, shrubs, and tree assemblages in riparian areas.

5. Surface water contamination from toxic chemicals. Contamination of surface waters could occur from agriculture, grazing, industrial sources, or residential developments. Education programs, grassed waterways, and wetland development could reduce this threat.

Hatchery Programs

The Lower Mainstem Clearwater River steelhead population is one of three populations in the MPG affected by hatchery releases. Hatchery releases also occur in the South Fork Clearwater River and

Lolo Creek population areas. About 10 percent of the total hatchery release occur within the Lower Clearwater River in Clear Creek, the upstream extent of the population as currently defined. About 42 percent of the hatchery fish are released in the South Fork Clearwater River population. About 7 percent of the hatchery releases are in Lolo Creek and the balance are into the North Fork Clearwater River at Dworshak National Fish Hatchery. All hatchery steelhead in the MPG were derived from the North Fork Clearwater River population and no natural-origin fish are used as broodstock. Hatchery fish from the Lolo Creek and South Fork Clearwater River hatchery programs may also influence the population. Large numbers of hatchery-origin steelhead from these upstream hatchery programs pass through the population in the mainstem Clearwater River, both as juveniles and adults. It is unknown how many migrating juvenile steelhead cease their migration and become freshwater residents in this population, or the number of upstream migrating adults that stop short of the release locations and spawn in the population. Fish sampling from Orofino Creek to the mouth of the Clearwater River during 1999-2002 found that most residuals recovered were within 4 km of the hatchery and were attracted to the cool water of the North Fork Clearwater River. Recent genetic analysis by IDFG found that the Lower Mainstem Clearwater River population exhibits no evidence of hatchery influence on its genetic composition.

The hatchery releases could reduce genetic adaptiveness of the Lower Mainstem Clearwater River population and influenced genetic adaptiveness and life history expressions. The hatchery fish also compete with natural-origin fish for food and space. Hatchery-related limiting factors and threats for Lower Mainstem Clearwater River steelhead are discussed at the MPG level in Section 6.2.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Clearwater River and tributaries continue to pose a threat to Lower Mainstem Clearwater River steelhead, and to other Clearwater River populations. Fishery-related limiting factors and threats for Lower Mainstem Clearwater River steelhead and other Clearwater River populations are discussed at the MPG level in Section 6.2.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

Watersheds with the highest priority for protection and restoration are streams that have relatively high natural base flows and high intrinsic potential for production. These watersheds include portions of the Potlatch River, Clear Creek, Lapwai Creek, and Big Canyon Creek. Other streams or watersheds that presently have high steelhead densities or where site-specific data indicates a high potential for production, are also priorities; these tributaries include Jim Ford Creek (below the natural barrier), Cottonwood Creek (of Nez Perce County), Jacks Creek, and Whiskey Creek (a tributary to Orofino Creek below the cascade complex) (Chandler 2013). The Nez Perce Tribe monitored juvenile steelhead distribution and abundance throughout the population between 2008 and 2012, in order to relate steelhead densities to habitat metrics and thereby prioritize where habitat restoration projects should be located (Chandler 2013).

Site-specific restoration priorities should be established from watershed plans developed from stream and fish population inventories. This has already been completed for several watersheds, including the Potlatch River, Lapwai Creek, Big Canyon Creek (RPU 2007; Rasmussen et al. 2009; Richardson et al. 2009). One of the first steps should be to complete fish and habitat inventories in high priority watersheds that presently do not have site-specific plans, or that have incomplete or outdated information. The Nez Perce Tribe and the IDFG have been systematically surveying streams in the population area. This information has been crucial in establishing habitat conditions, limiting factors, and centers of existing and potential steelhead production. Information gained from the inventories has been used in conjunction with locally developed restoration plans such as the Potlatch River Management Plan (RPU 2007), and restoration strategies developed by the Nez Perce Soil and Water Conservation District and Nez Perce Tribe for Big Canyon Creek watershed (Rasmussen et al. 2009), and Lapwai Creek drainage (Richardson et al. 2009). The Clearwater Technical Group ─ an advisory group consisting of state, federal, and tribal biologists, and other regional stakeholders ─ has been instrumental in identifying priorities for restoration activities, fish and habitat inventories, and for monitoring effects of restoration projects.

Habitat Actions

Whenever feasible, recovery activities should be designed to preserve, restore, or rehabilitate natural habitat-forming processes (i.e. flood frequency and magnitude, sediment supply, and LWD recruitment). When natural processes are compromised by irreversible alterations, such has highways or homes, or when time needed to recover natural processes is too long, artificial structures may be appropriate substitutes for missing habitat components.

General habitat restoration priorities for this population:

1. Restore hydrologic processes to retain surface flow by reducing surface runoff from altered land surfaces, disconnecting artificial drainage systems from natural drainage systems, and modifying water uses. This will contribute to reducing stream temperature problems.
2. Restore channel-forming processes by reestablishing floodplains in incised channels, removing or setting back flood control structures, and rehabilitating stream channels that have been straightened.
3. Reestablish riparian vegetation to improve LWD recruitment and create shade for streams.
4. Reduce fine sediment delivery to streams where it is increased caused by agriculture, road drainage systems (including undersized culverts), or other artificial sources.
5. Inventory, prioritize, and eliminate remaining artificial fish migration barriers.

Implementation of Habitat Plan

Implementation of recovery activities is voluntary on state and private lands, and would be conducted by interested parties such as the Nez Perce Tribe, county soil and water conservation districts, Idaho Department of Fish and Game, Idaho Department of Environmental Quality, Idaho Department of Lands, private landowners, and other entities. Recovery actions on non-Indian lands within the Nez Perce Tribal Reservation should be coordinated with the Nez Perce Tribe. The Nez Perce Tribe coordinates restoration work on tribal lands within the boundaries of the Nez Perce Indian Reservation. Work on private lands is most often conducted with technical assistance from conservation districts and state and federal agencies, and may be in cooperation with the Nez Perce Tribe. Recovery actions on federal lands are mandated by a variety of federal laws, policies, and regulations, including the ESA, which requires federal agencies to utilize their authorities to further the purposes of the ESA. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the watersheds of this steelhead population.

Many stream habitat restoration projects have been completed in the Lower Mainstem steelhead population area, under the direction of local, county, state, tribal, and federal programs. In the Potlatch drainage, stream habitat restoration projects have been conducted on private, state, federal, and tribal lands, including riparian fencing, riparian plantings, road obliterations, and culvert replacement (IDEQ 2008). The Nez Perce Soil and Water Conservation District and Nez Perce Tribe have been actively involved in monitoring stream conditions, identifying problems, and implementing stream restoration projects within the Lapwai Creek and Big Canyon Creek drainages. Recent projects in the Lapwai Creek and Big Canyon Creek drainages have included erosion control structures, barrier removals, riparian planting and seeding, livestock fencing and alternative water source development, dike removal and reconnection of streams to floodplains, and road decommissioning (Dau et al. 2010; Hills and Peterson 2010, 2011).

Table 6.2-9 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.2-9. Habitat Recovery Actions Identified for the Lower Mainstem Clearwater River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Barriers	Address 4 barriers	BPA Contract # 1997-017-00: Protect and Restore Lapwai Creek Watershed BPA Contract # 2002-070-00: Lapwai Creek Anadromous Habitat BPA Contract # 2008-604-00: Lower Clearwater and Potlatch Watersheds Habitat Improvement	N/A
Instream structural complexity; bed and channel form	Improve 8.61 instream miles		
Riparian conditions, sediment, temperature	Protect 6.7 riparian miles Improve 36.8 riparian acres		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Clearwater River steelhead MPG is to promote recovery by reducing the fitness and diversity risks that the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Lower Mainstem Clearwater River population is to reduce ecological and genetic risk associated with hatchery programs through use of local broodstock in upstream populations and selection of release sites. Specific direction will be developed through the HGMP process. The strategy also calls for monitoring of stray rates and sources, and actions to reduce straying where needed. Section 6.2.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The fisheries strategy is to continue to control harvest-related impacts through the abundance-based approach in fishery management programs to support the recovery of natural-origin populations. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.2.4.2 provides more information in the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Lower Mainstem Clearwater River steelhead population and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary, and ocean and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.2.6 Selway River Steelhead Population

The Selway River steelhead population is currently rated as maintained due to a tentative moderate abundance/productivity risk. The Selway River population's targeted proposed status is viable, which requires a minimum of low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Viable

This section identifies a number of actions framed to move the population towards achieving its proposed status. Reaching the population's proposed status, however, will require the implementation of actions throughout the population's entire range and life cycle, particularly in the mainstem Snake, and Columbia River migration corridors. These additional actions are described in Chapter 4 and Section 6.1.

Population Status

This section of the recovery plan compares the Selway River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The Selway River steelhead population includes the Selway River and all its tributaries (Figure 6.2-4). The population consists of both B-run and A-run steelhead. NWFSC (2015) classifies the Selway River as a high B-run population because more than 40 percent of returning adults are B-run.

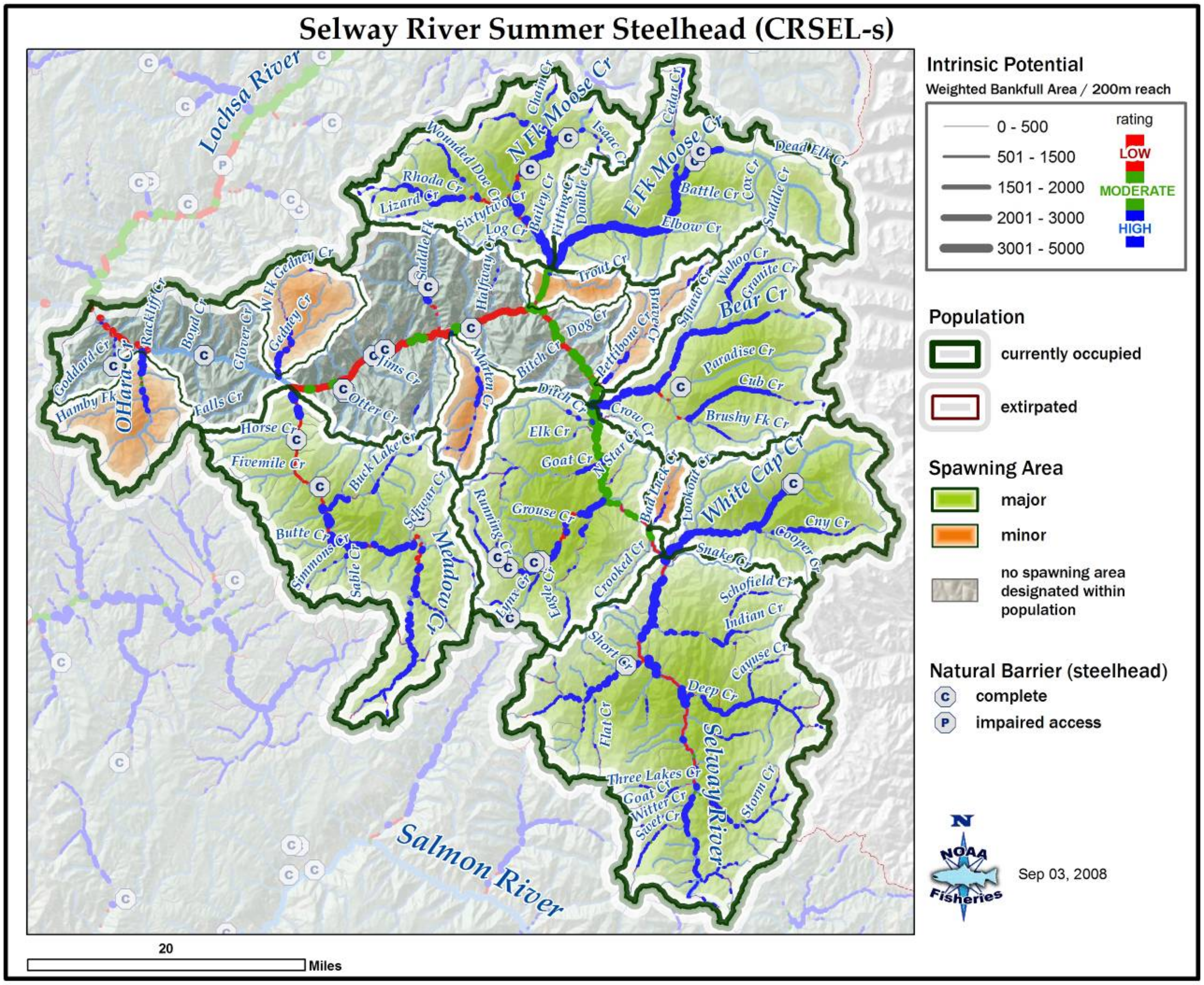


Figure 6.2-4. Selway River steelhead population boundary, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Selway River population as "Intermediate" in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Intermediate-size has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the minimum abundance threshold) to achieve viable status, with low (5% or less) risk of extinction over a 100-year timeframe.

Abundance and Productivity

Results from a recent genetic stock composition project have allowed the NWFSC (2015) to estimate population spawning escapements with more precision than in the past when estimates were developed for two average surrogate populations to represent both major run types (A and B). To be viable, the Selway River population needs a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner. Available data indicates a 10-year (2005-2014) average abundance of 1,650 natural-origin steelhead in the combined Selway and Lochsa Rivers, with an estimated 20-year geometric mean intrinsic productivity of 2.33 (NWFSC 2015). Based on this current abundance and productivity data, the NWFSC (2015) rated both the Selway and Lochsa River steelhead populations at moderate risk for abundance/productivity. The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for those populations for which new data is available. NMFS will update this section as new information becomes available.

Spatial Structure

The Selway River population has extensive and complex branching of seven major spawning areas and six minor spawning areas, and this structure provides inherent protection against extinction. Based on a limited number of spawner surveys, current spawning appears to be distributed widely across the population and to occur in all major and minor spawning areas. The population's spatial structure score is therefore very low risk, which is the lowest possible score and is adequate for the population to attain its overall proposed status of viable (NWFSC 2015).

Diversity

For this population, we assume that no major life history strategies have been lost. There is no hatchery program in the drainage, and genetic risk from hatchery fish is presumed to be low.

In common with all Snake River Basin steelhead populations, the eight dams on the Columbia and Snake Rivers create a low level of diversity risk by selectively impacting migrating adults and juveniles. The dams establish a thermal barrier in the reservoirs behind the dams that delays and potentially induces some mortality of migrating adults early in the migration season. Changes in flow and temperature patterns associated with the dams likely inhibit juvenile out-migration in late spring, as temperatures rise and flows decrease, causing increased travel time, increased energy expenditure and greater physiological stresses. Despite these risks, the cumulative diversity risk for the Selway River population is low (NWFSC 2015), which is adequate for the population to achieve its proposed status.

Summary

The Selway River steelhead population is currently at Moderate risk of extinction due to a tentative moderate risk rating for abundance and productivity, based on recent results from a genetic stock composition project that breaks out natural-origin returns to the Lochsa and Selway River populations as a specific group with relatively low miscalculation error (NWFSC 2015). The overall spatial structure and diversity rating is sufficiently low for this population to reach its proposed status. Table 6.2-10 summarizes the population's abundance/productivity and spatial structure/ diversity risks.

Table 6.2-10. Viable Salmonid Population parameter risk ratings for the Selway River steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Selway River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

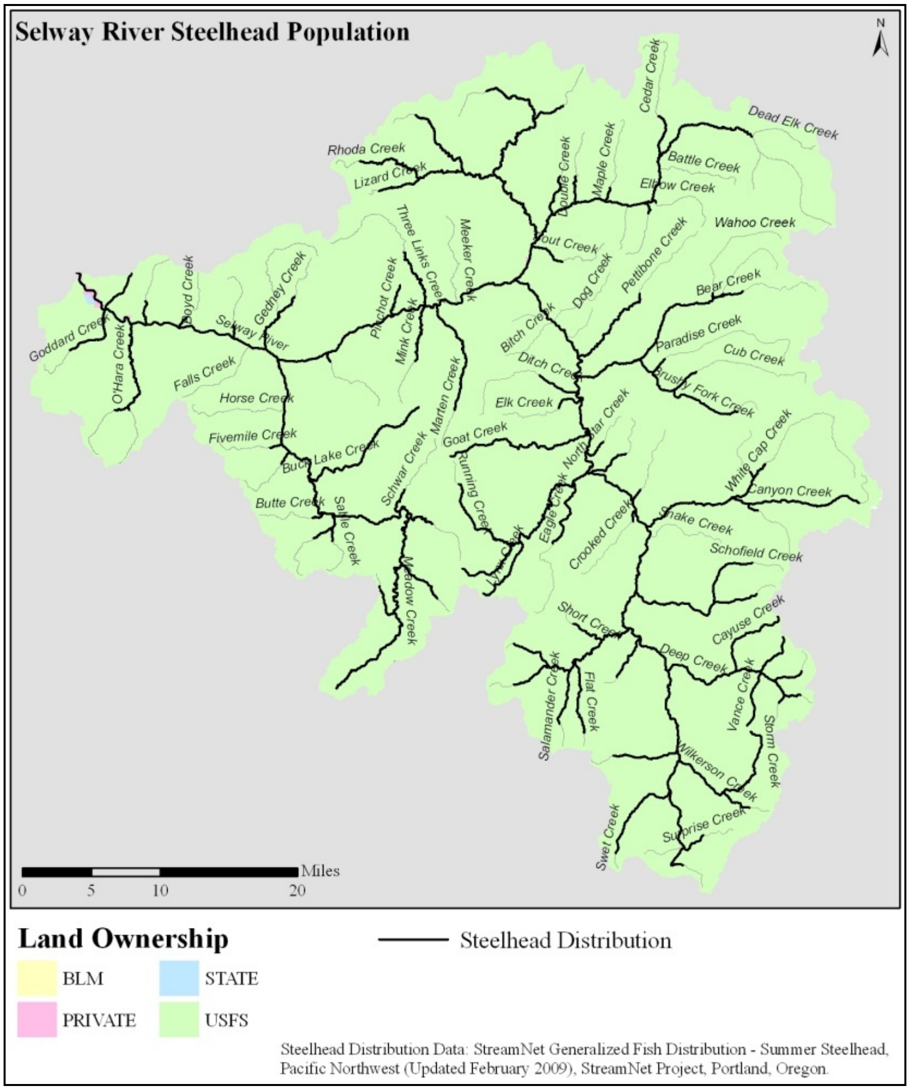
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the Selway River steelhead population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Selway River steelhead population includes all tributaries draining into the Selway River. The population boundaries drain approximately 2,011 square miles. The Selway River is a designated Wild and Scenic River, and nearly all of the drainage is contained within the Selway-Bitterroot Wilderness. Elevations range from about 1,400 feet to almost 9,100 feet. There are about 2,339 km of stream within the Selway River drainage, with 61 percent (1,437 km) occurring downstream from natural barriers. Annual precipitation is about 38 inches measured at the Fenn Ranger Station, with more snow accumulation at higher elevations (IDEQ 2000). Normal peak streamflows are associated with winter snowmelt and occur in the spring. Rain-on-snow events can melt accumulated snow causing rapid runoff and extreme flood flows. The combination of loose soils, steep slopes, and intense rain-on-snow precipitation events leads to relatively frequent landslides (IDEQ 2000).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.2-5. Land ownership in the Selway River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Steelhead are distributed throughout most streams of the population (Figure 6.2-5). The ICTRT identified seven major and six minor spawning areas (Figure 6.2-4). Almost 90 percent of the intrinsic potential steelhead habitat is contained within the seven major spawning areas. The Clearwater Subbasin Assessment rated the quality of steelhead habitat in the Selway River basin mostly as good or excellent, particularly in the upper basin (Ecovista 2003, p. 281).

Land ownership within the Selway River drainage is primarily U.S. Forest Service (99.9%) with private (0.08%), and state lands (0.02%) making up the remaining 0.1 percent. Private and state lands are concentrated in the lower basin along the Selway River downstream from O’Hara Creek.

Because of the predominance of wilderness and roadless area in the Selway River basin, human disturbance has been minimal. Natural sediment regimes may impact some fish species, and high stream gradients and other natural barriers are known to limit the distributions of multiple species.

IDEQ maintains a list of impaired waters across the state of Idaho to comply with section 303(d) of the Clean Water Act. Currently, no stream segments in the Selway River drainage are listed as impaired (IDEQ 2014), reflecting the remote, relatively undisturbed nature of the drainage.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors for each population by reviewing multiple data sources and reports on stream conditions across Idaho's watersheds. It identified the limiting factors based on these reports, and on discussions with local fisheries experts and watershed groups.

Habitat in the Selway River population area is in relatively good shape with the exception of localized areas of excess sediment and a small number of potential migration barriers on tributaries. Table 6.2-11 summarizes (1) the mechanisms by which each limiting factor affects steelhead, and (2) management objectives for addressing each limiting factor. The following section discusses each limiting factor.

Table 6.2-11. Habitat limiting factors identified for the Selway River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Reduce sediment from roads and recreation trails
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correct or remove fish passage barriers
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature

1. *Excess Sediment*

Fine sediment can harm steelhead and their habitat by smothering redds and spawning gravels, filling in pools used by juveniles for cover, or reducing the availability of aquatic insects (food). Excess fine sediments can reduce potential spawning habitat, incubation success, and juvenile rearing habitat quality. Conditions reported for the Selway River steelhead population suggest that sediment may be reducing population abundance and productivity.

The Clearwater River Subbasin Assessment identified sediment as one of the limiting factors for steelhead in the Selway River basin, mainly in the lower part of the basin (Ecovista et al. 2003, p. 346). Local experts convened for the 2008 FCRPS biological opinion classified sediment from roads as a limiting factor affecting steelhead in O'Hara Creek, Meadow Creek, and lower Selway River mainstem (BOR 2010a). The Nez Perce-Clearwater National Forest also identified excess sediment from roads as a risk to salmonid habitat in some subwatersheds of the Selway River (USFS 2007a). Table 6.2-12 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to each subwatershed, assessing the potential for sediment to limit the abundance of different salmonid life stages (rearing, spawning, or both). Sediment was generally ranked as a moderate or low risk to salmonid habitat, except for O'Hara Creek, for which sediment was ranked as a high risk to habitat. The Forest Service has undertaken a substantial amount of streamside road decommissioning to address this problem in O'Hara Creek. The Nez Perce-Clearwater National Forest recommends road decommissioning or maintenance for most of these subwatersheds (USFS 2007a). Road decommissioning, along with restoring riparian habitat along streams where road encroachment has occurred, would provide secondary benefits to stream temperature where elevated stream temperatures have been noted on lower O'Hara Creek. On the Bitterroot National Forest, in the headwaters of the Selway River, Deep Creek also has a streamside road, which may be contributing sediment to the stream. In some cases, undersized (non-barrier) culverts on roads can be replaced with larger culverts to reduce episodic sediment input into tributary streams during high flows.

Table 6.2-12. Subwatersheds identified in which excess sediment is a risk to salmonid habitat in the Selway River basin (USFS 2007a) and the Nez Perce Tribe.

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank	Primary Sources	Road Density (mi/mi^2)	
				Total	Within RCAs
Upper Running Creek	Rearing	2	Streamside Roads	0.24	0.25
Selway River - Glover Creek	Both	2	Road Crossing	1.15	1.38
Selway River - Goddard Creek	Both	2	Streamside Roads	1.87	1.06
Selway River - Rackliff Creek	Both	3	Road Crossing	0.54	1.55
O'Hara Creek	Both	1	Streamside Roads	1.82	1.13
*Horse Creek				1.84	0.05

*information provided by the Nez Perce Tribe

Stream segments in the Selway River that were 303(d)-listed as sediment-impaired in 1996 were later recommended for delisting by IDEQ and are now thought to support beneficial uses (IDEQ 2014). However, as described above, excess sediment remains a concern for salmonid habitat in some subwatersheds. Along with roads, the geology of the basin also contributes to high instream sediment levels, with many areas of high potential for surface erosion and mass failure.

2. *Migration Barriers*

Migration barriers block habitat access for juveniles and migrating adults. Most potential migration barriers in this population are due to culverts at road-stream crossings (USFS 2007a). Additionally, the Selway River Falls at RM 17 acts as a migration barrier in low-flow years. Passage barriers were indicated as a minor limiting factor for Selway River steelhead in the Clearwater River Subbasin Assessment, based on the number of stream-road crossings in the drainage (Ecovista et al. 2003, p. 346, 353-4). The 2013 FCRPS Expert Panel noted four migration barriers affecting steelhead in the Lower Selway, two of which have recently been replaced (BOR 2013a). The Nez Perce-Clearwater National Forest subwatershed summaries also identify four known fish migration barriers in the Lower Selway River – Gedney Creek watershed, impairing access to 13 miles of salmonid habitat (Table 6.2-13). This table will be updated during the Plan implementation process.

Table 6.2-13. Subwatersheds identified with known or undetermined barriers that may affect spawning or rearing habitat for steelhead in the Selway River basin (USFS 2007a).

		Migration Barriers		Connectivity (miles)	
Watersheds (HUC5)	Subwatersheds (HUC6)	Migration Barriers	Not Determined	Impaired Access	Not Determined
Lower Selway River-Gedney Creek	Selway River - Glover Creek	3	0	9	0
	Selway River - Rackliff Creek	1	0	4	0
	O’Hara Creek	0	1	0	1
	Total:	4	1	13	1
Source: Nez Perce-Clearwater National Forest subwatershed summaries (USFS 2007a).					

3. *Temperature*

Stream temperature in the mainstem Selway River can approach 25 degrees C in summer (IRZ 2000), well above suitable temperatures for steelhead. Given that much of the Selway is in wilderness, these temperatures may be naturally high. In O’Hara Creek, on the other hand, water temperatures have increased above historical conditions due to a decrease in riparian vegetation along streams and due to road encroachment (USFS 2001). The FCRPS expert panel recommends riparian plantings along O’Hara Creek to reduce high temperatures (BOR 2013a).

In summary, most salmonid habitat in this population is in good to excellent condition. Excess sediment from roads is a minor limiting factor in some streams. The extent that sediment has reduced steelhead habitat quantity or quality appears to be relatively small within the scope of the entire population. On the other hand, the prevalence of unstable soils and landslide prone areas necessitate careful consideration of future management policies within both the lower and upper portions of the basin.

Potential Habitat Limiting Factors and Threats

Two habitat concerns have not yet risen to the level of a limiting factor for the population, but may have local effects that need to be managed to protect habitat in the Selway River watershed.

1. Potential passage barriers posed by undersized culverts - The road system in the Selway River basin includes numerous culverts at stream crossings, many of which were not designed to accommodate 100-year storm events. If a culvert is too small to accommodate high flows during a storm event, the stream may overtop the road, delivering large amounts of sediment downstream and potentially creating a migration barrier.

2. Spread of invasive weeds - The spread of invasive weeds could increase soil erosion and negatively affect native grasses, shrubs, and tree assemblages in riparian areas. Spotted knapweed is the most abundant weed along the Selway River corridor.

Hatchery Programs

No hatchery releases occur in the Selway River steelhead population area. Further, hatchery-origin steelhead are rarely observed in the Selway River and are not believed to influence the natural population. Consequently, hatchery practices are not considered a threat or limiting factor for this steelhead population.

Fishery Management

Adult steelhead classified as both B-run and A-run return to the Selway River. In recent years, total exploitation rates on B-run steelhead have ranged near 15 to 20 percent (Ford 2011). The harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Section 6.2.3.3 provides more detail on fishery-related limiting factors and threats for Clearwater River steelhead populations.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The Selway-Bitterroot Wilderness Area provides protection for much of the population. Restoration projects from stream reaches in the lower Selway should be prioritized in the steelhead major and minor spawning areas.

Habitat Actions

The following habitat actions, ranked in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the population.

1. Reduce sediment delivery to streams from roads by reducing total road densities, decommissioning roads within unstable areas and along streams, and replacing undersized

culverts. The effort should also include adequate road maintenance and drainage improvements.

2. Eliminate migration barriers at road crossings that are blocking access to potential steelhead habitat.
3. Plant riparian vegetation in O'Hara Creek to decrease stream temperatures.

Implementation of Habitat Actions

Most of the land in the Selway River basin is federal, so responsibility for implementation of the habitat portion of the recovery plan for this population lies within the jurisdictions of the U.S. Forest Service. Since most of the habitat is within designated wilderness, there have been relatively few stream habitat restoration projects in the basin. The U.S. Forest Service has completed road decommissioning and culvert replacement. The Nez Perce Tribe has also been active in implementing habitat improvement projects in this watershed. The tribe treated 194 acres of land for invasive weeds between 1996 and 2012 and opened up one mile of previously blocked habitat (NPT 2013).

Table 6.2-14 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.2-14. Habitat Recovery Actions Identified for the Selway River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Barriers	Address 3 barriers (culverts)	BPA Contract # 2007-092-00: Restore Selway River Watershed	N/A
Temperature	Improve 1 riparian mile.		
Sediment	Improve 35 road miles		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Clearwater River steelhead MPG is to promote recovery by reducing the fitness and diversity risks that the hatchery programs may present. As part of this MPG-level strategy, the strategy calls to continue managing the Selway River steelhead population for natural production. The strategy includes monitoring for stray hatchery fish and implementing actions to reduce straying where needed. Section 6.2.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The fisheries strategy is to continue to control harvest-related impacts through the abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.2.4.2 provides more information in the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Selway River steelhead population and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan provide additional direction.

6.2.7 Lochsa River Steelhead Population

The population is currently rated as maintained due to a tentative moderate abundance/productivity risk. The population's targeted proposed status is Highly Viable, which requires a minimum of very low abundance/productivity risk, or Viable, which required a low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Highly Viable or Viable

This section identifies a number of actions framed to move the population towards achieving its proposed status. Reaching the population's proposed status, however, will require the implementation of actions throughout the population's entire range and life cycle, particularly in the mainstem Snake, and Columbia River migration corridors. These additional actions are described in Chapter 4 and Section 6.1.

Population Status

This section of the recovery plan compares the Lochsa River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The Lochsa River population includes the Lochsa River and all its tributaries (ICTRT 2003). The population was separated from Selway River steelhead largely on the basis of basin topography and assumed historic population size. The population consists of both B-run and A-run steelhead. NWFSC (2015) classifies the Lochsa River as a high B-run population because more than 40 percent of returning adults are B-run.

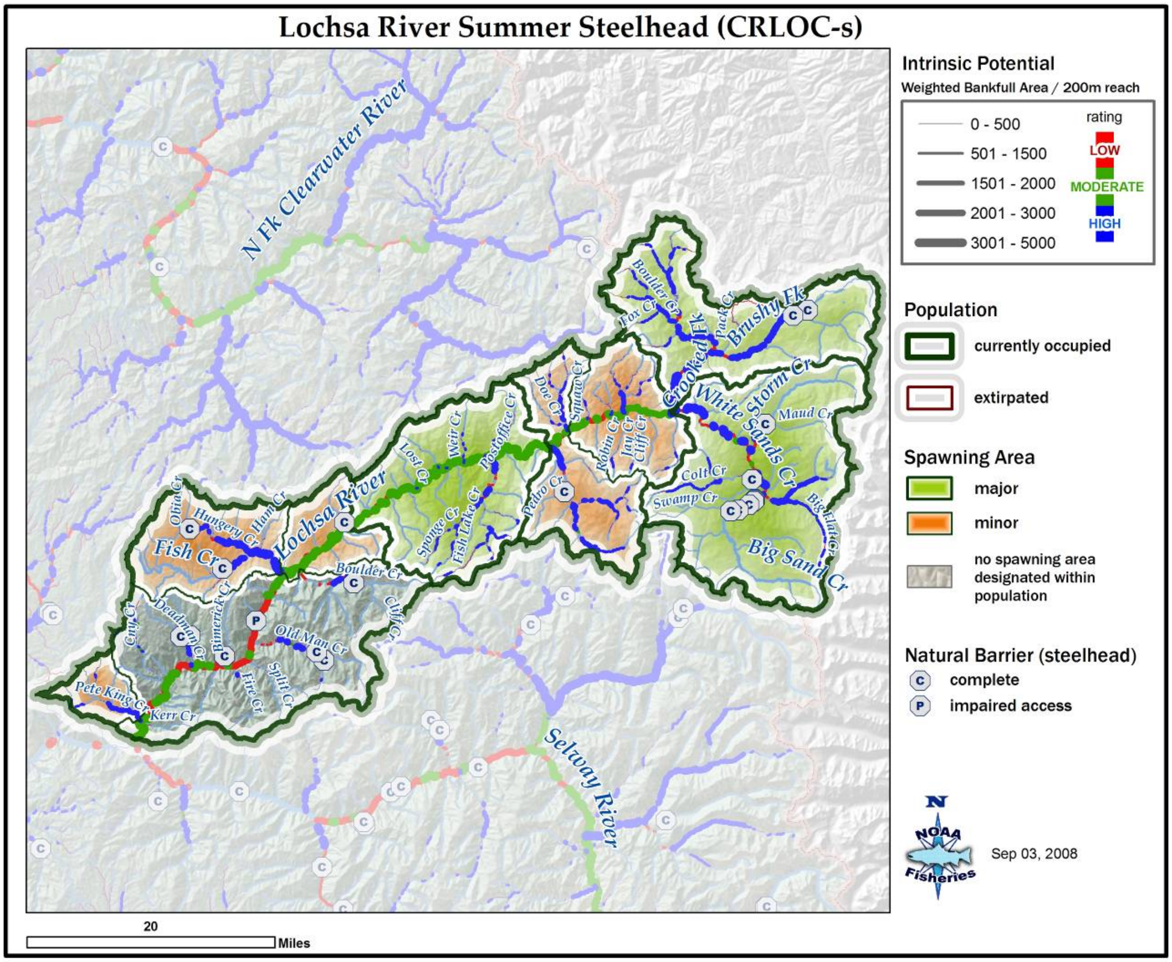


Figure 6.2-6. Lochsa River steelhead population boundary, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Lochsa River population as “Intermediate” in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the minimum abundance threshold) to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe. In order for the Lochsa River population to achieve a 1 percent or less risk (“very low risk”) of extinction over 100 years, productivity would need to be at or greater than 1.29 recruits per spawner at the minimum abundance threshold.

Abundance and Productivity

The Idaho populations of Snake River Basin steelhead do not have direct estimates of annual spawning escapements. Results from a recent genetic stock composition project have allowed the NWFSC (2015) to estimate population spawning escapements with more precision than in the past when estimates were developed for two average populations to represent both major run types (A and B). To be viable, the Lochsa River population needs a minimum abundance threshold of 1,000 natural-origin spawners and a productivity of 1.14 recruits per spawner. Available data indicates a 10-year (2005-2014) average abundance of 1,650 natural-origin steelhead in the combined Selway and Lochsa Rivers, with a 20-year geometric mean intrinsic productivity of 2.33 (NWFSC 2015). Based on this current abundance and productivity data, the NWFSC (2015) rated both the Selway and Lochsa River steelhead populations at moderate risk for abundance/ productivity.

The NWFSC memo produced in August 2016 (Appendix A) describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for populations where data is available. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The Lochsa River population has three major spawning areas and five minor spawning areas, and this structure provides inherent protection against extinction. Spawning survey information is limited due to poor accessibility from snow and high flows during the spawning season. Based on the available spawner surveys, current spawning appears to be distributed widely across the population and to occur in all major spawning areas. Although several migration barriers likely occur at road stream crossings in the population, these barriers block access to a relatively small amount of the population’s total potential habitat. The population’s spatial structure score is, therefore, low risk (NWFSC 2015). A very low spatial structure risk is adequate for the population to attain its overall proposed status.

Diversity

We assume that no major life history strategies have been lost from the population. Currently there is no hatchery program in the drainage. However, from 1973 to 1982 hatchery steelhead fry were outplanted into several tributaries within the population in most years. Hatchery adults were released into the population in four different years, ending in 1990. All hatchery releases are presumed to have been Dworshak Hatchery B-run stock. Although hatchery releases have ended, there is a low genetic risk from the multiple generations of past releases and the potential for the natural spawning population to consist of some hatchery-origin fish.

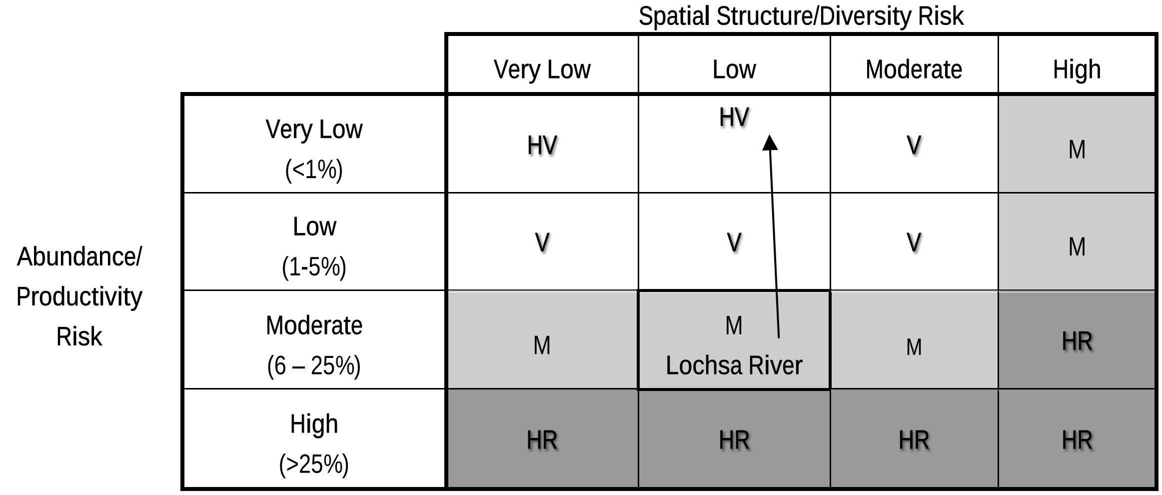
The eight dams on the Columbia and Snake Rivers also affect population diversity. The dams create a low level of diversity risk by selectively impacting migrating adults and juveniles. Section 6.1.6 discusses this impact, which affects all Idaho Snake River Basin steelhead populations.

Despite risks associated with past hatchery releases and the Columbia and Snake River hydropower system, the cumulative diversity risk for the Lochsa River population is low, which is adequate for the population to reach its proposed status (NWFSC 2015).

Summary

The Lochsa River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance and productivity, based on recent results from a genetic stock composition project that breaks out natural-origin returns to the Lochsa and Selway River populations as a specific group with relatively low miscalculation error (NWFSC 2015). This indicates that substantial improvements in abundance and productivity will need to occur for this population to reach its proposed status of highly viable, which requires a very low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for this population to reach its proposed status. Table 6.2-15 summarizes the population's abundance/productivity and spatial structure/diversity risks.

Table 6.2-15. Viable Salmonid Population parameter risk ratings for the Lochsa River steelhead population. The population does not meet population-level viability criteria.



		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Lochsa River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

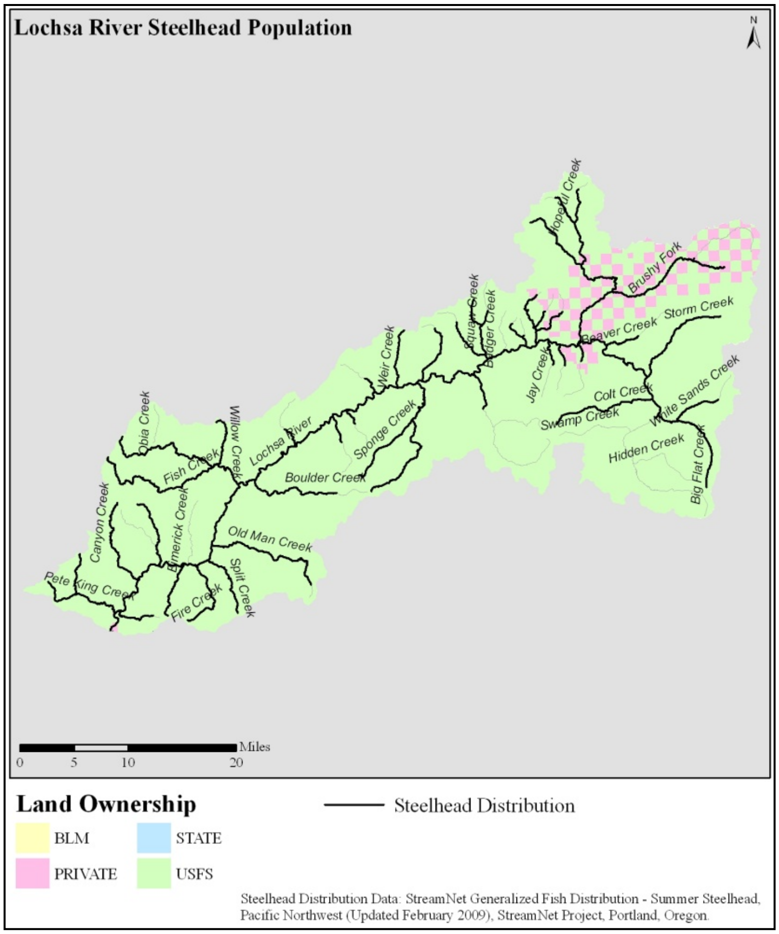
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Lochsa River steelhead population includes all tributaries of the Lochsa River. The population area drains approximately 1,181 square miles. The Lochsa River is a designated National Wild and Scenic River, and the headwaters of some of the south face tributaries are contained within the Selway-Bitterroot Wilderness. Elevations range from approximately 1,400 feet to almost 8,600 feet. Annual precipitation is about 40 inches, much of it snow accumulation at higher elevations. Rain-on-snow events can melt accumulated snow causing rapid runoff and extreme flood flows (IDEQ 1999b). Normal peak streamflows are associated with winter snow melt and occur in the spring. There are about 1,368 km of stream within the Lochsa River steelhead population, with about 59 percent (809 km) occurring downstream from natural barriers. Streams draining into the Lochsa are often incised, creating narrow valleys with very steep valley walls. These streams often enter the river as steep gradient cascades and waterfalls. The combination of loose soils, steep slopes, and intense rain-on-snow precipitation events produces relatively frequent landslides (IDEQ 1999b).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.2-7. Land ownership in the Lochsa River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Steelhead are distributed throughout most streams of the population (Figure 6.2-7). The ICTRT identified three major (Crooked, Fish Lake, and White Sands) and five minor (Warm Springs, Fish, Lower Lochsa, Boulder Lochsa, and Pete King) spawning areas. Steelhead habitat quality is mostly good-to-excellent throughout the Lochsa River basin (Ecovista 2003, p. 281).

Land ownership within Lochsa River steelhead population is primarily public with the U.S. Forest Service managing 95 percent of the watershed (Figure 6.2-7). Private lands make up the remaining 5 percent and are located in a checkerboard configuration in the headwaters of the basin. Land use in the Lochsa River basin has included logging and associated roads, a small amount of livestock grazing, and recreation. Large-scale commercial logging on U.S. Forest Service lands, and on the private “checkerboard” lands in the headwaters, started in the basin in 1953, leading to the construction of an extensive road network and to timber harvest in many riparian areas.

Landslides in the Lochsa River basin have had a large impact on stream habitat. In the winters of 1995 and 1996 there were 907 landslides caused by rain-on-snow events. Of these landslides, 58 percent were road-related, 12 percent were related to timber harvest, and the remaining 30 percent were considered to be natural slides (IDEQ 1999b). The rain-on-snow flooding events dumped an estimated 400,000 cubic yards of sediment into streams (McClelland et al. 1997). Road failures remain a threat to stream habitat.

U.S. Highway 12, completed in 1962, parallels the Lochsa River, and connects Lewiston, Idaho, with Missoula, Montana. The highway can is a source of sediment from winter road sanding, maintenance construction; small landslides associated with cut and fill slopes, and intrusions into flood-prone areas of the river (IDEQ 1999b).

IDEQ’s 2012 Integrated 303(d)/305(b) Report lists elevated water temperature as an impairment to water quality in the Lochsa River watershed. IDEQ (2012) has written temperature TMDLs for 14 tributary watersheds to the Lochsa River: Pete King Creek, Canyon Creek, Deadman Creek, Lower Small Tributaries, Post Office Creek, Squaw Creek, Badger/Wendover Creeks, Papoose Creek, Walton/Cliff Creeks, Crooked Fork, Colt Killed Creek (White Sand), Brushy Fork, Upper Brushy Fork, and Spruce Creek.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions and through conversations with local experts. We conclude that the habitat limiting factors for the Lochsa River steelhead population are migration barriers, excess sediment, riparian conditions, habitat complexity, and elevated stream temperatures. Table 6.2-16 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. A discussion of each limiting factors for habitat follows. Information of habitat conditions was provided by the U.S. Forest Service, IDEQ, the Clearwater River Subbasin Assessment and Management Plan, and a panel of local experts convened for the 2008 FCRPS biological opinion (USFS 2007a; IDEQ 1999b, 2012; Ecovista 2003; BOR 2010a).

Table 6.2-16. Primary limiting factors identified for the Lochsa River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correct or remove fish passage barriers.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Reduce chronic sediment delivery from roads. Treat, eradicate, and control invasive species.
Riparian Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Revegetation of riparian areas. Remove or relocate roads out of riparian areas. Treat, eradicate, and control invasive species.
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding.	Revegetation of riparian areas to increase LWD recruitment over time. In addition, wood placement where appropriate could increase habitat complexity while riparian trees mature.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Regrowth of riparian vegetation to improve shade and stream cover to reduce stream temperature. Restore hyporheic flow.

1. *Migration Barriers*

Loss of habitat connectivity has been ranked as having a moderate influence on steelhead in the Lochsa River basin, with most barriers created by culverts at stream road crossings (Ecovista 2003, p. 346). The greatest number of stream road crossings is in the Crooked and Upper Lochsa subwatersheds in the upper Lochsa River basin (Ecovista 2003). In subwatershed summaries for the Lochsa River, the Nez Perce-Clearwater National Forest indicated 17 known fish migration barriers, blocking access to 17 miles of salmonid habitat, and 50 undetermined barriers, potentially blocking access to 36 additional miles of salmonid habitat (Table 6.2-17). Additional barriers may also exist on private lands. Road crossings are the primary cause of known and potential migration barriers (USFS 2007a). The barriers and miles of blocked stream habitat in Table 6.2-17 are for both resident and anadromous salmonids, and some barriers or estimated habitat miles may be upstream from potential steelhead habitat.

Table 6.2-17. Subwatersheds identified with known or possible barriers to fish migration in the Lochsa River basin (USFS 2007a).

		Migration Barriers		Connectivity (miles)	
Watersheds (5th-field HUCs)	Subwatersheds (6th-field HUCs)	Migration Barriers	Not Determined	Impaired Access	Not Determined
Crooked Fork Creek Watershed	Upper Crooked Fork Creek	0	1	0	0
	Lower Crooked Fork Creek	5	2	2	0
	Lower Brushy Fork Creek	0	2	0	5
Colt Killed Creek Watershed	Lower Colt Killed	0	2	0	0
	Lower Big Sand	0	8	0	14
Upper Lochsa River Watershed	Imnamatoon Creek	0	1	0	0
	Wendover Creek	0	13	0	1
Middle Lochsa River	Weir Creek	4	1	6	1
	Stanley Creek	1	3	1	2
Lower Lochsa River	Bimerick Creek	0	1	0	7
	Dead Man Creek	0	1	0	0
	Glade Creek	3	5	7	0
	Canyon Creek	0	6	0	3
	Pete King Creek	4	4	1	3
	Total:	17	50	17	36

2. *Excess Sediment*

Conditions reported for the Lochsa River suggest that sediment may be reducing population abundance and productivity. Sediment was indicated as one of the limiting factors for steelhead in the Lochsa River in the Clearwater River Subbasin Assessment and Management Plan, with sediment constraining an estimated 73.7 miles of steelhead spawning and rearing habitat (Ecovista 2003, p. 353). The Nez Perce-Clearwater National Forest has also identified excess sediment as a risk to salmonids in some subwatersheds of the Lochsa River (USFS 2007a). Table 6.2-18 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to each subwatershed, assessing the potential for sediment to limit the abundance of different salmonid life stages (rearing, spawning, or both). Excess sediment was indicated as a high or moderate threat to salmonid habitat in many subswatersheds, including the steelhead major spawning areas Crooked Fork and White Sands, and minor spawning areas Pete King and Lower Lochsa River. Streamside roads were identified as the primary source of human-caused excess sediment. Total road density and road density within riparian conservation areas (RCAs) were high in many of the subwatersheds.

Table 6.2-18. Subwatersheds in the Lochsa River where sediment is a risk to steelhead abundance/productivity (USFS 2007a). Primary sources of excess sediment are shown for different life stages (rearing, spawning, or both). RCA refers to Riparian Conservation Area.

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank	Primary Sources	Road Density (mi/mi^2)	
				Total	Within RCA
Pete King Creek	Both	1	Streamside Roads	5.5	4.58
Lower Crooked Fork Creek	Spawning	1	Streamside Roads	6.3	3.10
Spruce Creek	Spawning	2	Streamside Roads	1.8	1.60
Lower Brushy Fork Creek*	Spawning	1	Streamside Roads	5.41	3.53
	Rearing	2	Streamside Roads		
Lower Colt Killed Creek*	Both	2	Streamside Roads	2.62	1.00
Legendary Bear Creek	Spawning	2	Streamside Roads	4.37	3.23
Wendover Creek	Spawning	2	Streamside Roads	4.07	3.06
Waw'aalamnime Creek	Spawning	1	Streamside Roads	3.09	2.74
Deadman Creek	Both	2	Streamside Roads	1.84	0.36
Glade Creek	Both	2	Streamside Roads	1.54	0.56
Canyon Creek	Both	2	Streamside Roads	5.71	4.13

*Due to the high proportion of checkerboard private land in these watersheds, and the possibility of further road-building and timber harvest, the risk to steelhead habitat from sediment may be higher than shown here.

Although the road system is likely contributing excess sediment to streams in the Lochsa River, sediment levels may also be naturally high. The geology of the basin contributes to high instream sediment levels: within the Lochsa River basin, 81 percent of watersheds have high surface erosion potential, 85 percent have high mass wasting potential, and 93 percent of the total landslide prone area is within 150 feet of a stream (IDEQ 1999b). The extensive road network has likely exacerbated naturally high levels of sediment delivery to streams. The forest road system in the Lochsa basin includes numerous culverts at stream crossings, many of which may be undersized. If a culvert is too small to accommodate high flows, the stream may overtop the road, delivering large amounts of sediment downstream and potentially decreasing substrate suitability or creating a migration barrier.

3. *Degraded Riparian Conditions*

Degraded riparian areas impact water quality, ecosystem function, and the stream environment (Murphy and Meehan 1991; Naiman 1992). Riparian areas influence stream conditions by stabilizing streambanks with vegetative root systems, reducing erosion and sedimentation; by providing canopy or overhead vegetation that creates shade to reduce stream temperature; and by providing a source of large woody debris important to instream habitat complexity and pool formation (Naiman et al. 1998). Thus, poor riparian conditions can threaten salmonids by impacting sediment, stream temperature, and habitat complexity. Conditions reported for Lochsa River steelhead suggest that degraded riparian conditions are reducing population abundance and productivity.

Disturbance of riparian habitat ranked as a moderate limiting factor for Lochsa River steelhead in the Clearwater River Subbasin Assessment and Management Plan (Ecovista 2003). Streamside roads, timber harvest, and wildfire have contributed to degraded riparian conditions. Legacy grazing practices in the lower elevation areas of the basin have degraded riparian vegetation in meadow areas.

4. Loss of Channel Complexity

Habitat indicators such as pool frequency, pool quality, LWD abundance, channel morphology, substrate, and streambank condition are often used to describe habitat complexity and quality (NMFS 1996). Poor habitat quality affects abundance and productivity VSP parameters by reducing survival and carrying capacity. Altered stream channels often lack the habitats (pools and riffles) and cover components (LWD, overhanging vegetation, undercut banks) necessary to fulfill salmonid habitat requirements during different life stages. Low abundance of LWD can lead to loss of pool habitat and hydraulic complexity as well as reduced cover and protection from peak flows (Hicks et al. 1991). The quality and complexity of habitat in the Lochsa River steelhead population have been reduced by channel modification and loss of instream woody debris and LWD recruitment potential.

Lack of high quality pools and poor instream cover were ranked as moderate limiting factors for Lochsa River steelhead in the Clearwater River Subbasin Assessment and Management Plan (Ecovista 2003). The Nez Perce-Clearwater National Forest identified channel modification and lack of LWD and LWD recruitment potential as risks to salmonids in the lower Lochsa River basin (USFS 2007a). Table 6.2-19 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to each subwatershed, assessing the potential for channel modification or lack of LWD to limit the abundance of different salmonid life stages (rearing or spawning). In the lower Lochsa River basin, stream channel modifications and lack of LWD were ranked as minor risks to spawning and rearing in the Fish Creek minor spawning area (Upper Fish, Lower Fish, and Hungery subwatersheds). Streamside roads were identified as the primary cause of channel modifications and lack of LWD and LWD recruitment potential. In the upper Lochsa River basin, lack of LWD ranked as a moderate to high risk to rearing habitat in several subwatersheds. These subwatersheds lie within the minor and major spawning areas of Warm Springs, Lower Lochsa River, and Crooked Fork. Streamside roads and timber harvest were identified as the primary causes of LWD reductions in the upper basin.

Consistent with the U.S. Forest Service assessments shown in Table 6.2-19, an expert panel of local biologists convened for the 2008 FCRPS biological opinion identified lack of woody debris as a habitat limiting factors for steelhead in the upper Lochsa River, but not the lower Lochsa River (BOR 2010b). The panel noted that loss of riparian vegetation, leading to reductions in LWD recruitment, exists throughout much of the area. In addition to the subwatersheds assessed by the U.S. Forest Service in Table 6.2-19, Brushy Fork Creek and Boulder Creek also lack sufficient LWD (NPT 2013).

Table 6.2-19. Subwatersheds in the Lochsa River population in which degraded habitat quality is a risk to salmonid abundance and production (modified from USFS 2007a). Primary sources of habitat degradation were identified for different life stages (rearing, spawning, or both).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank	Risk/Threat	Primary Sources	Secondary Sources*
Upper Fish Creek	Spawning	3	Channel Modification	Streamside roads	
	Rearing	3	Woody Debris	Streamside roads	
Hungery Creek	Spawning	3	Channel Modification	Streamside roads	
	Rearing	3	Woody Debris	Streamside roads	
Lower Fish Creek	Spawning	3	Channel Modification	Streamside roads	
	Rearing	3	Woody Debris	Streamside roads	
Lower Crooked Fork Creek	Rearing	1	Woody Debris	Timber Harvest	Roads
Spruce Creek	Rearing	2	Woody Debris	Timber Harvest	Roads
Legendary Bear Creek (Papoose Cr)	Rearing	1	Woody Debris	Streamside roads	Timber Harvest
Wendover Creek	Rearing	2	Woody Debris	Streamside roads	Timber Harvest
Fishing Creek	Rearing	1	Woody Debris	Streamside roads	Timber Harvest

*This column from Nez Perce Tribe, personal communication, 7-5-12.

5. *Elevated Water Temperature*

Elevated water temperatures may adversely affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions (Spence et al. 1996). In the Clearwater River Subbasin Assessment and Management Plan, stream temperature was indicated as one of the limiting factors for steelhead in the Lochsa River (Ecovista 2003, p. 346). Cold-water aquatic life criteria of maximum daily temperature of 19 °C average or 22 °C instantaneous are exceeded throughout the watershed (IDEQ 1999b). For many Lochsa River tributaries, elevated stream temperatures above cold-water aquatic life criteria are likely due to natural conditions and the area's hot summers (IDEQ 1999b, 2012). However, legacy clear cutting, timber harvest-related roads, and Highway 12 along a large portion of the Lochsa River have likely reduced stream shade from natural conditions. Many roads occur along stream bottoms, depleting streamside vegetation. IDEQ (2012) has written temperature TMDLs for 14 tributary watersheds to the Lochsa River: Pete King Creek, Canyon Creek, Deadman Creek, Lower Small Tributaries, Post Office Creek, Squaw Creek, Badger/Wendover Creeks, Papoose Creek, Walton/Cliff Creeks, Crooked Fork, Colt Killed Creek (White Sand), Brushy Fork, Upper Brushy Fork, and Spruce Creek. The TMDLs provide target shade levels based on potential natural vegetation. Timber harvest and streamside roads have reduced shade in these tributaries, such that the tributaries are the primary of source anthropogenic heat load to the mainstem Lochsa River. IDEQ (2012) assumes that reductions to temperatures in tributaries (from increases in shade) will lead to temperature reductions in the mainstem Lochsa River.

In summary, habitat limiting factors in the Lochsa River steelhead population are primarily linked to the extensive road system and past timber harvest, which has led to migration barriers, elevated sediment, reduced habitat complexity, degraded riparian conditions, and possibly elevated stream temperatures. A significant portion of legacy road and timber harvest impacts in the upper Lochsa

River drainage exist on private timberlands that are interspersed with federal lands in a checkerboard pattern. The checkerboard pattern limits opportunities for landscape-level restoration due to differing land management objectives on the private and federal lands, and the necessity to maintain an extensive road network to provide access to the private lands. Although habitat in many stream reaches in the Lochsa River population is in relatively good shape, these habitat limiting factors are nonetheless likely reducing abundance and productivity for this population.

Potential Habitat Limiting Factors and Threats

Two habitat concerns have not yet risen to the level of a limiting factor for the population, but may have local effects that need to be managed to protect habitat in the Lochsa River watershed.

1. Reduced water quality due to fuel spills - Since U.S. Highway 12 is the shortest route between Lewiston, Idaho and Missoula, Montana, the highway experiences a high volume of passenger vehicle and large truck traffic. The highway is a very curvy road and it is closely situated along the Lochsa River. Several notable fuel spills have occurred within the last decade, with diesel fuel spills up to 6,300 gallons going into the Lochsa River. Also, there have recently been a series of over-sized shipments on U.S. Highway 12 that may result in additional accidents along the Lochsa River.
2. Degraded riparian habitat from noxious weeds - A number of noxious weeds and exotic plants have been introduced into the watershed, particularly along the main travel ways. Noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs

No hatchery releases occur in the Lochsa River steelhead population area. Further, hatchery-origin steelhead are rarely observed in the Lochsa River and are not believed to influence the natural population. Consequently, hatchery practices are not considered a threat or limiting factor for this steelhead population.

Fisheries Management

The Lochsa River supports a B-run steelhead population. In recent years, total exploitation rates on B-run steelhead have ranged near 15 to 20 percent (Ford 2011). The harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Section 6.2.3.3 provides more detail on fishery-related limiting factors and threats for Clearwater River steelhead populations.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

First priority stream reaches for habitat restoration are those with intrinsic potential steelhead habitat in the in major spawning areas Crooked Fork, Fish Lake, and White Sands (see Figure 6.2-6). These watersheds contain almost two-thirds of the intrinsic potential habitat for the population. The second tier of priority stream reaches are those with potential for steelhead in the population's minor spawning areas: Warm Springs, Pete King, Lower Lochsa, Boulder, and Fish.

No specific habitat restoration efforts are needed in the Lochsa River mainstem, which provides important spawning, rearing, and migration habitat for the population. Habitat potential in the Lochsa River mainstem is overwhelmingly influenced by natural geomorphic features and stream power. Sediment reduction in the tributaries is the most important potential restoration action for habitat in the mainstem. U.S. Highway 12 runs along much of the Lochsa River mainstem, precluding restoration of natural riparian conditions along one side of the river.

Habitat Actions

Habitat in relatively good condition should continue to be protected, primarily by the U.S. Forest Service. Stream habitat in many parts of the population, however, will require recovery actions. The following habitat actions, ranked by priority, are intended to improve productivity rates and increase the capacity for steelhead smolt production in the watershed.

1. Eliminate known fish migration barriers blocking steelhead access to potential habitat, mainly at road stream-crossings. Inventory road crossings throughout the population to identify additional steelhead migration barriers.
2. Mitigate chronic sediment sources from roads. Controlling sources of sediment from roads may require road realignment, closure, or obliteration, or erosion control measures at stream crossings. Decommissioning of streamside roads will also lead to improved riparian conditions and increased LWD recruitment potential over time.
3. Improve riparian conditions where they have been altered by management activities in order to reduce sediment delivery to streams, increase shade, and increase large wood recruitment to streams over the long term.

Implementation of Habitat Actions

Because 95 percent of the land in the Lochsa River basin is managed by the Nez Perce-Clearwater National Forests, responsibility for implementation of much of the habitat portion of the recovery plan for this population lies within the jurisdiction of the U.S. Forest Service and Nez Perce Tribe. Habitat restoration actions may also be necessary, however, on the private checkerboard lands in the Lochsa River headwaters. Effective watershed restoration will require coordination of the management of checkerboard U.S. Forest Service and private lands. The Nez Perce Tribe has been engaged in habitat assessments and restoration projects through a partnership with the Nez Perce-Clearwater National Forest that began in 1997. Completed habitat restoration projects have included riparian vegetation planting, road decommissioning and improvements, and replacement and removal of stream crossing barriers.

Table 6.2-20 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with the various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.2-20. Habitat Recovery Actions Identified for the Lochsa River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Barriers	Address 13 barriers (culverts)	BPA Contract # 2007-395-00: Protect and Restore Lochsa Watershed	N/A
Instream Structural Complexity	Improve 35 stream miles (maintenance and reconstruction of existing structures)		
Riparian Conditions/Water Quality (Sediment, Temperature)	Protect 75 riparian miles Improve 1,549 riparian acres Improve 268.3 road miles		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Clearwater River steelhead MPG is to promote recovery by reducing the fitness and diversity risks that the hatchery programs may present. As part of this MPG-level strategy, the strategy calls to continue managing the Lochsa River steelhead population for natural production. The strategy includes monitoring for stray hatchery fish and implementing actions to reduce straying where needed. Section 6.2.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The fisheries strategy is to continue to control harvest-related impacts through the abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.2.4.2 provides more information in the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Lochsa River steelhead population to reach high viability and the larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan provide additional direction.

6.2.8 Lolo Creek Steelhead Population

The Lolo Creek steelhead population is currently rated as maintained or, tentatively, high risk due to a high abundance/productivity risk. Its targeted proposed status is Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Proposed Status
Maintained or High Risk?	Maintained

This section identifies a number of actions framed to move the population towards achieving its proposed status. Reaching the population's proposed status, however, will require the implementation of actions throughout the population's range and life cycle, particularly in the mainstem Snake and Columbia River migration corridors. These additional actions are described in Chapter 4 and Section 6.1.

Population Status

This section of the recovery plan compares the Lolo Creek population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

Lolo Creek was identified as an independent population based on its basin size and its geographic isolation from all but the Lower Mainstem steelhead population, which supports primarily A-run fish, whereas Lolo Creek currently supports A-run and B-run (>40%) steelhead (Figure 6.2-8). It is unknown whether the Lolo Creek population historically supported both A-run and B-run steelhead (ICTRT 2003).

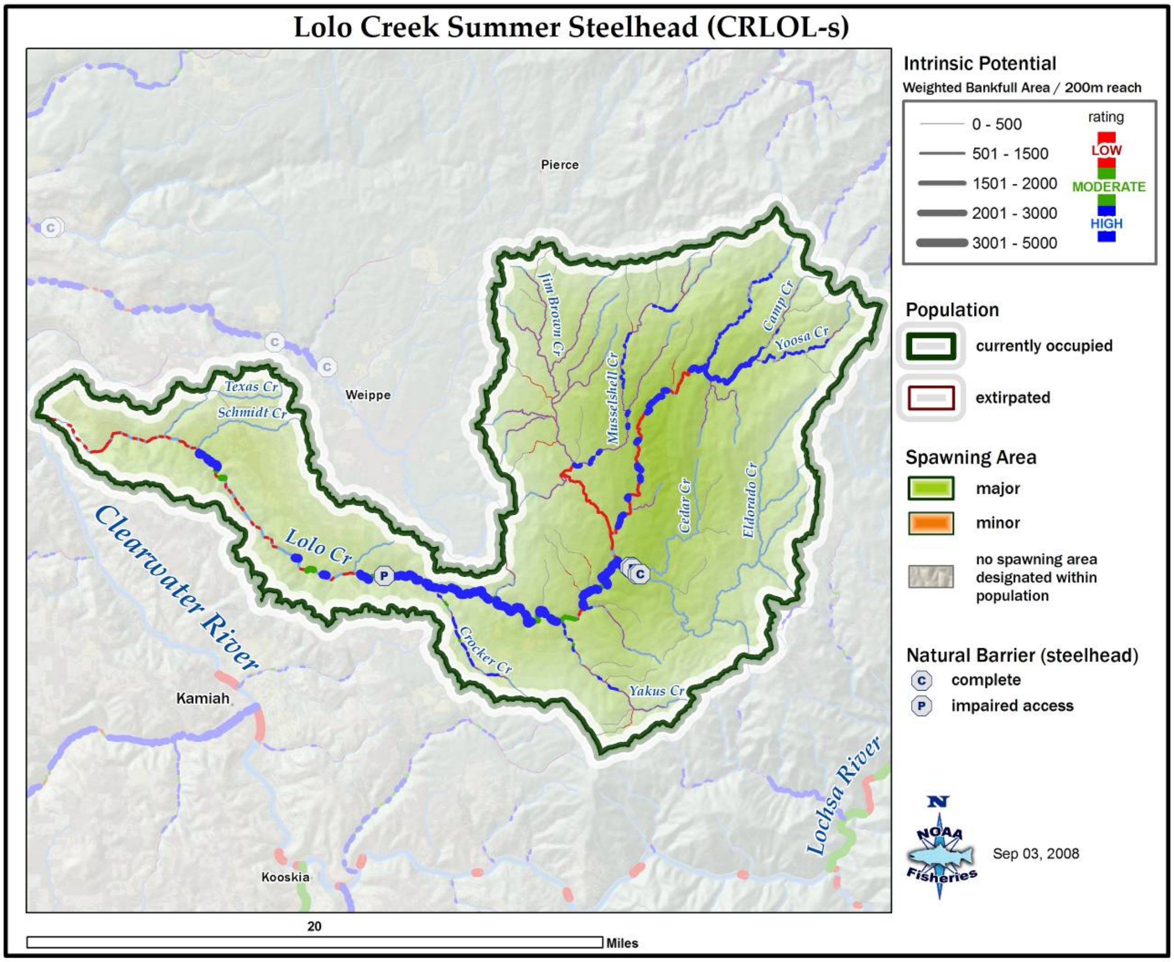


Figure 6.2-8. Lolo Creek steelhead population, consisting of one major spawning area. (The barrier on Eldorado Creek is a likely only a partial barrier to steelhead migration, and not a complete barrier are shown here.) Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The Lolo Creek drainage currently produces few natural-origin steelhead due to low numbers of returning adults and habitat conditions. Spawning has been observed in the upper mainstem of Lolo Creek, but the overall number of redds observed has been relatively low. Very little spawning has been observed in the Musselshell and Jim Brown Creek drainage, presumably due to fine textured substrates in the alluvial meadow systems of that drainage. Although steelhead habitat is available in the Eldorado Creek drainage, natural-returning steelhead have only been observed a few times. The Eldorado Falls may still present a partial migration barrier during various streams flows.

The ICTRT classified the Lolo Creek population as “Basic” in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Basic has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe.

Abundance and Productivity

The Idaho populations of Snake River Basin steelhead do not have direct estimates of annual spawning escapements. Results from a recent genetic stock composition project and recent pit-tag data are making it possible to better estimate population spawning escapements for Lolo Creek. In the past estimates were only developed for two average surrogate populations to represent both major run types (A and B); however, currently the results from the new project have a high misclassification rate for the stock group containing this population. A PIT-tag array located in Lolo Creek has also provided recent information. The PIT-tag information show that the number of fish has fluctuated by more than 50 percent from year to year, with the number of fish observed from 2012 through 2015 ranging from an estimated 680 natural-origin steelhead in 2012 to 280 fish in 2014. Because the data are limited, NWFSC (2015) applied the provisional high risk rating for abundance and productivity for B-run populations from previous species status reviews. Additional years of information from the genetics stock program, combined with refinements in the analysis, should allow for updating the provisional ratings in the future.

Spatial Structure

The Lolo Creek population consists of just one major spawning area, which potentially creates an inherent extinction risk. However, this risk is mitigated by the fairly extensive branching provided by the tributaries to Lolo Creek and the relatively large amount of intrinsic potential habitat within the watershed. Based on a limited number of spawner surveys, spawning appears to be occurring throughout Lolo Creek and in the tributaries Yakus, Eldorado, Yoosa, and Musselshell Creeks. However, the IDFG redd distribution data examined by the ICTRT were not current and may not reflect the true current spawning distribution. The population’s cumulative spatial structure score is low risk (as opposed to very low risk) largely due to the uncertainty about current spawning distribution. A low spatial structure risk is adequate for the population to attain its overall proposed status (NWFSC 2015).

Diversity

Diversity risk for the Lolo Creek population is driven by the lack of genetic data and the long history of hatchery outplanting in the watershed. Because no genetic data were available for this population, the ICTRT rated the genetic variation metric for this population as moderate. Hatchery outplants have led to a more substantial diversity risk for the population. Steelhead fry, fingerlings, smolts and adults have been released into the population since 1977, with all releases from Dworshak Hatchery B-run stock. Out-of-MPG hatchery steelhead are thus deliberately released into the population under current management programs, to supplement the watershed’s natural population. This practice has created a high diversity risk for spawner composition because of the duration of the supplementation releases over several generations of steelhead. The naturally spawning population may consist of a high proportion of hatchery-origin fish. The cumulative diversity risk for this population is moderate, which is sufficiently low for the population to meet its overall proposed status (NWFSC 2015).

Summary

The Lolo Creek steelhead population is currently at moderate or tentatively high risk due to a tentative high risk rating for abundance and productivity, based on the ICTRT's past risk ratings for B-run steelhead. In the absence of population-specific data, we assume that improvements in abundance and productivity will need to occur for this population to reach its proposed status of maintained, with moderate risk. The overall spatial structure and diversity rating of moderate is sufficiently low for this population to reach its proposed status. Table 6.2-21 summarizes the population's abundance/productivity and spatial structure/diversity risks.

Table 6.2-21. Viable Salmonid Population parameter risk ratings for the Lolo Creek steelhead population. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M Lolo Creek	HR
	High (>25%)	HR	HR	HR Lolo Creek?	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

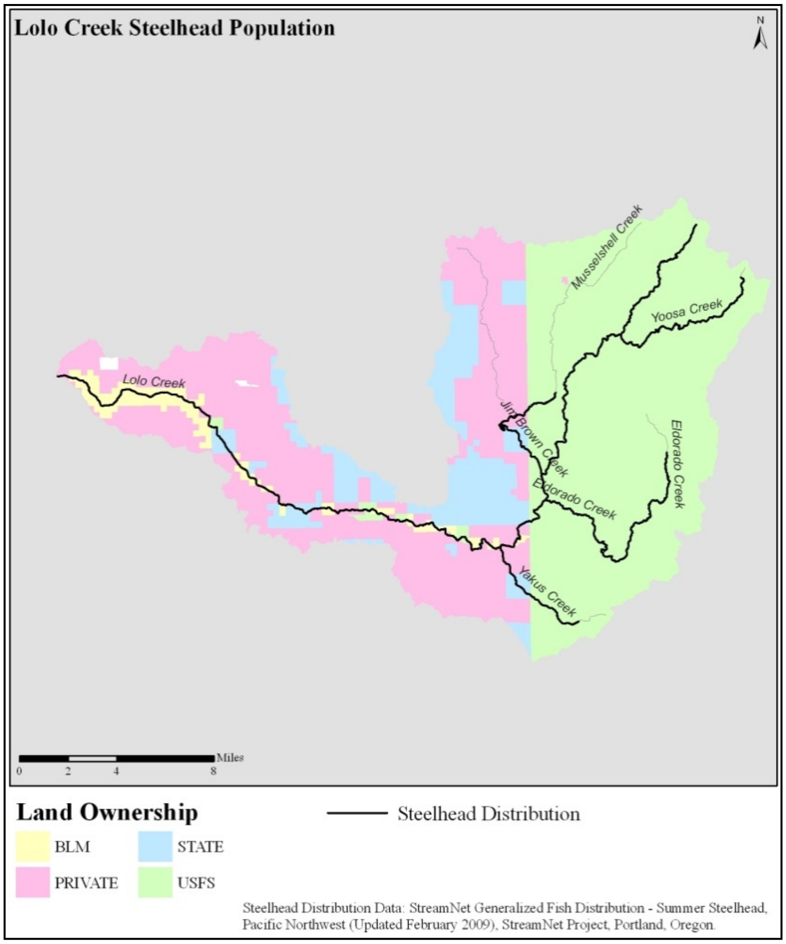
This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Lolo Creek steelhead population includes Lolo Creek and all of its tributaries. The population geographic boundary drains about 242 square miles. Elevations range from about 1,079 feet to almost 5,239 feet. The population includes about 373 km of stream with about 76 percent (284 km) occurring downstream from natural barriers. Upper Lolo Creek drains forested mountains and rolling hills of timber interspersed with meadows and fields. Lower Lolo Creek then flows into a narrow, rugged canyon that is largely inaccessible. The average annual precipitation in the area ranges from 25 inches at the Clearwater River mainstem (Orofino) to 43 inches in the rolling hills just north of the Lolo Creek drainage (Pierce) to 70 inches at Hemlock Butte at the headwaters of Lolo Creek (IDFG 1996). Lolo Creek can display wide amplitudes in seasonal stream flow from spring to late summer and fall. Normal peak streamflows are associated with winter snowmelt and occur in the spring although rain-on-snow events sometimes occur in winter causing rapid runoff (Espinosa and Lee 1991; Ecovista 2003).

Land ownership within the population is about 51 percent U.S. Forest Service, 34 percent private, 11 percent state lands, and 3 percent BLM lands (Figure 6.2-9). U.S. Forest Service lands are continuous within the upper basin occupying most of the Yakus Creek, Eldorado Creek, Yoosa Creek, and Musselshell Creek watersheds. Private and state lands are intermingled within the Jim Brown Creek and lower Lolo Creek watersheds. BLM lands are generally concentrated in the lower watershed along Lolo Creek. The lower watershed is contained within a steep v-shaped canyon that is roughly 1,500 feet deep along much of its lower half, moderating to about half this depth by the time it reaches the Nez Perce-Clearwater National Forest boundary (IDFG 1996).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.2-9. Land ownership in the Lolo Creek steelhead population**.** [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land use in the Lolo Creek watershed has included logging, mining, livestock grazing, and recreation. Timber harvest and road construction have had substantial impacts on stream habitat throughout the population, as have grazing and mining in localized areas. Extensive timber harvest and road construction began in 1957 and continued through the 1980s, by which point stream habitat conditions had become severely degraded (Espinosa et al. 1995). Sediment yield resulting from timber harvest and road construction increased from 60 to 149 percent over natural levels (Espinosa et al. 1995). Other impacts to stream habitat included channel impingement by roads and reduction in large woody debris recruitment to streams caused by the removal of riparian trees. Restoration projects to improve fish habitat in Lolo Creek began in the 1980s and included revegetation of riparian areas, bank stabilization projects, and placement of instream structures (Espinosa and Lee 1991).

The Clearwater River Subbasin Assessment rated the quality of steelhead habitat in the Lolo Creek watershed as mostly fair or good (Ecovista 2003, p. 281). Steelhead are distributed throughout most streams within the population boundaries, which consists of one major spawning area (Figure 6.2-8). In 1986, four basalt bedrock falls on lower Eldorado Creek were blasted to improve steelhead access to potential spawning and rearing habitat in Eldorado Creek (Espinosa and Lee 1991). The falls still create a partial barrier for upstream adult migration, but some returning steelhead get past the barrier.

IDEQ maintains a list of impaired waters across the state of Idaho to comply with section 303(d) of the Clean Water Act (Table 6.2-22). IDEQ (2011) has identified three tributaries to Lolo Creek as temperature-impaired, and has written temperature TMDLs for these tributaries.

Table 6.2-22. Stream segments in the Lolo Creek steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2009, 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 4a-TMDLs		
Eldorado Creek – 1st and 2nd order tribs.	Temperature, water	52.1
Jim Brown Creek – 1st and 2nd order tribs.	Temperature, water	44.6
Musselshell Creek – 1st and 2nd order tribs.	Temperature, water	30.8
Musselshell Creek – 3rd order tribs.	Temperature, water	4.3
Section 4c-Waters Impaired by Non-pollutants		
Jim Brown Creek - source to mouth	Other flow regime alterations; Physical substrate habitat alterations	44.63
No TMDLs Segments		

Current Habitat Limiting Factors

To determine the habitat limiting factors for the Lolo Creek steelhead population, NMFS reviewed multiple data sources and reports on stream conditions. Based on these reports and discussions with local fisheries experts, we conclude that the habitat limiting factors for the Lolo Creek steelhead population are migration barriers, sediment, riparian conditions, habitat complexity, and stream temperature. Table 6.2-23 summarizes (1) the mechanisms by which each limiting factor affects steelhead, and (2) management objectives for addressing each limiting factor. A discussion of each limiting factor follows.

Table 6.2-23. Primary limiting factors identified for the Lolo Creek steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream. Reduce chronic sediment from roads.
Riparian Condition	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Restoration of riparian vegetation and streambank stability; use of fencing or other livestock management changes to reduce impacts
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding.	Restoration of riparian vegetation and LWD recruitment potential. Installation of engineered wood structures where LWD recruitment is precluded by streamside roads.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature.

1. Migration Barriers

Most migration barriers for this population are caused by culverts at stream road crossings. The barriers block habitat access for juveniles and migrating adults.

A panel of local experts convened for the 2008 FCRPS classified migration barriers as a limiting factor for steelhead in all major Lolo Creek tributaries (BOR 2010a). Nez Perce-Clearwater National Forest subwatershed summaries from 2007 indicated 43 known fish migration barriers and 20 undetermined barriers on roads on U.S. Forest Service land, impairing access to at least 20 miles of stream (USFS 2007a). Many of the barriers identified in 2007 have since been removed through the Nez Perce-Clearwater National Forest’s partnership with the Nez Perce Tribe, and additional barriers have since been discovered through surveys conducted by the Nez Perce Tribe. Migration barriers remain a limiting factor. Given the high road density throughout the watershed, multiple migration barriers likely occur on non-federal land as well. An assessment of potential migration barriers for steelhead throughout the remaining portions of the watershed that have not been surveyed would provide guidance on priorities for restoring connectivity within the population.

2. *Excess Sediment*

The Clearwater River Subbasin Assessment ranked sediment as one of the most important limiting factors for steelhead throughout this population (Ecovista 2003, p. 347). Fuller et al. (1985) identified sedimentation problems in Lolo Creek, Yakus Creek, Mussellshell Creek, Eldorado Creek, and Jim Brown Creek. IDEQ (2011) reports that meadow reaches of Jim Brown Creek have accumulated excess sediment in their streambeds from human land use practices and historical wildfires; while current sediment loading to streams is being controlled, residual sediment load continues to affect these streams. The panel of local experts convened for the 2008 FCRPS biological opinion identified roads, timber harvest, grazing, and historic mining as the principal causes of elevated sediment levels in the Lolo Creek watershed (BOR 2010b). The panel concluded that excess sediment is affecting steelhead spawning and rearing success through reduced pool volume and reduced interstitial spaces within substrate used for spawning and rearing. Espinosa et al. (1995) also indicated that the quantity and quality of winter habitat may be limiting anadromous salmonid habitat in the Lolo Creek watershed, likely due to the increase in sedimentation of pools and channel substrate that are important cover components during winter.

The Nez Perce-Clearwater National Forest identified excess sediment as a risk to salmonid habitat in all subwatersheds of Lolo Creek with U.S. Forest Service land (USFS 2007a). Table 6.2-24 ranks the potential for sediment to limit the abundance of spawning or rearing salmonids in each subwatershed (1 - high risk, 2 - moderate risk, 3 - minor risk). In most subwatersheds excess sediment was ranked as a moderate risk to spawning habitat. The primary source of excess sediment identified in all subwatersheds was streamside roads. Total road density and the density of roads within riparian conservation areas (RCAs) were high in all subwatersheds, with roads occurring in landslide prone areas of all subwatersheds except Musselshell Creek. Jim Brown Creek, on private land, is also a significant source of sediment to steelhead habitat in Lolo Creek.

Table 6.2-24. Subwatersheds on U.S. Forest Service land identified with excess sediment as a risk to salmonid habitat in the Lolo Creek watershed (USFS 2007a).

HUC6-Subwatersheds	Life Stage	Risk Rank*	Primary Sources	Road Density (mi/mi^2)	
				Total	Within RCAs
Upper Lolo Creek	Spawning	2	Streamside Roads	5.16	5.52
Musselshell Creek	Spawning	2	Streamside Roads	5.46	6.24
Middle Lolo Creek	Spawning	2	Streamside Roads	4.73	10.05
Eldorado Creek	Spawning	1	Streamside Roads	5.04	5.72

Source: Clearwater National Forest subwatershed summaries (USFS 2007)

*1 - high risk, 2 - moderate risk, 3 - minor risk

Espinosa et al. (1995) chronicled sediment conditions in Lolo Creek and Eldorado Creek from 1957 to 1993. Sediment yield increased dramatically in the 1950s, in concert with extensive road construction and timber harvest, and remained high through 1983, when awareness of habitat and degradation problems helped to initiate a moderation of timber harvest and road construction activities on the Nez Perce-Clearwater National Forest. Sediment yield decreased from 1977 to 1993, but substrate conditions showed little recovery towards natural conditions of substrate embeddedness and levels of subsurface fines. Espinosa et al. (1995) predicted that it would take many years for excess sediment to be transported out of the watershed, allowing substrate conditions to improve.

3. Degraded Riparian Conditions

Conditions reported for the Lolo Creek steelhead population suggest that degraded riparian conditions are reducing population abundance and productivity. Ecovista (2003) indicated that degradation of riparian habitat is a moderate limiting factor in the Lolo Creek steelhead population, leading to decreased stream shade and decreased channel complexity. Grazing has reduced riparian vegetation in the Jim Brown Creek watershed (BOR 2010b). High road densities in riparian areas throughout the Lolo Creek watershed upstream from the lower canyon have also degraded riparian conditions (see Table 6.2-23). Fuller et al. (1985) recommended riparian enhancement projects in much of the Lolo Creek watershed to alleviate degraded stream conditions. Since that time riparian habitat restoration and protection has played a major role in restoration of fish habitat in the Lolo Creek watershed (Johnson 2010). The Nez Perce Tribe has recommended continued riparian restoration efforts in the Jim Brown Creek and Musselshell Creek drainages to improve vegetation density in order to increase shade and recruitment of large woody debris (Johnson 2010). Restoration of impaired meadow hydrology may be needed to reestablish woody vegetation. Hydrologic conditions might be improved by the use of permeable channel or floodplain structures that increase flow resistance and force water onto the floodplain.

4. High Water Temperatures

Elevated water temperatures may adversely affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions (Spence et al. 1996). The Clearwater River Subbasin Assessment ranked stream temperature as an important limiting factor for steelhead in the Lolo Creek watershed (Ecovista 2003, p. 346). IDEQ (2011) has found elevated stream temperatures in three tributaries: Eldorado Creek, Jim Brown Creek, and Musselshell Creek. Temperatures in these streams exceed cold-water aquatic life criteria for maximum daily temperatures of 19 °C average or 22 °C instantaneous, likely due to reductions in riparian vegetation. IDEQ (2011) developed TMDLs for these streams, calling for more shade to reduce stream temperature. In Jim Brown Creek, for example, increased shade could come from establishment of riparian buffers and the replanting of red cedar, Englemann spruce, and white pine along the meadow segments.

Monitoring data from the Nez Perce-Clearwater National Forest between 1990 and 2008 has indicated that stream temperatures in Lolo and Musselshell Creeks have exceeded the forest desired criteria (16-17 °C) by several degrees and maintained these high temperatures for extended periods of time. In

2008, the desired rearing temperature of 17 °C was met at seven tributaries (Dutchman Creek, Knoll Creek, Mike White Creek, Fan Creek, Lunch Creek, Trout Creek, and Nevada Creek) but not in Lolo Creek, Eldorado Creek, or Musselshell Creek. In 2015, high temperatures caused the death of 46 adult Chinook salmon (more than 20%) that returned to Lolo Creek, which is an indicator of potential temperature problems for steelhead in lower Lolo Creek.

5. *Loss of Habitat Complexity*

The Clearwater River Subbasin Assessment ranked lack of instream cover and pools as a moderate limiting factor for steelhead in Lolo Creek (Ecovista 2003, p. 346). Loss of salmonid rearing habitat has occurred from a lack of woody debris, leading to less habitat complexity. Several subwatersheds in this population may lack sufficient sources of LWD recruitment. The Nez Perce-Clearwater National Forest identified lack of woody debris as a risk to salmonid habitat in many areas of the Lolo Creek watershed (USFS 2007a). Table 6.2-25 ranks the potential for reduced levels of LWD to limit the abundance of spawning or rearing salmonids in each subwatershed (1 - high risk, 2 - moderate risk, 3 - minor risk). Loss of instream woody debris was associated with the effects of streamside roads and timber harvest. The risk ranking for woody debris was considered moderate in the Upper Lolo Creek and Eldorado Creek subwatersheds and high in the Musselshell Creek and Middle Lolo Creek subwatersheds.

Table 6.2-25. Subwatersheds in the Lolo Creek watershed in which lack of large woody debris is a risk to salmonid abundance and productivity (USFS 2007a).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank*	Risk to Salmonid Habitat	Primary Source	Secondary Source
Upper Lolo Creek	Rearing	2	Woody Debris	Streamside Roads	Timber Harvest
Musselshell Creek	Rearing	1	Woody Debris	Streamside Roads	Timber Harvest
Middle Lolo Creek	Rearing	1	Woody Debris	Streamside Roads	Timber Harvest
Eldorado Creek	Rearing	2	Woody Debris	Timber Harvest	Streamside
Source: Clearwater National Forest subwatershed summaries (USFS 2007)					

*1 - high risk, 2 - moderate risk, 3 - minor risk

Potential Habitat Limiting Factors and Threats

Several habitat concerns have not yet risen to the level of a limiting factor at the population level, but may have local effects that need to be managed to protect habitat in the Lolo Creek watershed.

- Passage barriers due to undersized culverts - The extensive road system in the Lolo Creek watershed includes numerous culverts at stream crossings, many of which were not designed to accommodate 50- or 100-year storm events. If a culvert is too small to accommodate high flows during a storm event, the stream may overtop the road, delivering large amounts of sediment downstream and potentially creating a migration barrier.
- Degraded riparian habitat from noxious weeds- A number of noxious weeds and exotic plants have been introduced into the watershed, particularly along the main travel ways. Noxious weeds can increase soil erosion and decrease native plant density.

- Low summer base flows - A combination of alterations to surface drainage features and a shift toward earlier timing of spring runoff has reduced stream flows in summer and lowered the elevation of the water table in portions of the drainage. The trend toward decreasing flows may be slowed or reversed by increasing recruitment of instream wood, reestablishing beaver activity, or using artificial wood structures.

Hatchery Programs

Hatchery supplementation continues to occur in the Lolo Creek steelhead population. Artificial propagation programs for steelhead in Lolo Creek and other Clearwater River tributaries are based on the North Fork Clearwater B-run stock that was trapped at the base of Dworshak Dam when the dam was constructed on the North Fork Clearwater River in 1969. The stock has been outplanted into the Lolo Creek population intermittently since 1977. Currently, a Lolo Creek supplementation program operates out of the Clearwater Hatchery using Dworshak Hatchery B-run steelhead stock. The release goal for this program is 50,000 unmarked smolts. Broodstock is collected at the Dworshak Hatchery. No natural-origin adults are spawned.

The use of out-of-basin broodstock presents a threat to the Lolo Creek natural-origin steelhead population. Hatchery fish that escape fisheries and interbreed with natural-origin fish in the basin may be decreasing among-population B-run diversity. Limiting factors include reduced genetic adaptiveness; demographic changes and life history changes. Hatchery-related limiting factors and threats for Lolo Creek steelhead and other Clearwater River steelhead populations are discussed at the MPG level in Section 6.2.3.2.

Fishery Management

Lolo Creek supports a mix of A-run and B-run steelhead. Most harvest-related mortality for steelhead returning to the Clearwater MPG occurs on the mainstem Columbia River in fisheries directed at fall Chinook salmon. In recent years, total exploitation rates on A-run steelhead have been stable at around 5 percent, while exploitation rates on B-run steelhead have generally been in the range of 15 to 20 percent (Ford 2011). Clearwater B-run steelhead experience higher harvest rates than the A-run steelhead because of their later run timing and larger size. While harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Section 6.2.3.3 provides more detail on fishery-related limiting factors and threats for Clearwater River steelhead populations.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

Because the Lolo Creek watershed consists of just one major spawning area, all streams with potential steelhead habitat are important for the recovery of the population. Based on intrinsic habitat potential, the greatest increases in abundance and productivity from habitat restoration would come from the Lolo Creek mainstem, Yoosa Creek, Musselshell Creek, and Yakus Creek (see Figure 6.2-9). Jim Brown Creek and Eldorado Creek could also be important for increasing steelhead productivity. The Nez Perce Tribe has expended considerable effort in fencing, riparian plantings, bridge replacement, road decommissioning, and culvert improvements in Jim Brown Creek, with similar accomplishments in Musselshell Creek and upper Lolo Creek.

Habitat Actions

The following habitat actions, ranked in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the population, moving the population towards a moderate risk status.

1. Restore habitat access and connectivity within the population by eliminating fish migration barriers. Actions should include restoring access to all potential steelhead habitat, inventorying remaining road crossings with undetermined status, and conducting routine maintenance and checks on existing passable structures.
2. Mitigate chronic sediment sources from roads and mines. Controlling sources of sediment may require road obliteration, realignment, conversion or closure, as well as improved road maintenance, replacement of undersized culverts, and rehabilitation of legacy mines. Reducing the total amount of roads, particularly those that occur along streams and on unstable slopes, should reduce sediment production. Existing roads on the Nez Perce-Clearwater National Forest are being prioritized for decommissioning by a cooperative effort of the Nez Perce Tribe and the Nez Perce-Clearwater National Forest (Johnson 2010).
3. Restore degraded riparian habitat through riparian plantings, fencing, and decommissioning of streamside roads. Passive restoration should be used in less disturbed areas to allow natural regrowth of riparian vegetation.
4. Accelerate restoration of instream habitat complexity through addition of logs or engineered wood structures where riparian alterations have reduced recruitment of large wood to streams.

Implementation of Habitat Actions

Implementation of the habitat portion of the recovery plan for Lolo Creek steelhead will likely occur through the work of the Nez Perce-Clearwater National Forest and the Nez Perce Tribe. BLM, IDEQ, IDFG, Idaho Department of Lands, county soil and water conservation districts, Potlatch Corporation and other private landowners are also likely to contribute. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the watersheds.

Many stream habitat restoration projects have been completed in the Lolo Creek watershed, dating back to the 1980s (Espinosa and Lee 1991). The Lolo Creek Watershed Restoration Project began in 1996 to enhance fish habitat, reduce sediment delivery, and protect riparian areas (McRoberts 2005). Since then, the Nez Perce Tribe, Nez Perce-Clearwater National Forest, and Bonneville Power

Administration have been active in restoration efforts in the Lolo Creek watershed. Restoration efforts have included fencing to exclude cattle for stream banks, stream bank stabilization, road decommissioning, riparian planting, and culverts replacement and removal.

Table 6.2-26 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.2-26. Habitat Recovery Actions Identified for the Lolo Creek Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Passage	Address 5 barriers (culverts)	BPA Contract # 1996-077-02: Lolo Creek Watershed Restoration	N/A
Habitat Complexity	Improve 1 riparian mile		
Riparian Conditions/Water Quality (Sediment, Temperature)	Protect 16 riparian miles Improve 10 riparian acres Improve 60 road miles		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Clearwater River steelhead MPG is to promote recovery by reducing the fitness and diversity risks that the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Lolo Creek steelhead population is to reduce ecological and genetic risk associated with hatchery programs through use of local broodstock and selection of release sites. Specific direction will be developed through the HGMP process. Section 6.2.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The fisheries strategy is to continue to control harvest-related impacts through the abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.2.4.2 provides more information in the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Clearwater River steelhead MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary, and ocean and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan provide additional direction.

6.2.9 South Fork Clearwater River Steelhead Population

The population is currently rated as maintained or high risk due to high abundance/productivity risk. Its targeted proposed status is maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Proposed Status
Maintained or High Risk?	Maintained

This section identifies a number of actions framed to move the population towards achieving its proposed status. Reaching the population's proposed status, however, will require the implementation of actions throughout the population's entire range and life cycle, particularly in the mainstem Snake and Columbia River migration corridors. These additional actions are described in Chapter 4 and Section 6.1.

Population Status

This section of the recovery plan compares the South Fork Clearwater River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The South Fork Clearwater River population includes the South Fork Clearwater River and its tributaries upstream from and including Mill Creek and supports both B-run (>40%) and A-run steelhead (Figure 6.2-10) (ICTRT 2003). Population spawning areas are isolated from other spawning areas in the Clearwater River at a distance that likely precludes substantial straying. Steelhead in this population were blocked by a dam constructed on the South Fork Clearwater River near the town of Harpster, about two miles downstream from the population's lower boundary. In 1911, the dam was constructed to provide power to the city of Grangeville. A fish ladder was installed in 1935 and remained until 1949, when it was destroyed by high water. The dam blocked steelhead migration into this population from 1911 to 1935, and from 1949 until 1963, when the dam was finally removed. The current population is derived from resident rainbow trout, juvenile stocking from Dworshak Hatchery stock, adults trapped at Lewiston Dam, and possibly residualized (resident) endemic *O. mykiss*.

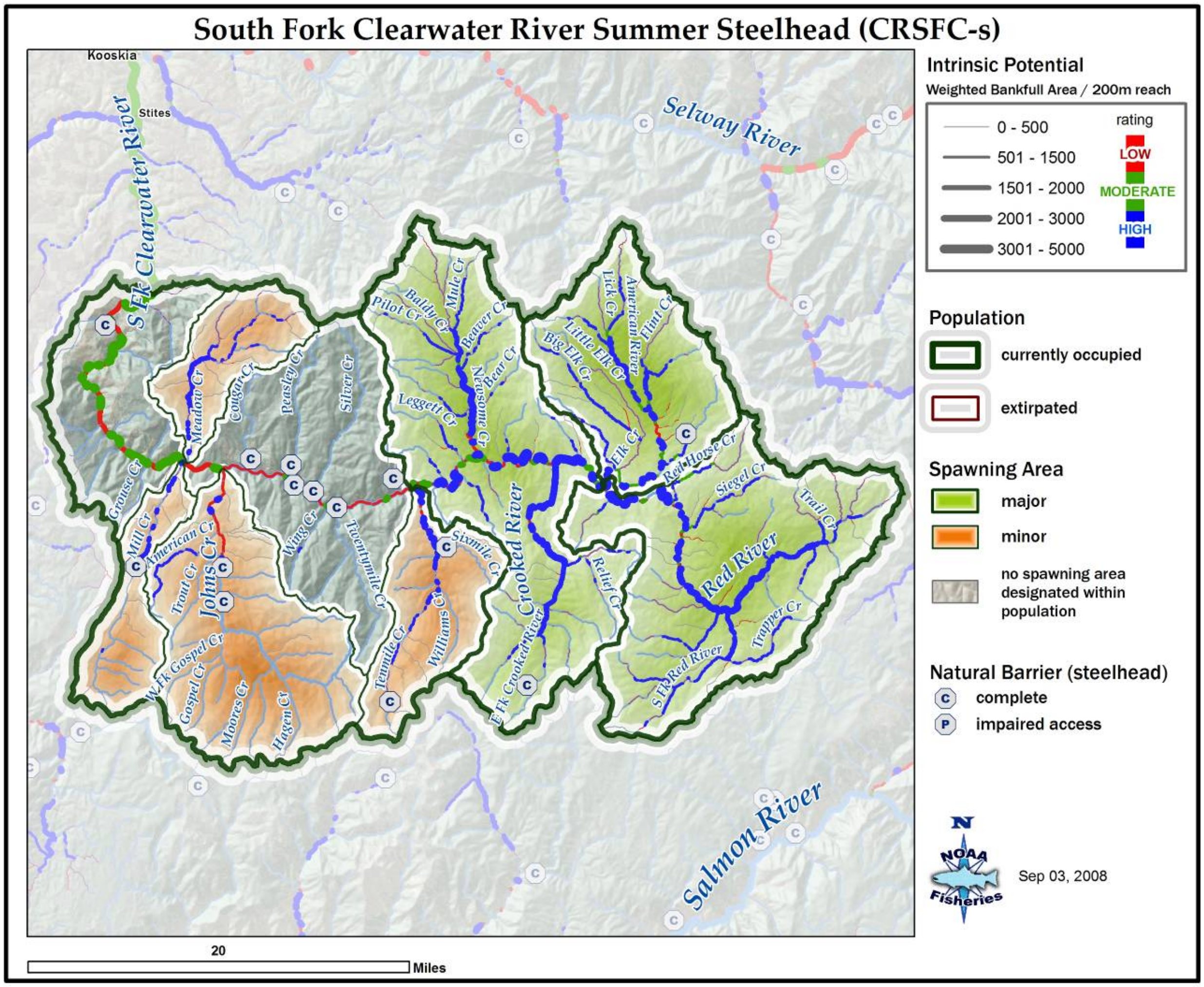


Figure 6.2-10. South Fork Clearwater River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the South Fork Clearwater River population as "Intermediate" in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the minimum abundance threshold) to achieve low (a 5% or less) risk of extinction over a 100-year timeframe.

Abundance and Productivity

The Idaho populations of Snake River Basin steelhead do not have direct estimates of annual spawning escapements. Results from a recent genetic stock composition project are making it possible to better estimate population spawning escapements for the South Fork Clearwater River population; however, the results from the new project currently have a high miscalculation rate for the stock group containing this population. NWFSC (2015) therefore carried forward the provisional high risk rating for abundance and productivity from prior status reviews, which was based on the aggregate abundance time series for B-run steelhead passing Lower Granite Dam. Additional years information from the genetics stock program combined with refinements in the analysis should allow for updating the provisional ratings in the future (NWFSC 2015).The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for those populations where new data is available. NMFS will update this section with this new information when it becomes available.

Spatial Structure

The South Fork Clearwater River population has three major spawning areas and four minor spawning areas, and this extensive spawning structure provides inherent protection against extinction. Current spawning is widely distributed throughout the population and has been documented in all of the larger tributaries to the South Fork Clearwater River, including all major spawning areas. The population’s spatial structure score is therefore low risk. A low spatial structure risk is adequate for the population to attain its overall proposed status (NWFSC 2015).

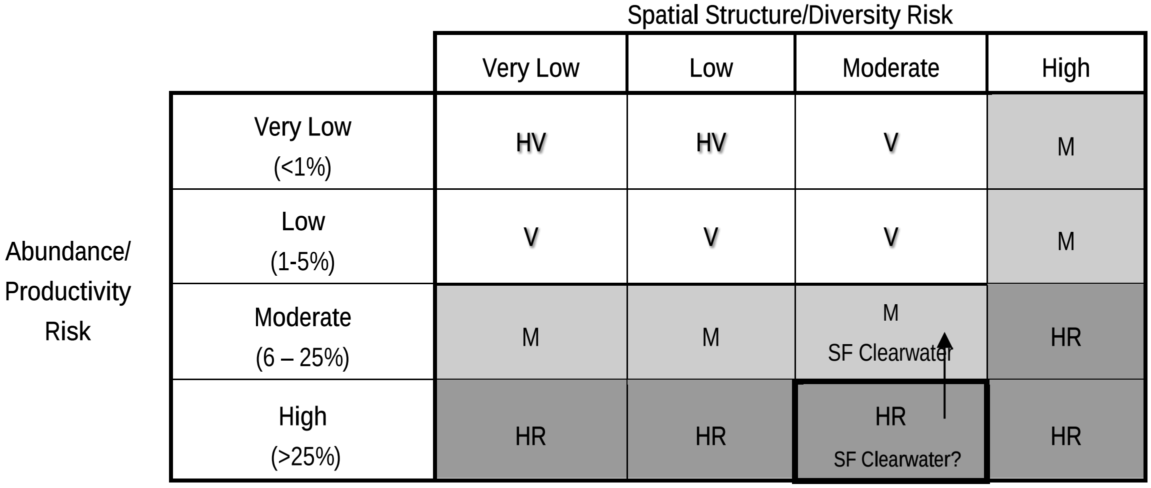
Diversity

For the South Fork Clearwater River, diversity risk is primarily driven by the long history of outplanting hatchery steelhead into this population. Steelhead fry, fingerlings, smolts and adults have been released into the population since at least 1969. The majority (possibly up to 100%) of released fish have been Dworshak Hatchery B-run stock. Some of the hatchery fish releases are for harvest augmentation, and there is substantial harvest of these fish within and outside of the population. All fish released for harvest augmentation are marked with an adipose fin clip. In recent years, unclipped hatchery steelhead smolts were released for supplementation purposes, and these releases are expected to continue into the near-term. The contribution of supplementation releases and unharvested marked hatchery fish to natural production is unknown, but the duration of supplementation releases and the potential for the naturally spawning population to consist of a high proportion of hatchery-origin fish creates diversity risk, leading to a cumulative diversity risk of moderate. This diversity risk is sufficiently low for the population to meet its overall proposed status (NWFSC 2015).

Summary

The South Fork Clearwater River steelhead population is currently at moderate to high risk due to a tentative high risk rating for abundance and productivity, based on the ICTRT’s average surrogate B-run population passing Lower Granite Dam (NWFSC 2015). In the absence of population-specific data, we assume that improvements in abundance and productivity will need to occur for this population to reach its proposed status of maintained, with moderate risk. The overall spatial structure and diversity rating of moderate is sufficiently low for this population to reach its proposed status. However, improvement of this rating to low risk, along with significant improvements in the abundance and productivity rating, would be necessary to allow this population to achieve a status of viable, with low risk. Table 6.2-27 summarizes the population’s abundance/productivity and spatial structure/ diversity risks.

Table 6.2-27. Viable Salmonid Population parameter risk ratings for the South Fork Clearwater River steelhead population. The population does not meet population-level viability criteria.



		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M SF Clearwater	HR
	High (>25%)	HR	HR	HR SF Clearwater?	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

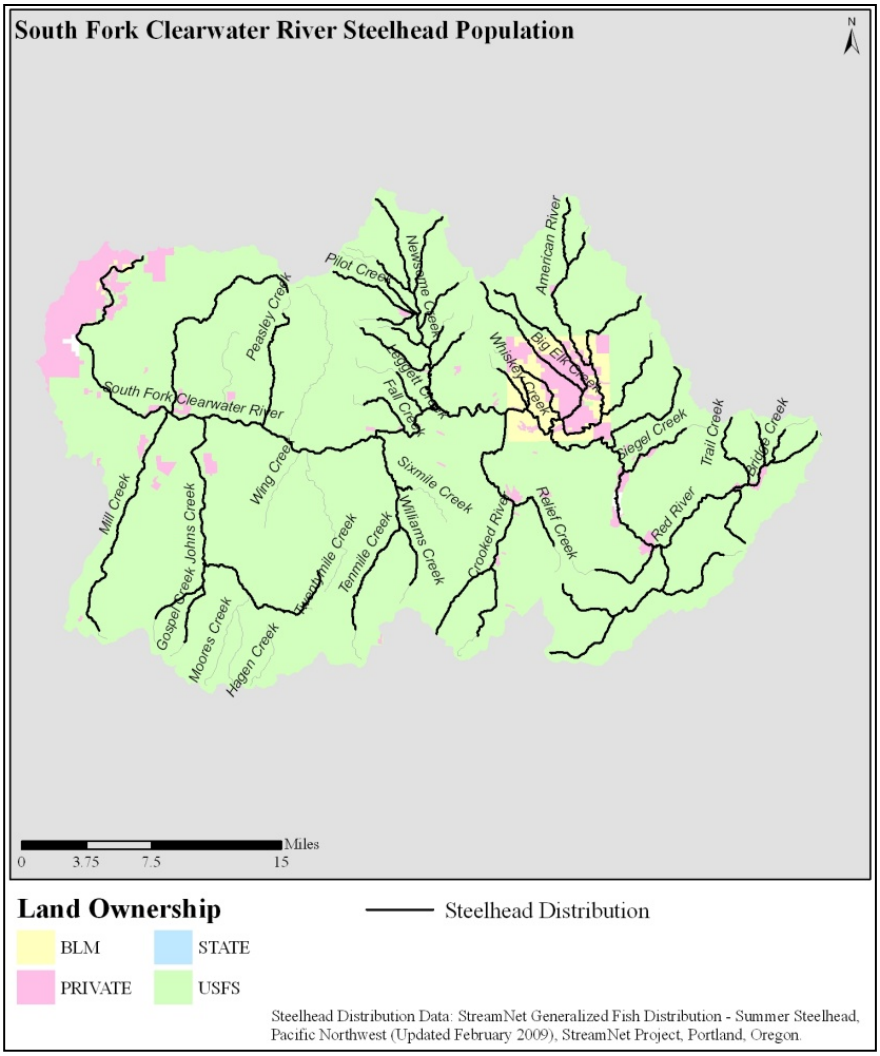
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The South Fork Clearwater River steelhead population includes the South Fork Clearwater River and its tributaries upstream from Mill Creek. Major watersheds within the South Fork Clearwater River include Newsome, Johns, Meadow, and Mill Creeks and American, Crooked, and Red Rivers. Tributaries of the South Fork Clearwater River drain a diverse area of forested mountains, rolling hills, and steep stream and river canyons. The climate varies from hot and dry at lower elevations to more cool and moist mountainous areas.



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.2-11. Land-ownership pattern within the South Fork Clearwater River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Steelhead are distributed throughout most streams of the population, with the most extensive distribution in the tributaries of the upper basin (Figure 6.2-11). The ICTRT identified three major (Upper South Fork, Newsome, and American) and four minor (Meadow, Johns, Tenmile, and Mill) spawning areas. Steelhead habitat quality has been reduced to varying degrees throughout the South Fork Clearwater River population due to alteration of watershed characteristics by human land uses. Newsome Creek, American River, and Red River were described by Ecovista (2003) as having fair-to-good habitat quality.

Land ownership within the population boundaries is primarily U.S. Forest Service (92%) with private, BLM, and state lands making up the remaining 8 percent (Figure 6.2-11). Private land ownership is scattered but most of it occurs along the lower South Fork Clearwater River mainstem, around the town of Elk City in the American River drainage, and along the Red River. BLM lands occur exclusively in the Elk City area along Whiskey Creek, Elk Creek, and American River. Land use in the

South Fork Clearwater River drainage has included mining, logging, livestock grazing, recreation, development, and road construction. Mining was historically a major land use, and the South Fork has the most extensive history of placer mining of any area in the Clearwater River basin. Major tributary systems were dredged, and hydraulic mining was common throughout the South Fork Clearwater River basin. Increased sedimentation, stream channelization, loss of floodplain connectivity and riparian degradation have occurred in areas where mining, logging, and road building has occurred.

Current Habitat Limiting Factors

To determine the habitat limiting factors for the South Fork Clearwater River steelhead population, NMFS reviewed multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, we conclude that the habitat limiting factors for the South Fork Clearwater River steelhead population are riparian conditions, elevated stream temperatures, migration barriers, sediment, and habitat complexity. Table 6.2-28 summarizes (1) the mechanisms by which each limiting factor affects steelhead, and (2) management objectives for addressing each limiting factor. The following section discusses each of the limiting factors, using information from the U.S. Forest Service, IDEQ, and the Clearwater River Subbasin Assessment and Management Plan (USFS 2006; IDEQ 2003; Ecovista 2003).

Table 6.2-28. Primary limiting factors identified for the South Fork Clearwater River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Riparian Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Revegetate riparian areas where vegetation lacks natural characteristics. Protect riparian areas with natural characteristics.
Floodplain Condition and Connectivity	Disconnection of main channels from the floodplain and side channel leads to simplified habitat complexity, and reductions in off-channel habitat during high flows, water storage, and primary production.	Reconnect floodplains and side channels by restoring channel roughness and riparian vegetation, removing or reshaping dredge mine tailings, and restoring the water table to its natural elevation where it has been lowered by artificial drainage features.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature. Restoration of hyporheic flow.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream. Reduction of sediment delivery to streams from roads.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Habitat Complexity	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding and spawning.	Restoration of riparian vegetation to increase LWD recruitment to streams over time. Reconnection of floodplains.

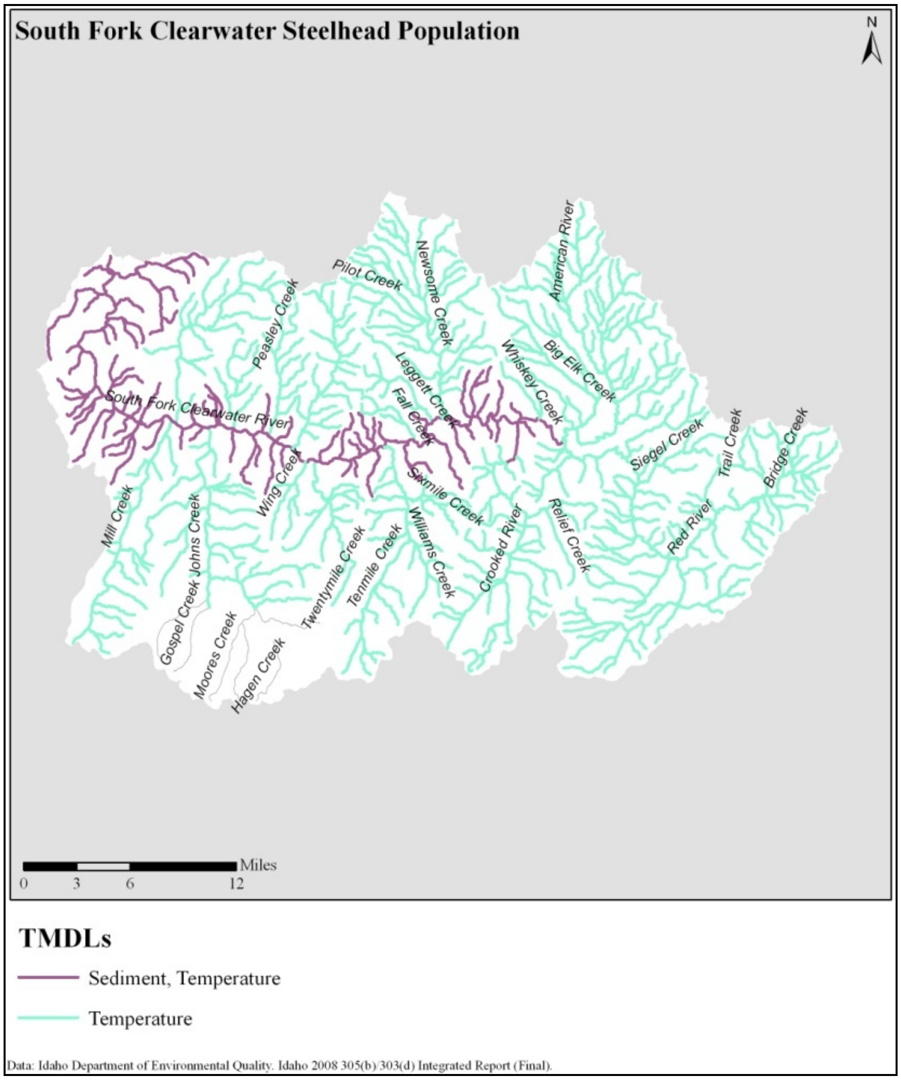
1. *Degraded Riparian and Floodplain Conditions*

Conditions reported for the South Fork Clearwater River steelhead population suggest that degraded riparian and floodplain conditions are reducing population abundance and productivity in many areas. Recognizing the need to improve riparian and floodplain conditions throughout the basin, IDEQ (2003) established shade targets for much of the South Fork Clearwater River. Poor riparian conditions exist throughout the South Fork Clearwater River area from various land use activities (i.e., historic dredge mining, road construction, and grazing). Much of the loss of riparian vegetation stems from streams becoming disconnected from their floodplains, most noticeably from past dredge mining. In some reaches of Newsome Creek, for example, streamside vegetation is limited due to mining spoils (USFS 2002).

A panel of local experts in fisheries and aquatic habitat emphasized the importance of riparian and floodplain habitat restoration in the American River, Red River, Newsome Creek, middle and upper South Fork Clearwater River, and Crooked River watersheds (BOR 2010a). The loss of riparian vegetation has reduced recruitment of large woody debris to stream channels, which has also reduced habitat complexity. Placer and dredge mining have removed riparian vegetation along many miles of stream in the upper South Fork Clearwater River watersheds. Ecovista (2003) rated riparian habitat degradation as one of the most important limiting factors for salmonids in the South Fork Clearwater River. In order for riparian conditions to improve along many streams in the population, these streams will first need to be reconnected to their floodplains.

2. *High Water Temperature*

Conditions reported for the South Fork Clearwater River steelhead population suggest that elevated temperatures are reducing population abundance and productivity.



Data: Idaho Department of Environmental Quality. Idaho 2008 305(b)/303(d) Integrated Report (Final).

Figure 6.2-12. Stream segments in the South Fork Clearwater River steelhead population identified from Section 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009).

Stream temperature was ranked by the Clearwater River Subbasin Assessment as one of the most important limiting factors for steelhead in this population, and elevated temperatures appear to be widespread throughout the watershed (Ecovista 2003, p. 347). Water temperatures are influenced by a variety of natural and anthropogenic factors in the basin. Temperatures throughout the Clearwater River basin are strongly influenced by high summer air temperatures and a shift toward earlier snowmelt. Reductions in shade, channel complexity, and floodplain connectivity contribute to high temperatures in summer. Water temperatures in portions of the South Fork Clearwater basin would naturally exceed the tolerance of anadromous fish if not for the cooling effect of gravel bars, meanders, and pools that facilitate the exchange of surface and hyporheic flows. Salmonids are also dependent hyporheic flows in winter to protect fish from freezing temperatures. Hyporheic exchange has likely been reduced by roads constructed in floodplains, placer mining activities, road drainage networks that intercept ground water, and reduction of large wood recruitment that is crucial for creation of bar, pool, and meander formation. IDEQ established temperature TMDLs for most stream reaches in this population, totaling about 2,221 miles of stream (Figure 6.2-12). Many of the streams evaluated by IDEQ (2003) exceed both the cold-water aquatic life and salmonid spawning criteria (see IDEQ 2003, Appendix J).

IDEQ (2003) recorded elevated stream temperatures all along the mainstem South Fork Clearwater River, as well as in some tributaries, during the summers of 1999 through 2001. Tributary temperatures observed at the mouths of the American and Red Rivers were particularly high, at greater than 72 ºF weekly maximum temperature. These two streams combine to form the headwaters of the South Fork Clearwater River, leading to high stream temperatures in the uppermost reach of the mainstem river. IDEQ (2003) observed that stream temperatures in the mainstem then appeared to decrease slightly as the river travels downstream. This slight drop in temperature indicates that much of the excess heat loading in the upper mainstem is the result of heat loading from the headwater tributaries, likely from both natural and human caused processes. Human-caused heat loading in the American and Red Rivers is largely a result of the loss of shade–producing riparian vegetation caused by grazing, road construction, dredge mining, and timber harvest (IDEQ 2003). Water temperatures are relatively stable moving further down the South Fork Clearwater River mainstem, until a dramatic increase occurs downstream from the population boundaries. Agricultural and other land use activities occurring in the lower South Fork Clearwater River basin have led to very low shade conditions along tributary streams.

In developing temperature TMDLs for the South Fork Clearwater River, IDEQ (2003) established shade targets as surrogates for water temperature. State temperature criteria for salmonids were exceeded at some time in all streams monitored within the basin. Despite extensive mining, logging, grazing, and road building in some parts of the South Fork Clearwater River drainage, many other tributary stream reaches are relatively unimpaired by human land uses. IDEQ (2003) therefore assumed that many streams in the drainage probably exceed the numeric temperature criteria naturally. In place of numeric temperature targets, shade targets were set to restore stream shading to conditions representing minimal human impact. Because the influence of shade on stream temperature is much more significant on smaller streams with smaller water volumes than on larger streams, IDEQ (2003) concluded that management of tributary conditions is the most effective method to reduce stream temperature in the mainstem South Fork Clearwater River. IDEQ set canopy closure targets of 75-90 percent for much of the tributary stream network in the population (IDEQ 2003). Shade improvements are needed across all land use and ownership categories.

3. *Migration Barriers*

Migration barriers have been identified in many of the subwatersheds of the South Fork Clearwater River steelhead population. In subwatershed summaries presented by the Nez Perce-Clearwater National Forest (USFS 2007a), there were numerous known (33) and potential (100) barriers associated with stream-road crossings. Given the extensive road system in the population, many more barriers may exist. Many of the known and potential barriers exist within subwatersheds that are designated as major spawning areas of the South Fork Clearwater steelhead population. Some of these barriers may be upstream from steelhead habitat, but many are likely blocking access to suitable steelhead rearing habitat and possible steelhead spawning habitat. An assessment of potential migration barriers that focuses on steelhead would provide guidance on priorities for restoring connectivity within the population. An expert panel of local biologists concluded that passage barriers were a limiting factor for steelhead in the American River, Red River, Crooked River, Newsome Creek, and Meadow Creek watersheds, as well as in other smaller tributaries to the South Fork Clearwater River (BOR 2010b).

4. Reduced Channel Complexity and Channel Morphology

The quality and complexity of habitat in the South Fork Clearwater River steelhead population have been reduced by channel and floodplain modification and loss of instream woody debris and LWD recruitment potential. The Nez Perce-Clearwater National Forest (USFS 2007a) identified channel modification and reduced levels of large woody debris as risks to salmonid habitat in many subwatersheds of the South Fork Clearwater River. No habitat risks were identified for Upper Johns Creek and Gospel Creek, which are in the Gospel-Hump Wilderness, but habitat problems exist in all other subwatersheds. Table 6.2-29 assigns a qualitative ranking (1 - high risk, 2 - moderate risk, 3 - minor risk) to assess the potential for either channel modification or lack of large woody debris to limit the abundance of different salmonid life stages (rearing, spawning or both). Current or past land uses were identified that contribute to these habitat modifications and to potential native aquatic population declines.

Channel modification and simplification most commonly resulted from historic dredging mining, affecting both rearing and spawning habitat quality. Secondary sources for channel modification were related to roads crossings and streamside roads. Channel modification was ranked mostly as a moderate or high risk to salmonid habitat. Lack of instream woody debris and sufficient sources for woody debris recruitment were identified in many subwatersheds as affecting the quality of rearing habitat and, to some extent, spawning habitat (Table 6.2-29). Lack of woody debris was most often associated with roads and dredge mining although timber harvest was noted as the primary source in the lower Red River subwatershed. Insufficient woody debris was mostly ranked as a moderate or high risk to salmonid habitat.

Table 6.2-29. Subwatersheds in the South Fork Clearwater River population in which degraded habitat quality is a risk to salmonid abundance and production (USFS 2007a). Primary and secondary sources of habitat degradation were identified for different life stages (rearing, spawning, or both).

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank*	Risk	Primary Source	Secondary Source
Elk Creek	Rearing	2	Channel Modification	Dredge Mining	None
		2	Woody Debris	Dredge Mining	Road Crossings
	Spawning	3	Channel Modification	Dredge Mining	Road Crossings
Lower American River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Dredge Mining	Streamside Roads

Subwatersheds (6th-field HUCs)	Life Stage	Risk Rank*	Risk	Primary Source	Secondary Source
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
Lower Crooked River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		1	Woody Debris	Dredge Mining	Streamside Roads
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
Lower Newsome Creek	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		1	Woody Debris	Dredge Mining	Road Crossings
	Spawning	2	Channel Modification	Dredge Mining	Road Crossings
Lower Red River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Timber Harvest	Streamside Roads
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
Meadow Creek	Both	1	Woody Debris	Road Crossings	Streamside Roads
Middle Red River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Dredge Mining	Timber Harvest
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
Mill Creek	Both	2	Woody Debris	Streamside Roads	Road Crossings
South Fork Clearwater River-Grouse Creek	Rearing	2	Channel Modification	Dredge Mining	Road Crossings
	Spawning	3	Channel Modification	Dredge Mining	Road Crossings
South Fork Clearwater River-Leggett Creek	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Dredge Mining	Road Crossings
	Spawning	2	Channel Modification	Dredge Mining	Road Crossings
South Fork Clearwater River-Peasley Creek	Rearing	2	Woody Debris	Streamside Roads	Road Crossings
	Both	2	Channel Modification	Streamside Roads	Road Crossings
		2	Woody Debris	Streamside Roads	Timber Harvest
	Spawning	2	Woody Debris	Streamside Roads	None
Upper American River	Rearing	2	Channel Modification	Grazing	None
		2	Woody Debris	Dredge Mining	Streamside Roads
Upper Crooked River	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		1	Woody Debris	Dredge Mining	Road Crossings
	Spawning	1	Channel Modification	Dredge Mining	Road Crossings
Upper Newsome Creek	Rearing	1	Channel Modification	Dredge Mining	Streamside Roads
		1	Woody Debris	Dredge Mining	Timber Harvest
	Spawning	2	Channel Modification	Dredge Mining	Streamside Roads
		2	Woody Debris	Streamside Roads	Timber Harvest
	Both	2	Channel Modification	Streamside Roads	Road Crossings

*1 - high risk, 2 - moderate risk, 3 - minor risk

A panel of local experts in fisheries and aquatic habitat, convened for the 2008 FCRPS biological opinion, noted habitat quality concerns within the South Fork Clearwater River population. For the American River, Red River, Crooked River, and Newsome Creek watersheds, the panel identified reduced habitat complexity, loss of pools or reduction in pool depth, and loss of riparian vegetation as limiting factors for steelhead (BOR 2010a). Based on BURP data, IDEQ (2003) found that most streams were wider and shallower than optimal for salmonid habitat.

Mitigation efforts to remove and stabilize mine tailings, glory holes, and waste rock deposited in the stream channel and floodplains, along with stream channel rehabilitation, have shown improvement in stream channel and habitat quality in some reaches of the Crooked and Red Rivers (Siddall 1992). Significant mining impacts remain in these streams.

5. *Excess Sediment*

Conditions reported for the South Fork Clearwater River steelhead population suggest that sediment is reducing population abundance and productivity. Elevated sediment levels are a widespread concern for this population, and ranked by the Clearwater River Subbasin Assessment as one of the most important limiting factors for South Fork Clearwater River steelhead (Ecovista 2003, p. 347).

The Nez Perce-Clearwater National Forest (USFS 2007a) identified excess sediment as a risk to salmonid spawning and rearing in many subwatersheds of the South Fork Clearwater River (Table 6.2-30). Table 6.2-30 ranks the potential for sediment to limit the abundance of spawning or rearing salmonids in each subwatershed (1 - high risk, 2 - moderate risk, 3 - minor risk). Primary and sometimes secondary sources of sediment were identified. These sediment sources contribute to aquatic habitat modifications or population declines for aquatic species. Excess sediment was indicated as a high or moderate risk in most subwatersheds, with sediment concerns distributed throughout much of the major spawning areas. The primary sources of sediment for most subwatersheds were road crossings and streamside roads. In addition to roads, secondary sources of sediment also included grazing, timber harvest, woodland fire, and historic dredge mining. Both dredge mining and hydraulic mining have influenced sediment dynamics in the South Fork Clearwater River drainage. From 1900 into the 1940s, hydraulic mining resulted in 20 to 30 large open pits throughout the South Fork Clearwater River drainage. The pits can be over 15 acres in size and contribute thousands of tons of sediment to the South Fork Clearwater River system each year.

Table 6.2-30. Subwatersheds in the South Fork Clearwater River in which sediment is a risk to salmonid abundance and production (USFS 2007a). Primary and secondary sources of excess sediment were identified for the habitat for different salmonid life stages (rearing, spawning, or both).

HUC6-Subwatersheds	Life Stage	Risk Rank*	Primary Sources of Sediment	Secondary Sources of Sediment
Lower Red River	Both	1	Road Crossings	Streamside Roads
Middle Red River	Both	1	Road Crossings	Streamside Roads
South Fork Red River	Both	1	Road Crossings	Timber Harvest
Upper Red River	Rearing	2	Facilities	None
		1	Road Crossings	Streamside Roads; Timber Harvest
	Spawning	1	Road Crossings	Timber Harvest
East Fork American River	Both	1	Road Crossings	Streamside Roads
Elk Creek	Both	1	Road Crossings	Dredge Mining
Lower American River	Both	1	Road Crossings	Grazing
Upper American River	Rearing	1	Road Crossings	Streamside Roads
	Spawning	1	Road Crossings	Grazing
Silver Creek	Both	3	Road Crossings	None
South Fork Clearwater River-Leggett Creek	Both	1	Road Crossings	Streamside Roads
South Fork Clearwater River-Peasley Creek	Rearing	2	Streamside Roads	Road Crossings
	Spawning	2	Streamside Roads	Road Crossings
South Fork Clearwater River-Wing Creek	Both	3	Road Crossings	Streamside Roads
Tenmile Creek	Both	3	Road Crossings	None
Twentymile Creek	Both	3	Road Crossings	None
Lower Crooked River	Both	1	Streamside Roads; Timber Harvest	Road Crossings; Dredge Mining
Upper Crooked River	Rearing	2	Road Crossings	Streamside Roads
	Spawning	2	Road Crossings	Dredge Mining
Lower Newsome Creek	Both	1	Streamside Roads	Road Crossings
Upper Newsome Creek	Both	1	Road Crossings; Streamside Roads	Dredge Mining; Grazing
Lower Johns Creek	Both	2	Streamside Roads	Road Crossings
Meadow Creek	Both	1	Streamside Roads	Grazing
Mill Creek	Both	2	Road Crossings	Streamside Roads
South Fork Clearwater River-Grouse Creek	Rearing	2	Road Crossings	Dredge Mining
	Spawning	3	Road Crossings	Dredge Mining
South Fork Clearwater River-Lightning Creek	Both	2	Streamside Roads	Road Crossings

*1 - high risk, 2 - moderate risk, 3 - minor risk

Sediment concerns are widespread throughout the population. Roughly 336 miles of stream in the South Fork Clearwater River have TMDLs for sediment; however, the TMDLs for sediment closely reflect streams where sediment is a limiting factor for steelhead. Sediment is a more widespread problem for steelhead than is reflected by the TMDLs.

The South Fork Clearwater Watershed Advisory Group (2006) concluded that sediment reductions needed to achieve the TMDL allocations would likely come from stream bank erosion control and road maintenance. Other sediment-reducing measures may be more appropriate than bank erosion control. Bank erosion is often a symptom of channel or floodplain alterations. Where bank erosion is caused by floodplain or stream channel alterations, further bank stabilization can exacerbate the problem. The FCRPS expert panel indicated road decommissioning and road improvements throughout the population as a way to reduce chronic sediment delivery to streams. Sediment will also need to be addressed in many of the subwatersheds listed above in Table 6.2-30. In Newsome Creek, for example, existing roads result in continually elevated sediment yields throughout most subwatersheds (USFS 2002).

Potential Habitat Limiting Factors and Threats

Two habitat concerns have not yet risen to the level of a limiting factor for the population, but may have local effects that need to be managed to protect habitat in the South Fork Clearwater River watershed.

1. Mineral exploration and development - Without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters.
2. Spread of invasive weeds. Invasive weeds are present in many parts of the population, and their spread could increase soil erosion and negatively affect native grasses, shrubs, and tree assemblages in riparian areas.

Hatchery Programs

Hatchery releases continue to occur in the South Fork Clearwater River steelhead population area. The hatchery program for the South Fork Clearwater River is one of two large hatchery programs within the Clearwater River steelhead MPG, with the other large program for the North Fork Clearwater River. Together, these two large hatchery programs and a smaller program for Lolo Creek release almost three million fish annually. Approximately 42 percent of the hatchery releases occur in the South Fork Clearwater River. The steelhead hatchery programs are based on the North Fork Clearwater B-run stock that was trapped at the base of Dworshak Dam when the dam was constructed on the North Fork Clearwater River in 1969. The Clearwater Fish Hatchery is transitioning to a local isolated broodstock collected by angling in the South Fork Clearwater River but shortfalls may be filled by supplies of fertilized eggs from Dworshak NFH. Fish from Clearwater Hatchery are released in the South Fork Clearwater River (including Meadow and Newcome Creeks) for fishery mitigation, and to support an experimental attempt to reestablish a natural spawning population in an area that had been blocked by dams in the last century. Earlier artificial production efforts by IDFG began in the early 1960s, outplanting adult steelhead trapped at Lewiston Dam (and eyed-eggs from adults collected at the dam) into the South Fork Clearwater River drainage.

The use of out-of-population broodstock presents a threat to the South Fork Clearwater River natural-origin steelhead population. Transitioning to in-population collections may ameliorate this threat. Other hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, weir operation, and a high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, demographic changes, life history changes, and competition between hatchery- and natural-origin fish for space and food. Hatchery-related limiting factors and threats for South Fork Clearwater River steelhead are further discussed at the MPG level in Section 6.2.3.2.

Fishery Management

The South Fork Clearwater River supports B-run steelhead. Most harvest-related mortality for steelhead returning to the Clearwater MPG occurs on the mainstem Columbia River in fisheries directed at fall Chinook salmon. In recent years, total exploitation rates on B-run steelhead have generally been in the range of 15 to 20 percent (Ford 2011). Clearwater B-run steelhead experience higher harvest rates than the A-run steelhead because of their later run timing and larger size. While harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Section 6.2.3.3 provides more detail on fishery-related limiting factors and threats for Clearwater River steelhead populations.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

First priority stream reaches for habitat restoration are those with intrinsic potential steelhead habitat in the Crooked River, Newsome Creek, Red River, American River, and Elk Creek watersheds, which comprise the population’s major spawning areas (see Figure 6.2-10). These watersheds contain nearly 85 percent of the modeled intrinsic habitat potential for the population. The second tier of priority stream reaches for restoration efforts are tributaries in the population’s minor spawning areas: Meadow, Tenmile, Mill, and Johns Creeks (habitat in Johns Creek is in excellent condition and may not require recovery actions). The third priority for habitat restoration efforts is the South Fork Clearwater River mainstem. The South Fork Clearwater River mainstem provides important spawning, rearing, and migration habitat for the population. However, improvements in sediment and temperature conditions, which are limiting the quality of the mainstem habitat, will most likely come from habitat restoration in tributaries. State Highway 14 runs the length of the South Fork mainstem, limiting restoration of natural riparian conditions along one side of the river. Several opportunities exist along Highway12 to reclaim legacy mine tailings or restore floodplain access.

Habitat Actions

Habitat in relatively good condition, such as the Johns Creek watershed, should continue to be protected. Habitat in many other parts of the population, particularly the steelhead major spawning areas in the upper watershed, will require recovery actions. The following habitat actions, ranked by priority, are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed.

1. Improve riparian conditions throughout the population in order to increase shade and thereby reduce summer stream temperatures, and in order to reduce sediment delivery to streams.

Manage livestock to minimize impacts to riparian vegetation and streambanks. Reestablishing riparian vegetation will also lead to increased large wood recruitment to streams, over the long-term.

2. Eliminate known artificial fish migration barriers blocking steelhead access to potential habitat, mainly at road stream-crossings. Inventory road crossings throughout the population to identify additional steelhead migration barriers.
3. Restore stream channels and floodplain function in reaches impacted by historic dredge mining and other land uses in the Newsome, Crooked, American, and Red River watersheds. Many of these stream reaches have straightened channels, infrequent pools, inadequate pool depth, inadequate riparian vegetation, and reduced habitat complexity, including lack of cover (BOR 2010b). Projects may include restoring natural floodplain meander patterns by reconnecting historic meanders or reconstructing stream channels.
4. Mitigate chronic sediment sources from roads and mining. Controlling sources of sediment from roads may require road realignment, closure, or obliteration; or erosion control measures at stream crossings and other road improvements. Reducing sediment from historic mine sites may require the removal or stabilization of mine tailings and waste rock deposited in the stream channel and floodplains.
5. Restore mechanisms that facilitate exchange of surface and hyporheic flows. Remove unnecessary bank stabilization structures to allow natural channel migration, reconnect floodplains to recharge hyporheic flows, and increase channel roughness and complexity with natural wood recruitment or artificial structures to facilitate bar and pool formation.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the work of the Nez Perce-Clearwater National Forest, the Nez Perce Tribe, IDFG, IDEQ, the Idaho County Soil and Water Conservation District, BLM, and private landowners, among other interested parties. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the population. These groups have a record of implementing salmonid habitat conservation projects in this drainage and in other areas within the state.

Many habitat restoration projects have already been completed in the South Fork Clearwater River drainage. Some projects date back to the 1980s (Siddall 1992). IDEQ (2003) provides a detailed list of past projects included fencing, riparian and stream bank restoration, grazing management plans, sediment control measures, road management (decommission, stabilization, closure), and trail restoration improvements. The Nez Perce-Clearwater National Forest, the Nez Perce Tribe, Idaho County Soil and Conservation District, IDFG, and others have been involved in multi-year projects to restore stream channels heavily impacted by dredge-mining. Projects implemented to improve habitat conditions include stream crossing barrier removal and replacement, riparian vegetation planting, riparian and wetland fencing, road decommissioning and improvement, stream structure enhancement, stream and floodplain restoration, and acquisition of land and conservation easements. Future efforts will build on these accomplishments.

Table 6.2-31 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.2-31. Habitat Recovery Actions Identified for the South Fork Clearwater River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Passage	Address 23 barriers (culverts)	BPA Contract # 1996-077-05: Meadow Creek Watershed Restoration BPA Contract # 2000-035-00: Newsome Creek Watershed Restoration BPA Contract # 2000-036-00: Mill Creek Watershed Restoration BPA Contract # 2002-072-00: Red River Watershed Restoration BPA Contract # 2007-134-00: Restore and Protect Crooked River Watershed BPA Contract # 2007-142-00: Restore and Protect American River Watershed	N/A
Habitat Complexity	Improve 8.1 instream miles		
Riparian and Floodplain Conditions/Water Quality (Sediment, Temperature)	Improve 15 riparian miles Improve 276.5 riparian acres Improve 38 wetland acres Improve 179.6 road miles		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Clearwater River steelhead MPG is to promote recovery by reducing the fitness and diversity risks that the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the South Fork Clearwater River population is to reduce ecological and genetic risk associated with hatchery programs through use of acclimated releases, local broodstock, and selection of release sites. Specific direction will be developed through the HGMP process. The strategy also calls for monitoring of stray rates and sources, and actions to reduce straying where needed. Section 6.2.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The fisheries strategy is to continue to control harvest-related impacts through the abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.2.4.2 provides more information in the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest and other MPG actions alone will not produce the increases in survival needed for the Clearwater River steelhead MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3 Salmon River MPG

The Salmon River MPG consists of steelhead returning to the Salmon River basin. The MPG supports 12 independent populations (ICTRT 2003) and all are considered extant (Figure 6.3-1, Table 6.3-1). Eight of the populations are classified as supporting only A-run steelhead and four are classified as supporting both A-run and B-run steelhead, with either a moderate (15-40%) or high (>40%) B-run steelhead component (NWFSC 2015). The populations are designated as Basic (minimum abundance threshold of 500) or Intermediate (minimum abundance threshold of 1,000) based on intrinsic potential habitat. Characteristics of the populations as defined by the ICTRT are listed in Table 6.3-1.

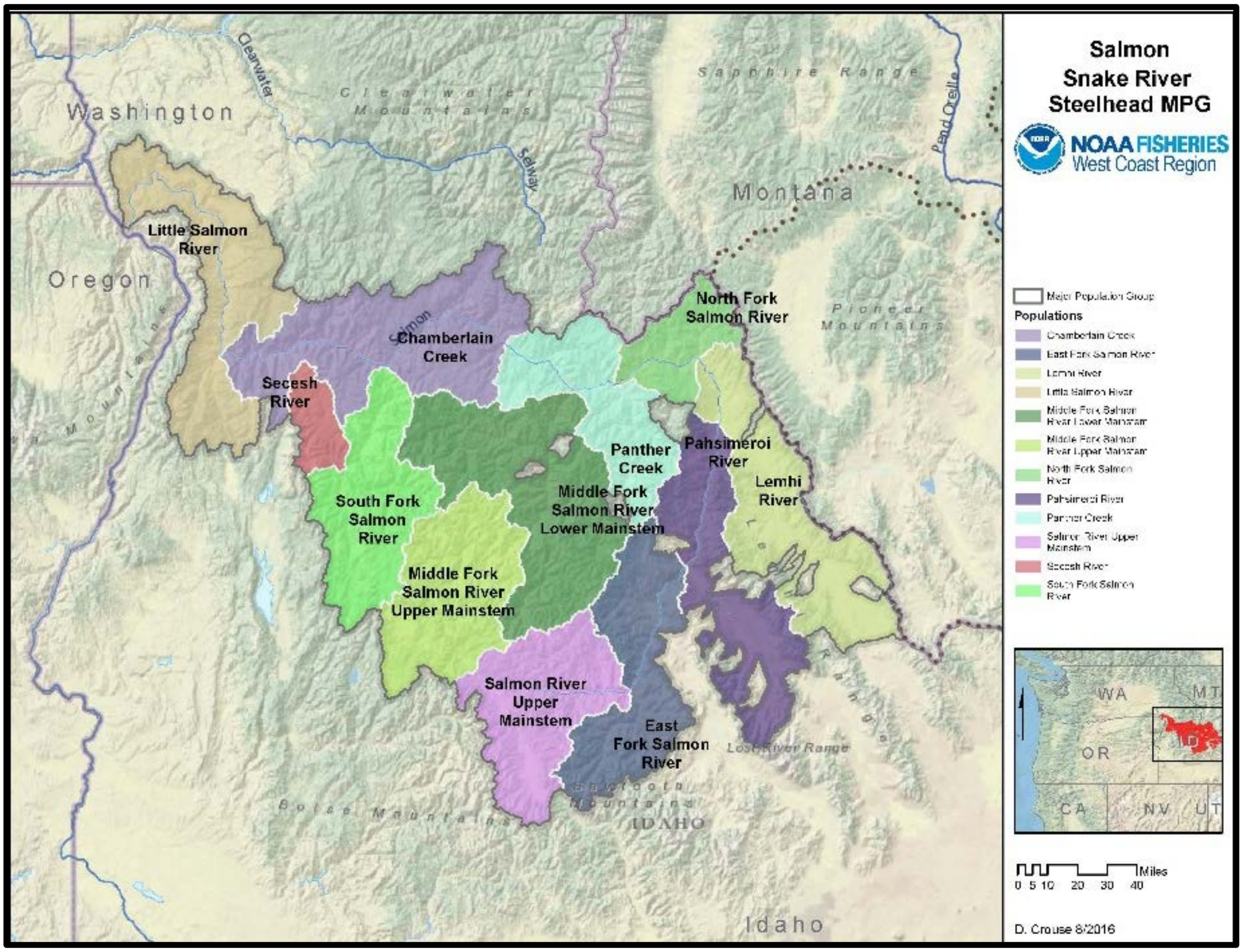


Figure 6.3-1. Salmon River steelhead MPG and populations.

Table 6.3-1. Salmon River steelhead MPG population characteristics. Minimum abundance and productivity values represent levels needed to achieve a 95% probability of existence over 100 years (ICTRT 2007b).

Population	Dominant Life History[1]	Size[2]	Minimum Abundance Threshold[2]	Minimum Productivity Threshold
Little Salmon R.	A-Run	Basic	500	1.27
South Fork Salmon R.	High B-Run	Intermediate	1,000	1.14
Secesh R.	High B-Run	Basic	500	1.27
Chamberlain Creek	A-Run	Basic	500	1.27
Lo. Middle Fork Salmon R.	Mod. B-Run	Intermediate	1,000	1.14
Up. Middle Fork Salmon R.	Mod. B-Run	Intermediate	1,000	1.14
Panther Creek	A-Run	Basic	500	1.27
North Fork Salmon R.	A-Run	Basic	500	1.27
Lemhi R.	A-Run	Intermediate	1,000	1.14
Pahsimeroi R.	A-Run	Intermediate	1,000	1.14
East Fork Salmon R.	A-Run	Intermediate	1,000	1.14
Upper Main. Salmon R.	A-Run	Intermediate	1,000	1.14

[1] B-run population category designations reflect relative contribution of fish exceeding B-run size threshold (High >40%, Moderate 15-40%, Low <15%) (NWFSC 2015).

[2] Population size categories and minimum abundance thresholds: Basic – 500 spawners; Intermediate – 1,000 spawners.

6.3.1 Viable MPG Scenarios

The ICTRT incorporated the viability criteria (ICTRT 2007a) into viable recovery scenarios for each MPG. The criteria, which are explained in detail in Chapter 3, Recovery Goal and Delisting Criteria, should be met for a MPG to be considered viable, or low risk, and thus contribute to the larger objective of species' viability. These criteria are:

1. At least one-half the populations historically present (minimum of two populations) should meet viability criteria (5% or less risk of extinction over 100 years).
2. At least one population should be highly viable (less than 1% risk).
3. Viable populations within a MPG should include some populations classified as "Very Large'" or "Large," and "Intermediate" reflecting proportions historically present.
4. All major life history strategies historically present should be represented among the populations that meet viability criteria.
5. Remaining populations within an MPG should be maintained (less than 25% risk) with sufficient abundance, productivity, spatial structure, and diversity to provide for ecological functions and to preserve options for species' recovery.

The criteria suggest several viable MPG scenarios for the Salmon River MPG:

- Since there are 12 steelhead populations in the Salmon River MPG, at least six must be Viable (low risk) for the MPG to be viable. One of these populations must achieve Highly Viable (very low risk) status
- At least four of the six viable populations must be Intermediate size.
- At least two of the six viable populations need to be B-run populations so that all major life histories are represented. Also, because the geographic area of this MPG is so large, it is important that spatial distribution of the viable populations be considered.
- All remaining populations should at least achieve maintained status.

6.3.2 Current MPG Status

The NWFSC (2015) and ICTRT (2008) used the viability criteria to determine the current status of the MPG. In the most recently biological status review, the NWFSC (2015) completed status assessments for all populations in the MPG, which together determine status at the MPG level. A population's current status is the cumulative risk resulting from the population's abundance, productivity, spatial structure, and diversity risks. This section summarizes these assessment results. Sections 6.3.5 through 6.3.16 provide more detailed discussions for each independent population.

Currently, the Salmon River steelhead MPG does not meet the MPG-level viability criteria. One population (Panther Creek) remains at high risk of extinction within 100 years and the remaining 11 populations in the MPG are presently at moderate risk of extinction, primarily due to moderate or high abundance/productivity risk. (Table 6.3-2). As discussed in Section 6.3.1, at least six of the MPG's twelve populations must be viable and one must be highly viable for the MPG to meet the viability criteria.

Table 6.3-2. Viable Salmonid Population (VSP) risk matrix for independent populations in the Salmon River steelhead MPG with current status, as determined from ICTRT population viability assessments.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	VL	VL	L	M
	Low (1-5%)	L	L	L	M
	Moderate (6 – 25%)	M	M SF Salmon R. Secesh R. Chamberlain Lo. MF Salmon R. U. MF Salmon R.	M Little Salmon North Fork Lemhi Pahsimeroi East Fork Upper Main.	HR Panther
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

The assessment of abundance/productivity risk for steelhead populations is problematic because of the lack of population-level abundance data for most populations. NWFSC conducted its 2015 status assessment for the populations using information from a sampling program at Lower Granite Dam that allows estimation of abundance for 10 different steelhead stock groups based on genetic stock identification of returning adults. As part of the Integrated Status and Effectiveness Monitoring Project, the Shoshone-Bannock Tribes, Nez Perce Tribe, and IDFG are coordinating the installation of PIT-tag arrays at the mouths of major rivers. Data from the PIT-tag arrays will help generate population-specific estimates of adult steelhead returns. Abundance/productivity assessments in this Plan will be updated as this population-specific information becomes available.

6.3.3 MPG Limiting Factors and Threats

Many limiting factors and threats affect the viability of Idaho’s Snake River Basin steelhead during their complex, wide-ranging life cycle. NMFS defines limiting factors as the biological and physical conditions that limit a species’ viability (e.g., high water temperature) and threats as those human activities or natural processes that cause the limiting factors. While the term ‘threats’ may carry a negative connotation, these are often legitimate and necessary human activities that may at times have unintended negative consequences on fish populations. Adjusting such activities can often minimize or eliminate the negative impacts.

Discussions for individual Salmon River steelhead MPG populations in Sections 6.3.5 through 6.3.16 describe local-level limiting factors and threats, which generally occur in a population area and are specific to a population. Chapter 4 summarizes the generally downstream, or regional-level factors that influence all Idaho Snake River Basin steelhead populations. These factors usually apply to all Idaho Snake River Basin steelhead MPGs and populations in a similar manner because they affect the populations in the mainstem Snake and Columbia Rivers, the estuary, and the ocean. The section also discusses impacts from climate change. Section 6.1 summarizes factors across all Idaho Snake River Basin steelhead populations.

6.3.3.1 Natal Habitat Alteration

Good to excellent steelhead habitat conditions exist in most sections of this MPG that are included in the Frank Church ─ River Of No Return Wilderness. The wilderness area covers most of the Upper Middle Fork Salmon River, Lower Middle Fork Salmon River, and Chamberlin Creek population areas, and parts of the South Fork Salmon River and Panther Creek population areas. Other habitat in these population areas also lies primarily under U.S. Forest Service management. The remaining steelhead populations in this MPG contain a mix of public and private lands. While all the population areas continue to contain some high quality steelhead habitat, habitat degradation in many reaches has resulted from mining, agricultural use, livestock grazing, timber harvest, recreational use and road development associated with these uses. These land uses have reduced riparian function and floodplain connectivity, increased sediment loading, reduced summer base flows and disconnected tributaries from mainstream rivers, elevated summer water temperatures, and reduced instream habitat quality complexity in some areas. Presently, many degraded areas are on an improving trend due to ongoing habitat restoration efforts. Passage barriers continue to restrict steelhead passage to historical habitat in each population area. In several population areas, unscreened irrigation diversions entrain juvenile steelhead into irrigation canals where they become trapped. Table 6-3.3 identifies the primary habitat-related limiting factors in the different population areas. Sections 6.3.5 through 6.3.16 discuss the population-level limiting factors and threats in more detail.

Table 6.3-3. Primary habitat-related limiting factors in Salmon River Steelhead MPG.

Population	Primary Habitat-related Limiting Factors								
	Riparian Condition	Excess Sediment	Passage Barriers	Summer Flow	High Water Temperature	Instream Complexity	Floodplain Function	Entrainment	Toxics (metals)
Little Salmon R.	√	√	√	√	√	√			
South Fork Salmon R.	√	√	√						
Secesh R.		√	√						
Chamberlain Creek	√	√	√		√	√			
Lower MF Salmon R	√	√	√						
Upper MF Salmon R.		√							
Panther Creek	√	√	√	√	√			√	√
North Fork Salmon R.	√		√	√		√	√	√	
Lemhi R.	√	√	√	√	√	√	√	√	
Pahsimeroi R.	√	√	√	√	√	√		√	
East Fork Salmon R.	√	√	√	√	√	√	√	√	
Upper Main Salmon R.	√	√	√	√	√	√	√	√	

6.3.3.2 Hatchery Programs

Hatchery releases occur in four of the twelve steelhead populations in the Salmon River MPG: Upper Mainstem Salmon River, Little Salmon River, East Fork Salmon River, and Pahsimeroi River. Hatchery programs within this MPG currently release approximately three million fish annually. Approximately 40 percent of these fish releases occur in one population area, the Upper Mainstem Salmon River population.

Most hatchery programs in this MPG are isolated harvest programs designed to meet mitigation and treaty/trust harvest obligations. A small percentage of hatchery steelhead are being integrated with the natural population in the East Fork Salmon River for supplementation purposes (Table 6.1-2). Numbers of fish to be released and release locations are determined through *U.S. v. Oregon* negotiations. Target annual release numbers for brood years 2006-2008 at all locations in the Salmon River drainage totaled 730,000 smolts, of which 530,000 fish were not adipose-clipped. Approximately one million steelhead eyed-eggs are outplanted annually in addition to the supplementation smolt releases. The Secesh River and the South Fork Salmon River populations, the two Middle Fork Salmon River populations, and the Chamberlain Creek population have no history of hatchery steelhead releases and are managed for natural-origin production.

Hatchery and Genetics Management Plans for the hatchery programs describe program operations and actions taken to support recovery and minimize ecological or genetic impacts, such as straying and other forms of competition with naturally produced fish. The FCRPS Biological Opinion (NMFS 2008a) requires the hatchery operators and the action agencies to provide NMFS with updated HGMPs describing site-specific applications of the “best management practices" for the hatchery programs as described in Appendices C and D of the Supplemental Comprehensive Analysis of the FCRPS (NMFS 2008b) for those mitigation hatchery programs funded by the FCRPS action agencies. The HGMPs are the basis for NMFS' biological opinions on hatchery programs under ESA sections 7 and 10 and the 4(d) rule, which all relate to incidental and direct take of listed species.

Summary of Hatchery-Related Limiting Factors and Threats

The large number of hatchery fish released in the MPG relative to the likely size of natural production poses risks to the populations they influence. However, several hatchery practices in the MPG pose additional risk. The most prominent:

1. The use of B-run[3] steelhead in areas where they are not native. The history of B-run steelhead in the upper Salmon River is unknown. Approximately one million of the hatchery fish currently released into the basin are B-run, and these are released only into naturally A-run populations. Traditionally these B-run releases were from an out-of-MPG source (Dworshak National Fish Hatchery), and released unacclimated into mainstem areas. The B-run hatchery steelhead that escape fisheries and interbreed with natural-origin fish on spawning grounds in the MPG decrease among-population life history diversity, as well as among-MPG diversity.
2. Mainstem releases of nonacclimated fish. Unacclimated fish have little time to imprint, and if released into mainstem rather than tributary areas, what imprinting that occurs will be imprecise. Therefore, the fish are more likely to stray to other areas. Since 2017, however, all steelhead mainstem releases have been discontinued. Hatchery steelhead releases occur only in tributaries, most associated with weirs, or at the Upper Salmon River weir at the Sawtooth Fish Hatchery.

The risk posed by natural spawning of returning hatchery fish is currently impossible to quantify because of a poor understanding of current population sizes. It has been estimated that, overall, less than 10 percent of the returning hatchery fish stray, but in receiving populations hatchery strays could be a substantial portion of the natural spawners.

Historic and current limiting factors and threats that affect the natural populations within this MPG are found in Table 6.3-4 below.

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[3] At the time that the ICTRT developed the viability criteria and initial DPS status assessments (2007a) it was assumed that the A-run and B-run distinction carried over to the population level. New research on Snake River Basin steelhead indicates that some populations support A-run and B-run types. NMFS recently updated the Snake River Basin steelhead population life history designations based on initial results from genetic stock identification studies of natural-origin returns. Using this new information, they designated the steelhead populations as either A-run or B-run based on length (less or more than 78 cm), but further assigned the B-run populations to different categories reflecting mixtures of A-run and B-run steelhead.

Table 6.3-4. Salmon River Basin Steelhead MPG hatchery programs, limiting factors and threats, and recovery strategies.

Population	Summary/Description	Current		Hatchery Influence		Hatchery Effects on Population Viability (+ denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability)	Recovery Strategy
		Limiting factors	Threats	Current	Historical		
Little Salmon River	Excluding the Rapid River tributary, the Little Salmon drainage has received large numbers of juvenile hatchery steelhead from the Salmon, Snake, and Clearwater drainages. Hatchery fish, classified as A-run based on size, ocean age, and timing characteristics have been introduced from Oxbow, Pahsimeroi, and Sawtooth hatcheries. Hatchery B-run steelhead stocked in the Little Salmon drainage are progeny of adult steelhead collected at Dworshak National Fish Hatchery on the North Fork of the Clearwater River. Steelhead supplementation does not occur in Rapid River, and natural production maintains the run. The Rapid River steelhead run is classified for wild fish management.	Competition for food and space; Reduced genetic adaptiveness; Demographic Changes Life History Changes	Incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish; Continued use of out-of-MPG broodstock; Operation of weir; high pHOS and low pNOB*	Smolt releases	?	Legacy effects of out-of-population broodstock. + maintaining natural production upstream of the weir on the Rapid River. - Straying of fish into natural production areas could reduce long-term productivity.	Manage for natural production in Rapid River upstream of weir; Monitor for strays.
South Fork Salmon River	Steelhead hatchery fish are not released in these watersheds. Strays from other hatchery programs are not known to be a problem with these populations.	None	None	None	?	No effect	Continue to manage for natural production without hatchery releases; Monitor for strays.
Secesh River		None	None	None	?		
Lower Middle Fork Salmon River		None	None	None	?		
Upper Middle Fork Salmon River		None	None	None	?		
Chamberlain Creek		None	None	None	?		
Panther Creek		None	None	None	?		
North Fork Salmon River		None	None	None	?		
Lemhi River	Fish are not currently released directly into the Lemhi River, but Salmon River releases occur below the Lemhi River.	None	None	None	Yes, but specifics unknown	No effect	Manage for natural production; Monitor for strays.
Pahsimeroi River	Initiated from wild steelhead collected and transplanted from the middle Snake River beginning in 1966. These fish were collected at Hells Canyon Dam and originally inhabited waters of the upper Snake such as the Weiser and Powder rivers. In 1974, managers released Clearwater River B-run steelhead smolts from Dworshak National Fish Hatchery into the Pahsimeroi River. Stocking of B-run progeny into the Pahsimeroi River was discontinued in 1983. Natural production has been maintained by releasing Steelhead adults were released or outplanted above the weir for natural production most years since 1969. A policy of releasing at least l/3 of the steelhead run above the weir was implemented in the early	Competition for food and space; Reduced genetic adaptiveness; Demographic Changes Life History Changes	Incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish; Continued use of out-of-MPG broodstock; Operation of weir; high pHOS and low pNOB	Smolt releases	Releases since mid-1960s	Legacy effects from previous broodstock and other practices are likely still affecting this population. + maintaining natural-origin fish upstream of weir.	Use mix, as appropriate of acclimated release, local broodstock, selection of release sites to minimize risk. Developed through HGMP process, including use of best management practices.

Population	Summary/Description	Current		Hatchery Influence		Hatchery Effects on Population Viability (+ denotes a Beneficial Effect and – Denotes a Risk or Threat to Viability)	Recovery Strategy
		Limiting factors	Threats	Current	Historical		
	1980's. Since 1988, all steelhead released above the weir for natural production have been of natural origin.						
East Fork Salmon River	Between the late 1970s and the late 1990s, the IDFG released Dworshak-origin, B-run steelhead in the East Fork Salmon River (at the satellite weir). In the late 1990s, the IDFG discontinued this program. The B-run steelhead program was maintained but relocated to within a few hundred yards of the mouth of the East Fork. In 2001, the IDFG initiated an integrated steelhead conservation program in the East Fork Salmon River. There are three hatchery programs that may affect the East Fork Salmon River steelhead population. Two are segregated harvest programs while one uses returns to the weir on East Fork and integrates natural-origin returns into the broodstock.	Competition for food and space; Reduced genetic adaptiveness; Demographic Changes Life History Changes; weir location.	Incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish; Continued use of out-of-basin and MPG broodstock; Operation of weir; high pHOS and low pNOB	Smolt releases	Release since at least the early 1970s	+ Integrated program uses local broodstock. - continued use of out-of-population broodstock for isolated programs. Low pNOB, high pHOS could reduce genetic adaptiveness.	Developed through HGMP process.
Upper Mainstem Salmon River	The Sawtooth FH steelhead broodstock was originally derived from a mixture of indigenous wild steelhead and returns from Pahsimeroi Hatchery A-run steelhead. The Pahsimeroi Hatchery steelhead broodstock was originally transplanted from the Snake River. Currently, naturally produced steelhead are not included in the hatchery broodstock. Upper Salmon A-run steelhead from Sawtooth and Pahsimeroi hatcheries are released in four areas of the upper Salmon River. Broodstock are collected at both Sawtooth and Pahsimeroi hatcheries and no natural-origin returns are used for broodstock in these programs.	Competition for food and space; Reduced genetic adaptiveness; Demographic Changes Life History Changes	Incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish; Continued use of out-of-basin and MPG broodstock; Operation of weir; high pHOS and low pNOB	Smolt releases	Releases since mid-1960s	- continued use of out-of-population broodstock. High pHOS in some areas. Use of B-run steelhead that may not have been native to area.	Monitor for strays; Use mix, as appropriate of acclimated release, local broodstock, selection of release sites to minimize risk. Developed through HGMP process.

* Proportion of hatchery-origin spawners (pHOS); proportion of natural-origin broodstock (pNOB).

6.3.3.3 Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia River, Snake River, Salmon River and tributary reaches continue to pose a threat to the abundance, productivity and diversity of the Salmon River steelhead MPG. The Salmon River steelhead MPG supports eight A-run steelhead populations (Little Salmon River, Chamberlain Creek, Panther Creek, North Fork Salmon River, Lemhi River, Pahsimeroi River, East Fork Salmon River and Upper Mainstem Salmon River) and four steelhead populations supporting both A-run and B-run steelhead (South Fork Salmon River, Secesh River, Lower Middle Fork Salmon River, and Upper Middle Fork Salmon River). Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead populations; however, the ICTRT has determined that no phenotypic traits appear to be at substantial risk because of harvest activities (ICTRT 2010).

Mainstem Columbia and Snake River Fisheries

Most harvest-related mortality for steelhead returning to the Salmon River MPG occurs in the mainstem Columbia River from the mouth upstream to McNary Dam during fisheries targeting fall Chinook salmon, including tribal gillnet and dip net fisheries. Salmon River B-run steelhead experience higher harvest rates than the A-run steelhead because they are larger and more susceptible to catch in the gillnet gear, and because their timing coincides with the return of fall Chinook salmon. In recent years, total exploitation rates on A-run steelhead have been stable at around 5 percent, while exploitation rates on B-run steelhead have generally been in the range of 15 to 20 percent (Ford 2011).

As discussed in Chapter 4, mainstem Columbia River fisheries targeting Snake River Basin steelhead are managed under an abundance-based annual harvest schedule under the jurisdiction of the *U.S. v. Oregon* Management Agreement for 2008-2017 and the associated biological opinion. The *U.S. v. Oregon* Management Agreement and abundance-based harvest rate schedule allow the tribal harvest on B-run steelhead to vary from the fixed rate of 15 percent depending on the abundance of B-run steelhead and upriver fall Chinook salmon. Recent harvest rates for A-run steelhead in the Columbia River mainstem are generally less than 10 percent annually. The Columbia River mainstem fisheries are under constant monitoring on an annual basis consistent with the *U.S. v. Oregon* Management Agreement

Tributary Fisheries

Fishery-related mortality of natural-origin steelhead returning to natal habitats in the Salmon River MPG is currently not considered a threat to the steelhead populations. No state fisheries directly target natural-origin steelhead. All recreational fisheries on steelhead are largely confined to mainstem and major tributary locations and target hatchery-origin fish. State regulations require that all caught natural-origin steelhead be released unharmed; however, incidental mortalities can occur in fisheries directed on hatchery fish, or resident fish.

Tribal fisheries for steelhead occur in the mainstem Salmon River and Salmon River MPG in natural production areas as the tribes continue traditional fishing practices. The tribal fisheries are managed in accordance with approved Tribal Resource Management Plans to exert a level of impact on natural-origin steelhead populations commensurate with recovery.

Summary of Fishery-related Limiting Factors and Threats

Historical and Current Limiting Factor

- Direct mortality associated with fisheries that target specific stocks.
- Indirect mortality of fish harvested incidentally to targeted species or stock.
- Delayed mortality of fish that encounter gear but not landed, or that die after being caught and released.
- Selective effects on timing, size, age (including larger, older fish) and/or distribution due to type of gear or fishing technique and/or location.
- Reduced marine-based nutrient supply and carrying capacity.

Historical Threats

- Past Columbia and Snake River mainstem fisheries.
- Past Salmon River and tributary fisheries. While harvest would have occurred in the Salmon River and tributaries, few, if any, published catch data are available for these fisheries.

Current Threats

- Fisheries targeting harvestable hatchery steelhead, fall Chinook salmon, or other species
- Targeted fisheries
- Harvest methods and timing
- Illegal harvest (poaching)

6.3.3.4 Other Threats and Limiting Factors

Steelhead populations in the Salmon River MPG are also affected by threats posed by the Columbia and Snake River hydropower system, predation and competition in mainstem reaches and reservoirs, estuarine habitat alterations, and climate change. Chapter 4 and Section 6.1 summarize the factors that affect all Idaho Snake River Basin steelhead populations.

6.3.4 MPG Recovery Strategy

6.3.4.1 Proposed Population Status

There are multiple viable scenarios for the Salmon River MPG, as described in Section 6.3.1. To provide focus for this recovery plan, NMFS and the state of Idaho have selected a proposed status for each population, matching one of the viable MPG scenarios. The selections are described below and shown in Table 6.3-5; however, the recovery scenario remains flexible and will be updated depending on how the populations respond to changes over time. Any viable MPG scenario satisfying the criterion in 6.3.1 is acceptable for achieving the recovery goal for the MPG.

Table 6.3-5. Viable Salmonid Population (VSP) risk matrix for independent salmonid populations in the Salmon River steelhead MPG. This scenario illustrates one way to achieve a viable MPG.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV Lower MF Salmon	V	M
	Low (1-5%)	V	V SF Salmon Chamberlain Upper MF Salmon	V Panther Lemhi	M
	Moderate (6 – 25%)	M	M Secesh	M Little Salmon NF Salmon Pahsimeroi EF Salmon Upper Main Salmon	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable; V – Viable; M – Maintained; and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

South Fork Salmon River

The South Fork Salmon River population is one of seven Intermediate-size populations, at least four of which must meet viable status. It is one of four B-run populations in the MPG and has one of the highest (>40%) concentrations of B-run steelhead. At least two of the populations with B-run components in the MPG must be viable. There is no record of hatchery influence and no current program. Habitat was degraded by past intensive land uses but has since shown signs of recovery and the stream network now functions largely as a natural system. Located at the downstream end of the MPG, this population will provide geographic distribution of viable populations. For these reasons, the proposed status for this population is ***Viable***, with a low (1-5%) risk of extinction over 100 years.

Chamberlain Creek

The Chamberlain Creek population is one of seven Intermediate-size populations, at least four of which must meet viable status. There is no record of hatchery influence and no current program. The watershed functions as a natural system largely within the wilderness boundaries. The population also provides connectivity between populations in the South Fork, Middle Fork, and Upper Salmon River drainages. The proposed status of this population is therefore ***Viable***, with a low risk of extinction.

Lower Middle Fork Salmon River

The Lower Middle Fork Salmon River population is one of two populations in the Middle Fork Salmon River drainage. The population will help meet the requirement for four Intermediate-size populations. It has a moderate (15-40%) B-run component. There is no record of hatchery influence and no current program. The watershed functions largely as a natural system within the wilderness boundaries. This population is targeted to achieve a proposed status of ***Highly Viable***, with very low (less than 1%) risk of extinction over 100 years.

Upper Middle Fork Salmon River

The Upper Middle Fork Salmon population, one of two populations in the Middle Fork Salmon River drainage, is an Intermediate-size population with a moderate (15-40%) B-run component. There is no record of hatchery influence and no current program. The watershed functions largely as a natural system within the wilderness boundaries. Habitat is in very good conditions, and there should be few development pressures in the future since the area is protected as wilderness. The proposed status for this population is ***Viable***, with low extinction risk.

Panther Creek

Panther Creek is a Basic-size population, with an A-run life history. The population has had some hatchery influence, likely from out of population stocks, and the habitat was substantially impacted by past mining activity. However, habitat conditions have been improving in recent decades and this drainage has the potential to become very productive again. The watershed is largely federally owned, such that the habitat is well protected from development pressure. There are far fewer water withdrawals than in other populations upstream from the Middle Fork Salmon River. The proposed status for this population is ***Viable***.

Lemhi River

This population is an Intermediate-size, A-run population. Although the population has been impacted by human land uses, many projects have been completed or are underway to improve stream habitat conditions and to reconnect tributaries to the mainstem Lemhi River, reestablishing access for steelhead to tributary habitat. There has been some hatchery influence to the population in the past, but currently no active supplementation occurs. This population occupies the eastern boundary of the MPG and would provide geographic distribution in the upper Salmon River for viable populations. The proposed status for this population is ***Viable***.

Little Salmon River

This Basic-size, A-run population has experienced substantial impacts to habitat from human land uses and has historically had hatchery fish from outside the MPG released into the system. For these reasons, the proposed status for the population is ***Maintained***, with only a moderate (25% or less) risk of extinction over 100 years.

Secesh River

Secesh River is a Basic-size population, and is one of two high (>40%) B-run life history populations in the MPG. There is no record of hatchery influence and there is no current program. The watershed functions largely as a natural system. The watershed is almost entirely in federal ownership but some floodplain development is occurring on private inholdings. Although this population is a good candidate for reaching viability, the South Fork Salmon River population (chosen above for Viable status), which is also a High B-run population, encompasses all other watersheds in the South Fork Salmon River basin, providing geographic and life history representation for this MPG. The proposed status for this population is ***Maintained***, with only a moderate extinction risk.

North Fork Salmon River

This population is Basic-size, with an A-run life history. The habitat has been affected by human disturbance, and out-of-population hatchery steelhead were released into the North Fork between 1977 and 1994. The proposed status for the population is ***Maintained***, with only a moderate extinction risk.

Pahsimeroi River

The Pahsimeroi is an Intermediate-size population, with an A-run life history. It has been substantially affected by human land uses, but habitat conditions have improved in some reaches following restoration work in recent years. However, there is an active hatchery supplementation program in the watershed. The proposed status for this population is ***Maintained***, with only a moderate extinction risk. This will accommodate some degree of hatchery impact to the population.

East Fork Salmon River

This population is Basic-size, with an A-run life history. Habitat has been impacted by human land uses and there has been hatchery supplementation of this population. The proposed status is ***Maintained***, with only a moderate extinction risk.

Upper Mainstem Salmon River

The Upper Mainstem Salmon is an Intermediate-size population, with an A-run life history. It has been impacted by human land uses, but habitat restoration projects are ongoing. However, there is an active hatchery program in this population. The proposed status for this population is ***Maintained***, with only a moderate extinction risk. This will accommodate some degree of hatchery impact to the population.

If each population achieves its proposed status, shown in Table 6.3-5, the Salmon River steelhead MPG will be viable. Other combinations, however, could also achieve MPG-level viability. Thus, we will continue to monitor the status of the populations and adjust the MPG-level recovery scenario over time based on how the populations respond to recovery efforts.

6.3.4.2 Recovery Strategies and Priority Actions

The recovery strategy for the Salmon River MPG increases abundance and productivity for all populations. The VSP risk matrix (Table 6.3-2 and Table 6.3-5) shows that some populations require a decrease in abundance/productivity risk to reach their proposed status of highly viable (very low risk), viable (low risk), or maintained (moderate risk). Because of the uncertainty in the abundance/productivity risk rating for Idaho steelhead populations, increases in abundance and productivity may be necessary for all populations in this MPG. The current spatial structure and diversity risks, on the other hand, are acceptable for all populations in this MPG to attain the proposed status, except Panther Creek. The Panther Creek population diversity risk can be decreased by reconnecting the major spawning area in the upper Panther Creek drainage. This area was disconnected by historic mining activities and the remediation work to reconnect the habitat is in the final phases.

Increases in population and MPG abundance and productivity will come from the cumulative positive impacts of recovery actions targeting every life stage.

Natal Habitat

The Frank Church ─ River Of No Return Wilderness Area covers a large section of this MPG, including most of the Upper Middle Fork Salmon River, Lower Middle Fork Salmon River, and Chamberlin Creek populations, and parts of the South Fork Salmon River and Panther Creek populations. The remaining habitat in these populations is predominately under federal management, and habitat conditions are improving as a result of actions in existing federal land management plans. Habitat in the other populations in this MPG, on the other hand, continues to be impacted by various land uses.

The priority spawning and rearing habitat recovery actions in this MPG are:

1. Collect and analyze population-specific data to accurately determine the population status and address critical uncertainties.
2. Increase flow levels to eliminate barriers, reconnect tributaries, and to increase the productivity of the habitat.
3. Remove fish barriers including road crossings and irrigation diversion structures.
4. Make sure that existing diversions are properly screened to avoid entrainment of smolts.

Other habitat actions specific to certain populations are identified in the population-level recovery plans in Sections 6.3.5 through 6.3.16.

Hatchery Programs

The intent of the recovery strategy is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. All four steelhead populations in the MPG where hatchery releases occur, including the Upper Mainstem Salmon River population, are targeted to achieve a status of Maintained, which will accommodate a higher degree of hatchery impact. The MPG strategy targets the eight populations where hatchery releases do not occur for natural production to achieve a status of either Viable or Highly Viable.

Key aspects of the population-specific hatchery recovery strategies for this MPG include: Continue to limit releases to the upper Salmon River, Little Salmon River, East Fork Salmon River, and Pahsimeroi River population areas. Reduce ecological and genetic risk associated with the hatchery programs by releasing acclimated fish from locally adapted broodstock at sites where these risks can be minimized or managed, and monitoring for straying within natural production areas.

Key hatchery strategies to support recovery:

- Manage the MPG for natural production in populations as outlined in Table 6.3-4.
- Increase portion of releases of fish from locally adapted broodstock.
- Minimize the risk of B-run releases into the receiving A-run populations.
- Ensure that all hatchery fish are genetically marked (e.g. fin clip, genetic marking, internal or CWT).
- Reduce mainstem releases.
- Customize array of release sites to minimize interactions with wild fish.
- Intensively monitor for strays and estimate proportion of strays at the population level by source.

Fishery Management

The overall harvest strategy for the Salmon River steelhead MPG is to continue the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead. Fishery opportunities provided for steelhead will continue to be sensitive to annual population abundance and promote recovery, while remaining consistent with tribal trust responsibilities and formal agreements like *U.S. v. Oregon*. Based on the fishery management protocols under *U.S. v. Oregon* agreements, as well as the guidelines and constraints of the ESA, the fishery mortality rates for natural-origin steelhead will be managed at levels intended to support the recovery of natural-origin steelhead populations belonging to this MPG. Tributary fisheries for Snake River Basin steelhead will continue to be managed to support natural production and not reduce the likelihood of survival and recovery of the DPS.

The harvest strategy also calls to refine monitoring and research efforts. More data are needed to monitor and manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries.

Specific elements of the harvest strategy include:

- Mark all hatchery-origin juveniles (e.g., fin clips, genetic marking, internal or coded wire tags).
- Where possible, develop a population-specific sliding scale for harvest management based on natural-origin returns and designed to minimize impacts to natural-origin fish.

- Coordinate harvest among all co-managers to ensure that the collective impacts to each population are consistent with recovery goals.
- Implement and improve creel surveys and other monitoring of fisheries to assess and manage impacts on natural-origin returns.
- Continue implementation of parential-based tagging and/or genetic stock identification studies to determine population-specific impacts from mainstem Columbia River fisheries.

Additional Out-of-MPG Threats

Actions taken within the MPG to improve population viability, including natal habitat restoration actions, will not alone produce the increases in survival needed for the Salmon River steelhead MPG to achieve viability. Additional survival improvements must also come from recovery actions implemented downstream of spawning tributaries: the Salmon, Snake and Columbia River migration corridor, Columbia River estuary, and ocean. Actions to address concerns related to climate change are also a high priority. These issues and strategies are discussed in Chapter 4 and Section 6.1, and in the Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan.

6.3.5 South Fork Salmon River Steelhead Population

The South Fork Salmon River steelhead population is currently rated as maintained, with a tentative moderate abundance/productivity risk and low spatial structure and diversity risk. The South Fork Salmon population is targeted to achieve a proposed status of Viable, which requires a minimum of low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Viable

The actions identified in this section, together with the actions defined in Chapter 4 and Section 6.1, aim to achieve the population's proposed status by addressing limiting factors and threats throughout its range and life cycle.

Population Status

This section of the recovery plan compares the South Fork Salmon River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015), which identifies population risk in terms of four viability parameters: abundance, productivity, spatial structure, and diversity. This section focuses primarily on population abundance (the total number of adults) and productivity (the ratio of returning adults to the parental spawning adults). It compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure (the amount and nature of available habitat) and diversity (genetic traits) concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The South Fork Salmon population consists of the South Fork Salmon River and all of its tributaries, except the Secesh River (Figure 6.3-2). Spawning areas in the South Fork Salmon River basin are geographically well separated from other spawning aggregates in the Salmon River. Genetic samples from the South Fork Salmon River, however, are distinct from those in the Secesh River, leading to the separation of these two populations. The South Fork Salmon River population is a High (>40%) B-run population.

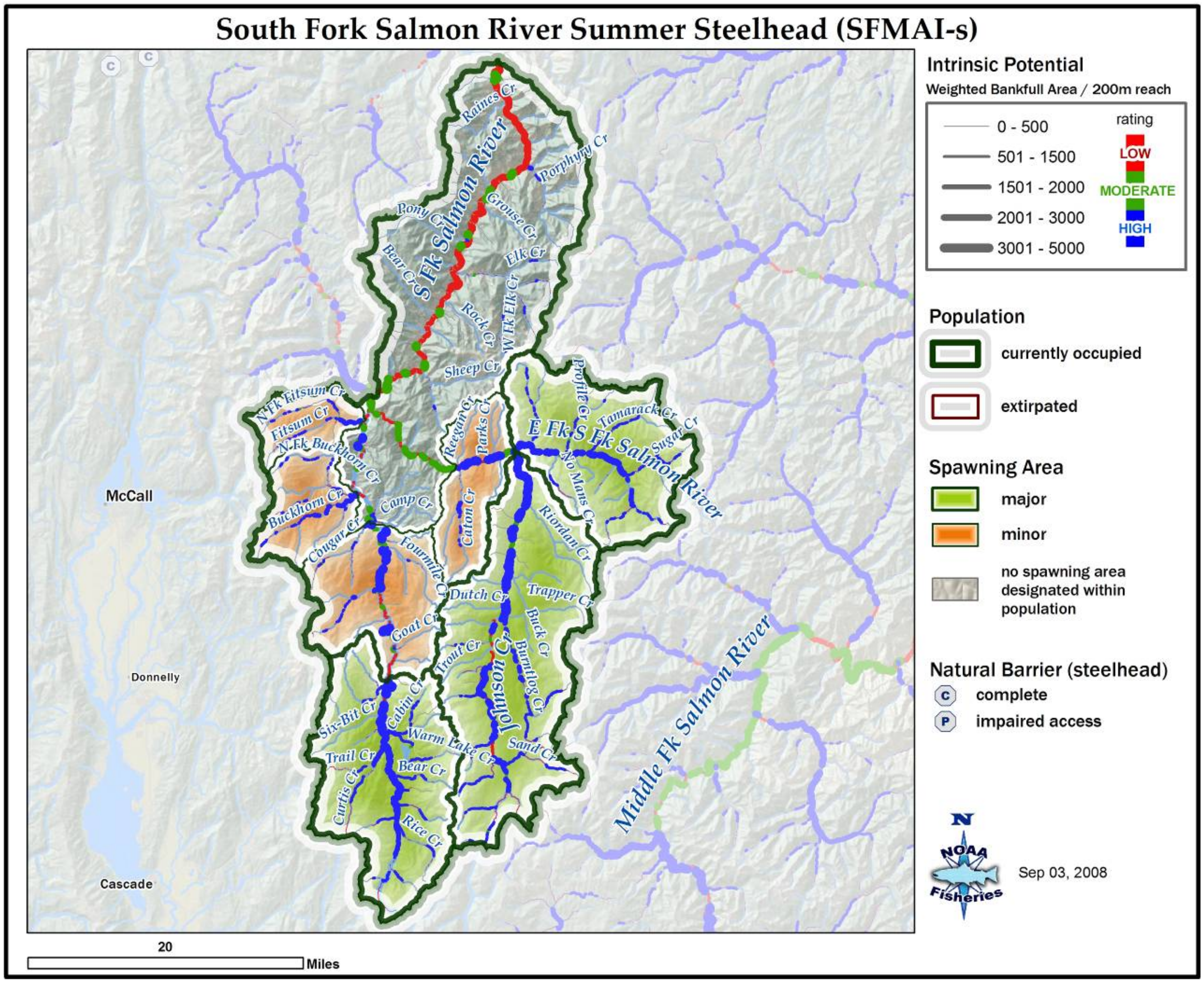


Figure 6.3-2. South Fork Salmon River steelhead population boundary, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the South Fork Salmon River population as "Intermediate" in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the abundance threshold) to achieve a 5 percent or less risk ("low risk") of extinction over a 100-year timeframe.

Abundance and Productivity

To determine abundance and productivity risk for this population, the NWFSC 2015 status review used results from an adult steelhead sampling program at Lower Granite Dam which generated abundance estimates for different Snake River Basin steelhead stock groups based on genetic stock identification. One of the genetic stock groups comprises two populations, the South Fork Salmon River and Secesh River, with relatively low misclassification potential. Based on the current genetic stock identification analysis extrapolation, the NWFSC estimated a 10-year (2005-2014) geometric mean natural-origin abundance of 1,028 for this stock group, which is below the sum of the minimum abundance thresholds for the two component populations (500 and 1,000). The estimated intrinsic productivity for the stock group is estimated at 1.80. The NWFSC rated abundance/ productivity for the populations at moderate risk (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status, including for this population. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The ICTRT has identified three major spawning areas (Johnson Creek, Upper East Fork South Fork, and Upper South Fork) and four minor spawning areas (Middle South Fork, Buckhorn Creek, Fitsum Creek, and Lower East Fork South Fork) within this population. Based on juvenile fish surveys, all major and minor spawning areas are currently occupied. The extensive branching of occupied spawning habitat leads to a very low spatial structure risk, which is adequate for the population to reach its proposed status of viable (NWFSC 2015).

Diversity

A population’s diversity risk rating is a function of multiple metrics that assess the population’s major life history strategies, phenotypic variation, genetic variation, spawner status including hatchery and stray influences, and distribution across different habitat types. The major life history strategies historically represented in the population are unknown, but the population is currently classified as consisting of both B-run and A-run steelhead. Genetic data suggest that this population is well differentiated from other Salmon River populations, and there is no hatchery program in this population. Cumulative diversity risk is therefore low, which is adequate for the population to meet its proposed status (NWFSC 2015).

Summary

The South Fork Salmon River steelhead population is tentatively rated at maintained due to a tentative moderate risk rating for abundance/productivity. A population-specific monitoring program will be necessary to reduce the uncertainty of this rating. In the absence of population-specific abundance data, we assume that an increase in abundance and productivity will be needed for this population to reach its proposed status of viable. Table 6.3-6 shows the population’s current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-6. South Fork Salmon River population risk ratings integrated across the four viable salmonid population (VSP) metrics. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V ↑	V	M
	Moderate (6 – 25%)	M	M South Fork Salmon River	M	HR
	High (>25%)	HR		HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

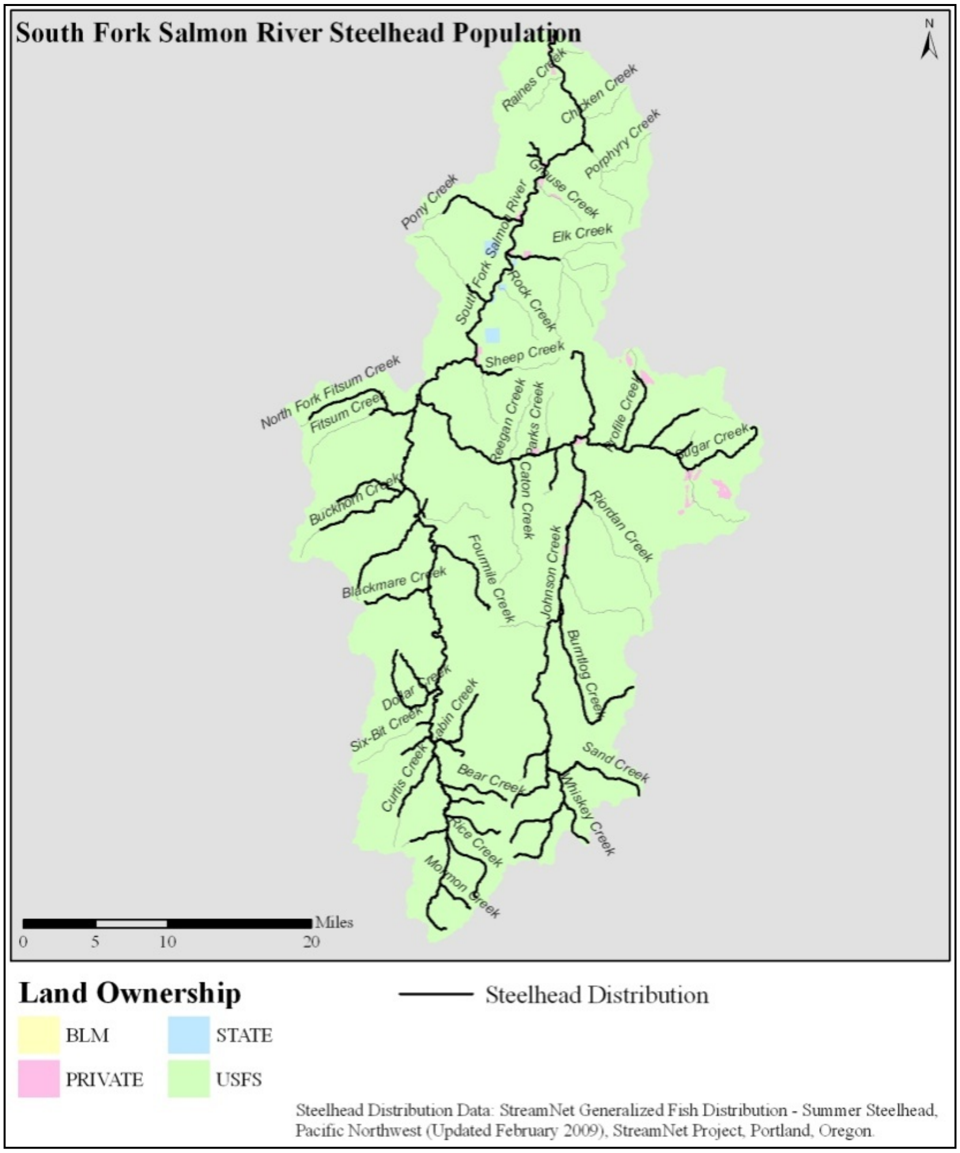
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The South Fork Salmon steelhead population includes the South Fork Salmon River and all of its tributaries, except the Secesh River. The South Fork Salmon River steelhead population contains three major tributaries: the East Fork South Fork Salmon River, Johnson Creek, and the upper South Fork. The South Fork Salmon enters the main Salmon River downstream of the confluence with the Middle Fork Salmon River. The geographic area encompassed within this population has a drainage area of approximately 1,063 square miles (2,752 km^2). The drainage is semiarid, with most of the precipitation falling as snow in the higher elevations. Precipitation averages about 31 inches per year. The heaviest precipitation usually falls as snow in November and December. Occasionally, storms move over the area producing warm rainstorms in late fall or early winter. These storms can cause significant rain-on-snow events, resulting in high flows. Peak stream discharge typically occurs during May and June following snowmelt (IDEQ 2002a).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-3. Land ownership in the South Fork Salmon River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Steelhead habitat in the South Fork Salmon River is characterized as being in mostly good to excellent quality (NPCC 2004, p 1-36). There are about 1,283 km of stream within the population with about 771 km downstream of natural barriers.

Land ownership within South Fork Salmon River population is primarily U.S. Forest Service (99.14%), with state (0.24%), and private (0.62%) combined at less than one percent (Figure 6.3-3). The northeast portion of the South Fork Salmon River basin is located within the boundaries of the Frank Church ─ River Of No Return Wilderness. The U.S. Forest Service principally administers the land uses within the South Fork Salmon basin. The state lands include state endowment lands and homesteads that the state has purchased. Private land is scattered throughout the watershed and includes working ranches, guest ranches, private residences, recreational facilities, villages, and mining sites. Current land uses include mining, timber harvest, grazing, and recreation.

A history of over utilization by sheep within the South Fork Salmon River led to a closure of grazing allotments (IDEQ 2002a). Historically, the South Fork Salmon River and Johnson Creek drainages were affected by sheep grazing from the turn of the century through the early 1960s. Erosion and poor vegetation recovery resulted in a reduction of sheep numbers in the 1950s. In the 1960s, the sheep market crashed and sheep grazing ended. The allotments shifted from sheep to cattle in the 1960s; however, by 1970 the U.S. Forest Service had eliminated all grazing allotments in the South Fork Salmon basin (USFS 1995, as cited by IDEQ 2002a). Currently, grazing plays a very minor role in the South Fork Salmon watershed and is associated with permitted outfitter and guide activity on National Forest System lands. Limited grazing occurs on private land near Yellow Pine.

Mining has also played a significant role in the South Fork Salmon basin (IDEQ 2002a). The alluvial deposits in and along the South Fork and the East Fork South Fork Salmon Rivers, the Upper Secesh River, and Johnson Creek were placer mined for gold in late nineteenth century and into recent years. Most placer mining activity was limited in scale. The most extensive mining occurred in the Upper East Fork South Fork Salmon River. Antimony and tungsten were mined at Stibnite from the 1930s through the 1950s. Beginning in the 1970s until 1997, gold was produced from a moderately large surface mine at Stibnite using heap-leach techniques (Griner and Woodward-Cyde 2000, as cited in IDEQ 2002a). Mines at Cinnabar and Fern Creek produced significant quantities of mercury during the 1940s and 1950s. The greatest amount of activity at Cinnabar Mine occurred during the 1940s and 1950s.

IDEQ (2002a) characterized timber harvest activity and associated sediment problems in the South Fork Salmon basin. The highest volume of logging activity took place from 1950-1965 with an estimated 147 million board feet. A series of intense storms and rain-on-snow events between 1958 and 1965 created numerous landslides and slumps triggered by logging and associated road construction, inundating the river and some of its tributaries with heavy sediment loads (Platts 1972, as cited in IDEQ 2002a). Arnold and Lundeen (1968), as cited in IDEQ (2002a), estimated in 1965 that about 1.5 million cubic yards (about 7 times the normal load) of sediment was stored in the upper 59 miles of the South Fork Salmon River and its tributaries. The rain-on-snow events in the winter and spring of 1965 caused over 100 landslides, the majority of which were related to roads. In June 1965, the dam on Blowout Creek failed and an 8-foot surge of floodwater, sediment and debris went into Meadow Creek, a tributary to the East Fork South Fork Salmon River. The floodwater damaged habitat in the East Fork South Fork Salmon River downstream to Yellow Pine. Concerns over sedimentation and fish habitat resulted in the U.S. Forest Service halting all land disturbing activities in the upper South Fork Salmon River drainage in 1965. Between 1977 and 1982, timber harvest was allowed as long as an annual review of monitoring results showed that fish habitat was continuing to improve. Another moratorium occurred from 1986-1988 due to no improvement in fish habitat. Currently, timber management is limited to sales of utility poles, house logs, post and poles and fuel harvest.

The IDEQ has found that several stream segments in this population are not fully supporting their assessed beneficial uses (Table 6.3-7). These impaired stream segments are listed under the Clean Water Act, section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an EPA-approved TMDL) (IDEQ 2009, 2014).

Table 6.3-7. Stream segments in the South Fork Salmon River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d)		
East Fork of the South Fork Salmon River - 1st and 2nd order	Arsenic	25.2
East Fork of the South Fork of the Salmon River - 3rd order	Combined Biota/Habitat Bioassessments	2.6
East Fork of the South Fork of the Salmon River - 3rd order	Antimony	2.6
East Fork of the South Fork of the Salmon River - 3rd order	Arsenic	2.6
East Fork South Fork Salmon River - 5th order	Sedimentation/Siltation	14.5
Sugar Creek - 3rd order (Cane Creek to mouth)	Arsenic	2.8
Sugar Creek - 3rd order (Cane Creek to mouth)	Antimony	2.8
Sugar Creek - 3rd order (Cane Creek to mouth)	Mercury	2.8
East Fork of the South Fork Salmon River - 1st and 2nd order	Arsenic	25.2
Section 4a-TMDLs		
South Fork Salmon River - East Fork Salmon River to mouth	Sedimentation/Siltation	36.85
SF Salmon River - 3rd order (Curtis Cr. to Mormon Cr.)	Sedimentation/Siltation	13.7
SF Salmon River - 4th order (Curtis Cr. to Buckhorn Cr.)	Sedimentation/Siltation	26.77
South Fork Salmon River - 5th order	Sedimentation/Siltation	8.2
All 1st and 2nd order streams in Warm Lake Creek drainage	Temperature, water	16.2
Buckhorn and WF Buckhorn Creeks - 4th order	Temperature, water	2.6
Buckhorn Creek - 3rd order	Temperature, water	9.0
Buckhorn Creek - 5th order (WF Buckhorn Creek to mouth)	Temperature, water	0.5
Buckhorn Creek and tributaries - 1st and 2nd order	Temperature, water	56.3
Dollar and NF Dollar Creeks - 1st and 2nd order	Temperature, water	22.4
Dollar Creek - 3rd order (NF Dollar Creek to mouth)	Temperature, water	0.9
Elk Creek - 4th order (West Fork Elk Creek to mouth)	Temperature, water	4.1
Elk Creek and tributaries - 1st and 2nd order	Temperature, water	37.0
Elk Creek and West Fork Elk Creek - 3rd order sections	Temperature, water	1.2
Johnson Creek - 3rd order	Temperature, water	18.1
Johnson Creek - 4th order	Temperature, water	13.1
Profile Creek - 3rd order (Missouri Cr. to SF Salmon River)	Temperature, water	4.1
Profile Creek and tributaries - 1st and 2nd order	Temperature, water	21.4
Rice Creek - entire watershed	Temperature, water	9.4
SF Salmon River - 3rd order (Curtis Creek to Mormon Creek)	Temperature, water	13.7
SF Salmon River - 4th order (Curtis Cr. to Buckhorn Cr.)	Temperature, water	26.7

Waterbody	Impairment/Cause	Stream Miles
SF Salmon River and tribs. above EFSF - 1st and 2nd order	Temperature, water	135.2
South Fork Salmon River - 5th order	Temperature, water	8.2
South Fork Salmon River - East Fork Salmon River to mouth	Temperature, water	36.7
Upper Johnson Creek and tributaries - 1st and 2nd order	Temperature, water	70.6
Warm Lake and Cabin Creeks - 3rd order	Temperature, water	1.9
Warm Lake Creek above Warm Lake - entire watershed	Temperature, water	6.2

*The combined biota/habitat bioassessment cause is assigned to a waterbody on the 303(d) list (Category 5 of the integrated report) when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, we conclude that the habitat limiting factors for the South Fork Salmon steelhead population are sediment, migration barriers, and degraded riparian conditions with reduced shade and LWD recruitment. Table 6.3-8 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. This section discusses each limiting factors, using information from U.S. Forest Service reports, IDEQ reports, and the Salmon Subbasin Assessment and Management Plan (USFS 2007a; IDEQ 2002a, 2009, 2014; NPCC 2004; Ecovista 2004).

Table 6.3-8. Primary limiting factors identified for the South Fork Salmon steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream. Road improvements and road decommissioning.
Migration Barriers	Migration barriers such as culverts, dams, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal fish passage barriers and road stream crossings
Riparian Condition	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Riparian restoration actions to increase shade and large woody debris recruitment

The Salmon Subbasin Assessment and Management Plan (NPCC 2004) also considered high temperatures and chemical contamination to be limiting habitat quality in the South Fork drainage. Currently, several streams in the population area do not meet Bull Trout spawning criteria based on Forest Service temperature data: South Fork Salmon River and Johnson, Rice, Dollar, Trail, Warm

Lake, Profile, Buckhorn, Lick, Grouse and Elk Creeks (IDEQ 2014). Data presented by the U.S. Forest Service (2006) show that temperature values often exceed current temperature criteria, but these values are considered to reflect a natural temperature regime in most of the South Fork Salmon River drainage.

As indicated by IDEQ (2002a), dissolved metals from past mining activity, while still present, have mainly been found at levels below state and federal acute criteria standards. IDEQ (2002a) indicated that total dissolved metals were below USEPA and state criterion and are declining with each year of sampling. Reclamation and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) efforts have addressed potential impacts from mine sites to fish and fish habitat (USFS 2007a), including removing hazardous materials toxic to aquatic organisms (USFS 2007a).

1. *Excess Sediment*

Fine sediment can harm steelhead and their habitat by smothering developing young steelhead in spawning gravels, filling in pools used by juveniles for cover, or reducing the availability of aquatic insects (food). Excess fine sediments can affect VSP parameters by reducing spawning and incubation success and by reducing juvenile rearing habitat quality. High sediment levels in the past likely reduced this population’s abundance and productivity, but sediment levels are now improving.

Sediment has been the primary habitat concern in the South Fork Salmon watershed, although data indicate that conditions are acceptable for spawning and that fine sediments, in general, are decreasing or at least stable (NPCC 2004). Fine sediments are naturally high in this watershed but were exacerbated by decades of intensive logging, grazing, mining, and road building. IDEQ’s (2002a) review of biological data and sediment impacts to aquatic habitat indicated that habitat conditions within the South Fork Salmon basin are approaching the historic range of instream sediment levels. The TMDL approved by the USEPA in 1991 included targets for percent depth fines and cobble embeddedness. The data on these targets suggest that the watershed has attained the cobble embeddedness target with an improving trend but has not attained the target for percent depth fines.

NPCC (2004) rated sediment as a moderate priority for the East Fork South Fork Salmon and Johnson Creek. Currently, about 14.5 miles of stream in the lower East Fork South Fork remain on the 303(d) list for sediment (Table 6.3-7). IDEQ (2002a) indicated that the existing road system contributes large quantities of sediment during storm events. The close proximity of roads to streams is most likely the major contributing factor. In the East Fork South Fork Salmon River drainage, disturbance area as indicated by Equivalent Clearcut Area (ECA) is low (4%) and road densities also appear to be fairly low at 0.7 mi/sq. mile. ECA accounts for all human ground disturbances such as logging, mining, and roads, as well as natural disturbances such as wildfire. However, the concentration of roads near riparian conservation areas is relatively high at 2.2 mi/sq. mi. As indicated by the U.S. Forest Service (2006), the use and maintenance of the mainstem East Fork South Fork Salmon River Road and the Quartz Creek Road, along with historical mining disturbance in the Stibnite area, are sources of existing and potential sediment delivery to the East Fork South Fork Salmon River.

Sediment TMDLs have been developed for about 77 miles of stream on the mainstem South Fork Salmon. In the Lower South Fork Salmon River, sediment delivered to streams appears to be more dispersed. Total road density is low (0.4 mi/sq. mile), but the higher density of roads in riparian conservation areas (0.9 mi/sq. mi) and in landslide prone areas may contribute to elevated sediment (USFS 2007a). Data collected from 2001-2005 showed that substrate embeddedness was functioning at risk for most of the analysis area, with the exception of Elk Creek, which was functioning at unacceptable risk. In 2012, the IDEQ revised sediment targets for the South Fork Salmon River TMDL to more closely reflect natural conditions in the watershed (IDEQ 2014).

Many streams have been further impacted by wildfire. In the Upper South Fork Salmon River total disturbance area was relatively low at 5 percent ECA in 2006 (USFS 2007a) but then increased due to the Cascade Complex Wildfires of 2007. Total road densities are low at 0.5mi/sq. mi although roads are concentrated in riparian areas (1.1mi/sq. mi). The U.S. Forest Service (2007a) reported relatively stable conditions for spawning gravels in this population but with some sampling sites functioning at risk or at unacceptable risk for intragravel conditions. Due to the natural erosive nature of the Idaho Batholith and the extensive ground disturbance caused by the Cascade Complex Wildfires, the risk of erosion and sediment delivery have been greatly increased for the next 10 to 30 years (USFS 2011).

High intrinsic habitat potential has been estimated for steelhead for most of the river reaches currently listed for sediment in the Upper South Fork Salmon and East Fork South Fork Salmon (see Figure 6.3-2).

2. Migration Barriers

Passage barriers in this population are primarily caused by road-stream crossings. In the Upper South Fork Salmon River, a culvert creates a passage barrier on Indian Creek. On Rice Creek, the U.S. Forest Service plans to restore fish passage at three road crossings that are currently barriers, creating access to two miles of potential steelhead habitat (USFS 2011). A perched culvert at the mouth of Goat Creek was replaced with an open-bottom structure in 2008, allowing steelhead to access habitat in this tributary. A possible barrier to fish passage on Grouse Creek, a tributary to the lower South Fork, may have been created after a road along the stream recently washed out, depositing sediment and debris in the stream channel (USFS 2007a). Fish passage may reestablish naturally over time as the stream cuts down through the debris. In the East Fork South Fork Salmon River drainage, barriers exist at culverts, some of which may only be barriers at low flows (USFS 2007a). The East Fork Salmon River Road could present a man-made barrier in Reegan, Williams, and Dutch Oven Creeks. The “Glory Hole” on the mainstem East Fork South Fork is likely a barrier to steelhead at low flows. The Glory Hole is an old mining pit constructed mid-channel in 1955 in the upper East Fork South Fork above the Sugar Creek confluence. High stream gradients at the upstream end of excavation pit have created a possible upstream migration barrier to steelhead at certain flows. In the Johnson Creek watershed, 14 road stream-crossing culverts have been identified as barriers to fish passage, with barriers on Sheep Creek and Landmark Creek most important for steelhead (BOR 2013b).

3. *Degraded Riparian Condition*

Degraded riparian conditions can threaten salmonids by impacting sediment, stream temperature, and habitat quality. Degraded riparian conditions may be reducing this population’s abundance and productivity through changes in habitat quality. Riparian conservation areas (RCAs) in the South Fork Salmon River have been affected by roads, mining, and recreation (dispersed and approved campgrounds). In the East Fork South Fork Salmon, riparian areas in the upper drainage are the most disturbed with only 62 percent of RCAs intact. RCAs in lower East Fork tributaries are in better condition at greater than 80 percent intact. In the lower South Fork Salmon River, riparian areas are functioning appropriately (USFS 2007a). In the upper South Fork Salmon River, 33 percent of total road length is adjacent to streams, concentrating ground disturbances in the riparian conservation areas. Riparian areas in the upper South Fork Salmon are considered to be functioning at risk. Re-establishment of riparian vegetation should increase shade levels, potentially reducing summer stream temperatures over time along some stream reaches. Johnson Creek is 303(d)-listed for temperature, and high temperatures have also been observed in tributaries to the upper East Fork South Fork Salmon River (BOR 2013b). Past mining activities in the upper East Fork modified stream channels such that riparian vegetation and shade levels are low in some tributaries. Re-establishment of riparian vegetation could also increase LWD recruitment over time. In the East Fork South Fork Salmon River, the U.S. Forest Service (2007a) noted poor habitat conditions: streams were deficient in LWD, had few pools, and poor pool quality. Poor habitat conditions were linked to disturbances caused by mining and roads within the riparian conservation areas. Habitat restoration upstream from the Glory Hole on the East Fork South Fork is not a priority until this barrier has been removed.

Summary of Current Habitat Limiting Factors and Threats

In summary, habitat limiting factors in the South Fork Salmon River steelhead population are linked to human-induced disturbances such as mining and road building. The inherently fragile parent geology combined with human disturbances and heavy precipitation makes the basin susceptible to large sediment producing events that degrade habitat quality for steelhead. Roads located near streams encroach on riparian habitat, limit potential sources of large woody debris, and create passage barriers at road-stream crossings. Priorities for addressing limiting factors in the South Fork Salmon steelhead population should be mitigation and elimination of sediment inputs from human caused disturbances and elimination of fish passage barriers. Restoration of riparian areas, elimination of sediment inputs, and improvements habitat quality may require road obliteration, realignment, conversion, or closure.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but needs to be managed to protect steelhead habitat in the South Fork Salmon River population area.

1. Degraded water quality from mining exploration and development - without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters. Historic mining sites may also be releasing toxic heavy metals into surface waters.

2. Degraded habitat and water quality from wildfire - severe wildfires can increase sediment delivery to streams and stream temperatures.
3. Degraded habitat from noxious weeds - the spread of noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs

No hatchery releases occur in the South Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Straying and interbreeding of hatchery-origin fish from other populations with South Fork Salmon River natural-origin steelhead remains a potential genetic risk to the population. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to South Fork Salmon River steelhead, a B-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for South Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The mainstem sections and tributaries of the East Fork South Fork, Johnson Creek, and South Fork Salmon above the Secesh River are the priority stream reaches for restoration. These areas consist of the major and minor spawning areas within the population. The South Fork Salmon below the Secesh River is a lower priority. Emphasis for restoration projects in this lower section of the basin should be the adult and juvenile migration corridor of the South Fork Salmon River.

Habitat Actions

The following habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in the population, and contribute to maintaining and restoring the VSP parameters while moving the population towards a viable status. These actions are ranked in priority order.

1. Continue to reduce sediment loading through road decommissioning and riparian enhancement projects in selected areas. Many miles of National Forest road have already been decommissioned in order to reduce sediment delivery to streams. Additional reductions in

sediment delivery can also be realized by paving the approaches to bridges in areas likely to deliver sediment.

2. Restore riparian function in localized areas of the drainage by improving riparian vegetation and decreasing sediment delivery. Decommissioning or obliterating non-essential roads within riparian areas will allow regrowth of riparian vegetation. For permanent roads in riparian areas, appropriate maintenance practices will decrease sediment delivery to streams.
3. Eliminate fish passage barriers that are blocking steelhead from accessing potential habitat.

Implementation of Habitat Actions

Most of land in the South Fork Salmon River population area is federal, so responsibility for implementation of the habitat portion of the recovery plan for this population lies within the jurisdictions of the U.S. Forest Service. On federal lands, following the existing Land and Resource Management Plan should provide the protection needed for this population. The Boise National Forest began implementing the Johnson Creek Watershed Improvement Project in 2011, which includes decommissioning roads along tributary streams and reducing dispersed recreation along Johnson Creek. The Nez Perce Tribe has also been active in implementing habitat improvement projects in the watershed, particularly road obliteration projects. Projects implemented to improve habitat conditions include passage barrier removal and replacement, riparian vegetation planting, riparian and wetland fencing, road decommissioning and improvement, stream and floodplain restoration, and acquisition of land and conservation easements. Future efforts will build on these accomplishments.

Table 6.3-9 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-9. Habitat Recovery Actions Identified for the South Fork Salmon River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Passage	Address 6 barriers (culverts)	BPA Contract # 2007-127-00: East Fork of South Fork Salmon River Passage Restoration	N/A
Sediment	Improve 98 road miles		
Riparian Conditions	Improve 2 riparian acres		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions, as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the South Fork Salmon River steelhead population is to continue managing the population for natural production. The strategy also calls for monitoring of strays and actions to reduce straying where needed. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The South Fork Salmon River supports a high component of B-run steelhead. The harvest strategy is to support recovery by continuing to control harvest impacts through the abundance-based approach and existing fishery management programs to limit ESA impacts on natural-origin Snake River Basin steelhead. Tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest and other MPG actions alone will not produce the increases in survival needed for the South Fork Salmon River steelhead population and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.6 Chamberlain Creek Steelhead Population

The Chamberlain Creek steelhead population is currently rated as maintained, with a tentative moderate abundance/productivity risk and a low spatial structure/ diversity risk (NWFSC 2015). The Chamberlain Creek population is targeted to achieve a proposed status of Viable, which requires a minimum of low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Viable

The actions identified in this section, together with the actions defined in Chapter 4 and Section 6.1, aim to achieve the population's proposed status by addressing limiting factors and threats throughout its entire range and life cycle.

Population Status

This section of the recovery plan compares the Chamberlain Creek population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

This population, which includes fish spawning in French, Sheep, Crooked, Bargamin, and Sabe Creeks, the Wind River, and Chamberlain Creek, was delineated based on life history and basin topography (ICTRT 2003). All steelhead in this population are A-run, whereas the populations located in the South Fork Salmon River and lower Middle Fork Salmon River are classified as supporting both B-run and A-run life history expressions. The Chamberlain Creek steelhead population (Figure 6.3-4) is one of 12 populations in the Salmon River MPG within the Snake River Basin steelhead DPS.

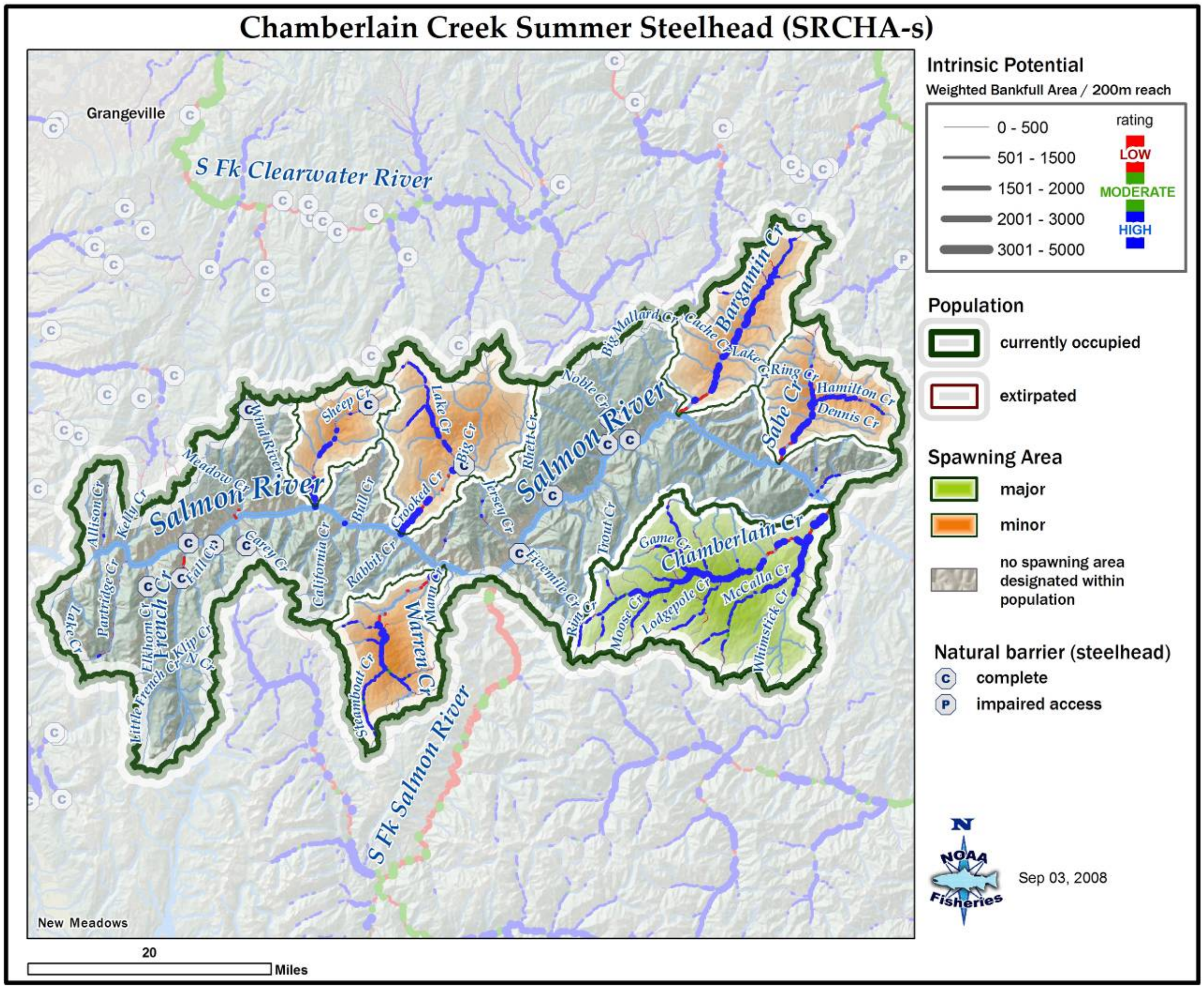


Figure 6.3-4. Chamberlain Creek steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Chamberlain Creek population as “Basic” in size and complexity based on historical habitat potential (ICTRT 2007a). A “Basic” steelhead population has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe.

Abundance and Productivity

Population-specific abundance estimates are not available for most Snake River Basin steelhead populations, including the Chamberlain Creek population. Results from a recent genetic stock composition project allowed the NWFSC (2015) to estimate population spawning escapements with more precision than in the past. The project produced estimates of natural-origin abundance for several different stock groups, including a stock group consisting of the Chamberlain Creek population and two Middle Fork Salmon populations. Based on the genetic stock composition study, the NWFSC estimated a 10-year (2005-2014) geometric mean abundance of 2,213 for the stock group, which is below the combined minimum abundance thresholds 2,500 for the three populations. The estimated intrinsic productivity for the stock group over the most recent 20-year series was 2.38 (NWFSC 2015). The NWFSC (2015) tentatively rated abundance/productivity risk for the Chamberlain Creek population as moderate based on this information.

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status, including for this population. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The Chamberlain Creek population has one major spawning area and five minor spawning areas. All historic major and minor spawning areas are assumed to be currently occupied based on juvenile and adult surveys. The population’s spatial structure score is therefore low risk (NWFSC 2015). A low spatial structure risk is adequate for the population to attain its overall proposed status.

Diversity

Since only A-run fish are believed to have historically occupied the Chamberlain Creek population, no major life history strategies have been lost. There is no hatchery program in this population. Cumulative diversity risk of low is adequate for the population to attain its proposed status (NWFSC 2015).

Summary

The Chamberlain Creek steelhead population is estimated to be at moderate risk due to a tentative moderate risk rating for abundance and productivity (NWFSC 2015). The overall spatial structure and diversity rating is sufficiently low for this population to reach its proposed status. Table 6.3-10 shows the population’s current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-10. Chamberlain Creek population risk ratings integrated across the four viable salmonid population (VSP) metrics. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	↑ M Chamberlain Creek	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

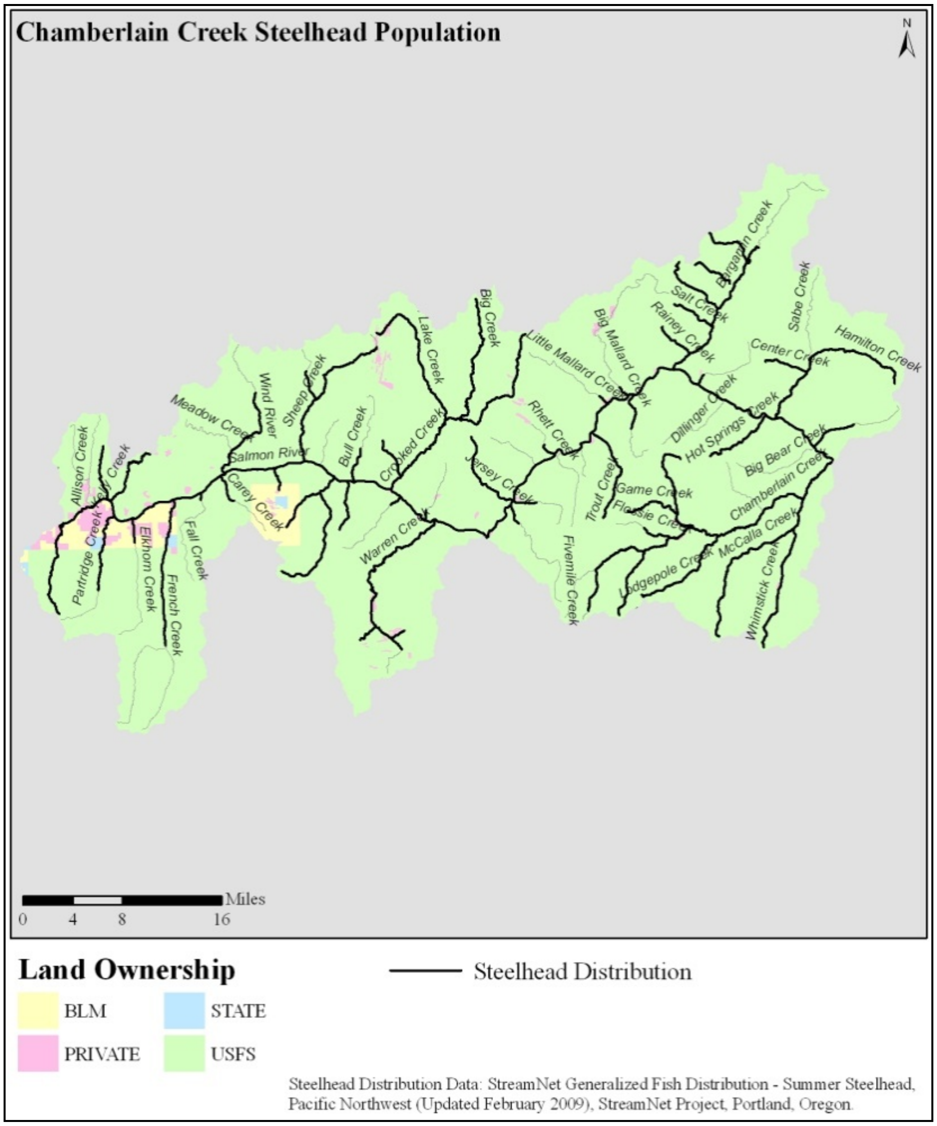
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Chamberlain Creek steelhead population includes the Salmon River and its tributaries from the mouth of the Little Salmon River upstream to Chamberlain Creek, excluding the South Fork Salmon River drainage. The drainage area within this steelhead population is about 4,073 km^2 (1,573 mi^2). There are about 1,899 km of stream within the Chamberlain Creek population with less than half (804 km) occurring downstream from natural barriers. Watersheds draining the south side of the Salmon River include Lake, Partridge, Elkhorn, French, Fall, California, Warren, and Chamberlain Creeks. Watersheds draining the north-side of the Salmon River include Allison, Wind, Sheep, Mallard, Bargamin, and Sabe Creeks. Streams in this geographic area tend to be V-shaped valleys draining mountainous, high gradient, topography. Typical of mountainous areas, snowmelt creates high flows in spring with low flows generally occurring in late summer/fall and into the winter. Steelhead are presumed to be distributed throughout many of the streams within the population, all abundance and density are less well known. The ICTRT identified one major (Chamberlain Creek) and five minor (Bargamin, Crooked, Warren, Sabe, and Sheep Creeks) spawning areas. The quality of steelhead spawning and rearing habitat in this population was rated as mostly excellent (NPCC 2004, p 1-36).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-5. Land-ownership pattern within the Chamberlain Creek steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land ownership within Chamberlain Creek steelhead population is primarily U.S. Forest Service (96.0%) with BLM (2.2%), state (0.2%), and private (1.6%) combined at less than five percent (Figure 6.3-5). The BLM administers lands near Carey Creek and downstream near Partridge Creek. Private lands are mostly scattered along the north side of Salmon River and downstream near Partridge, Elkhorn, and French Creeks. State owned land is concentrated on the south side of the Salmon River close to private and BLM lands.

Land use in the Chamberlain Creek steelhead population has included mining, logging, grazing, recreation, and road construction associated with such activities. Development is limited with no incorporated cities, just small communities such as Dixie and Warren.

This portion of the Salmon River drainage has not been significantly impacted by habitat fragmentation associated with land uses and development (NPCC 2004). In large part, the quality of habitat for most of the population is a result of many of the streams draining the Gospel-Hump and Frank Church ─ River Of No Return wildernesses. In the Chamberlain Creek drainage there has been no recent resource development. Two large stock ranches in the basin were active in the early 1900s, but most recent activity has been associated with recreational use and incidental grazing by pack animals. Localized disturbances throughout this steelhead population have occurred, many of which are legacy issues related to past land uses. Because much of the basin is designated wilderness, there has been very little recent timber harvest. Historically, grazing occurred in several drainages such as Bargamin, Big, Sabe, and Sheep Creeks, but recent grazing management has allowed a general upward trend in vegetation condition. Most limiting factors identified for this steelhead population are related to mining and roads. As noted by the U.S. Forest Service (2007b) and IDEQ (2002b), Allison, Warren, and Crooked Creeks are the areas of concern. Warren Creek was extensively dredge mined in the past, affecting habitat quality and riparian vegetation. Similarly, Crooked Creek in the vicinity of Dixie was dredged in the past and insufficient riparian shade contributes to elevated stream temperatures. In the Allison Creek drainage, the main concern is roads that produce sediment.

The IDEQ’s 2008 Integrated (303(d)/305(b)) Report for the Clean Water Act includes stream segments in this population that are not fully supporting their assessed beneficial uses. Table 6.3-11 shows the impaired stream segments listed in IDEQ’s 2008 Integrated Report under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an EPA-approved TMDL) (IDEQ 2009, 2014).

Table 6.3-11. Stream segments in the Chamberlain Creek steelhead population identified as impaired in IDEQ’s Integrated Report (IDEQ 2009, IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 4c-Waters Impaired by Non-pollutants		
Warren Creek – tributaries	Physical substrate habitat alterations	77.02
Warren Creek - source to mouth	Physical substrate habitat alterations	9.28
Warren Creek - source to roadless boundary	Physical substrate habitat alterations	8.7
Section 4a-TMDLs		
Crooked Creek - Lake Creek to mouth	Water temperature	8.27
Crooked Creek - source to unnamed tributary	Water temperature	41.74
Crooked Creek - unnamed tributary to Big Creek	Water temperature	2.5

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, we conclude that the habitat limiting factors for the Chamberlain Creek steelhead population are migration barriers, sediment, habitat quality and temperature. Table 6.3-12 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. This section discusses each limiting factors, using information from U.S. Forest Service reports, IDEQ reports, and the Salmon Subbasin Assessment and Management Plan (USFS 2007b; IDEQ 2002b, 2009; NPCC 2004; Ecovista 2004).

Table 6.3-12. Primary limiting factors identified for the Chamberlain Creek steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correct or remove fish passage barriers
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream
Habitat Quality	Reduced habitat quality as measured by pools frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding.	Restoration of instream and riparian habitats
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmonids.	Passive restoration of riparian vegetation to improve shade and stream cover. Improved bank stability may lead to reduced stream width-to-depth ratios, which may also improve stream temperatures.

1. Migration Barriers

The extent of migration barriers in the Chamberlain Creek steelhead population is unknown but may be affecting population abundance and productivity by limiting available spawning and rearing areas. Migration barriers are a potential limiting factor because the location and status of the physical structures in this population have not been established. In the subwatershed summaries produced by the Nez Perce-Clearwater National Forest, there were several undetermined fish migration barriers occurring in the subwatersheds of Rhett, Middle-Salmon Jersey, and possibly Lake. It is unknown whether these potential migration barriers affect steelhead spawning and rearing habitat. The U.S. Forest Service (2007b) also indicated that there are at least four culverts in the Warren Creek analysis area that are potential fish passage barriers and that in some tributaries, such as Smith Creek, dredge piles in the stream channel may hinder or block fish passage. The U.S. Forest Service (1999) also identified culverts associated with Road 1614 that need to be evaluated and possibly removed.

2. *Excess Sediment*

Despite the remote location of this population, high sediment levels from past land uses may be reducing this population's abundance and productivity. The U.S. Forest Service (1999, 2007b) documented elevated sediment conditions for some streams above desired conditions. Conditions in Elkhorn Creek were considered functioning at risk with cobble embeddedness at 26 percent, although a significant long-term downward trend was indicated. French Creek and Little French Creek also have higher than desired cobble embeddedness (>30%) but a trend was not indicated. Off-road vehicle use and livestock within the French Creek watershed have created local concerns for streams and riparian areas (USFS 2007b).

Substrate conditions in Fall Creek were considered functioning at unacceptable risk with a mean cobble embeddedness of 33.5 percent. The Fall Creek drainage has a very high total road density (2.30 mi/mi^2) and a total of 4.97 miles within riparian conservation areas. Motorized vehicle damage in Fall Creek was noted in headwater areas, tributary and trail crossings, and in seep areas along the trail south of the wetlands (USFS 2007b). In Warren Creek, cobble embeddedness has not been measured directly; however, high surface fines estimates (Raleigh 1995, as cited in U.S. Forest Service 2007b) indicate that embeddedness may be high as well. The U.S. Forest Service (1999) noted for steelhead that in tributaries such as Allison and Crooked Creeks, the effects of sediment have probably lowered the carrying capacity of juvenile rearing and quality of spawning habitat from roads and mining development. IDEQ is developing an implementation plan for the Chamberlain Creek area (IDEQ 2014).

3. *Degraded Channel Complexity and Quality*

Indicators of habitat quality in the Chamberlain Creek steelhead population are generally in good condition except as noted below. In the Warren Creek analysis area, the U.S. Forest Service (2007b) noted a low frequency of LWD in Warren Creek. Pool frequency met current standards but there were few quality pools available. The U.S. Forest Service (2007b) suggested that past activities, such as dredge mining, road construction within riparian areas, and logging had likely led to reduced quantities of LWD. They noted that future potential for LWD recruitment was limited in areas where stream channels flow through dredge piles, or along roads. Streambanks in the analysis area are generally stable, but development and dredge mining on Warren Creek has altered riparian ecosystems extensively in certain areas leading to loss of shade, LWD recruitment, and sediment buffering capabilities. IDEQ (2002b) listed about 95 stream miles in the Warren Creek drainage as impaired by habitat alterations. Pool frequency and pool quality were considered low in Allison Creek, possibly due to chronic sediment delivery from existing roads may have filled in pools (USFS 1999, as cited in IDEQ 2002b).

4. *Elevated Water Temperatures*

NPCC (2004, p.3-28) rated stream temperature as having a moderate-to-high level of influence on habitat quality for the Chamberlain Creek steelhead population. IDEQ listed stream temperature as impairing water quality on about 52 miles of Crooked Creek and developed a temperature TMDL for this drainage in 2002. Temperature data indicated that salmonid spawning criteria were exceeded for the six years of data evaluated in Crooked Creek (IDEQ 2002b).

The legacy effects of past mining, roads, development, and timber harvest have altered riparian condition, reducing canopy cover. Increased width-to-depth ratios for Crooked Creek are likely the result of dredge mining within the stream. Canopy cover and bankfull width data presented by IDEQ (2002b) suggest that the area in need of the most improvement is the area from the bottom of Dixie Meadow (RM 11) to about Nugget Gulch (RM 17). The TMDL calls for regrowth of riparian vegetation to provide natural levels of shade. Because the Crooked Creek watershed is under predominantly federal ownership, with over half of the drainage in the Gospel-Hump Wilderness, shade levels are likely to recover naturally over time.

In other tributaries in this population, the U.S. Forest Service (2007b) has recorded temperatures above the NMFS (1996) standards for properly functioning habitat conditions for Chinook salmon and steelhead. Streams such as Lake, Elkhorn, French, Fall, and Warren Creeks have displayed streams temperatures above desired temperature range of 10-13.9 °C. However, the temperatures in most of these streams appear to be similar to undisturbed control sites, suggesting that the high temperatures are part of the natural range of variability. In Warren Creek, on the other hand, past activities such as dredge mining and road construction in riparian areas likely led to an increase in stream temperatures by reducing shade and increasing the streams width-to-depth ratio (USFS 2007b). With the exception of Warren Creek, active restoration of riparian vegetation in the Chamberlain Creek population is not a high priority action for steelhead under this recovery plan.

Summary of Current Habitat Limiting Factors and Threats

In summary, most of the habitat in this population is in relatively good shape. Habitat limiting factors in the Chamberlain Creek steelhead population are linked to human induced disturbances such as mining, roads, timber harvest, and recreation. These disturbances are concentrated in a few watersheds. NMFS has identified migration barriers, sediment, temperature, and habitat quality as limiting factors. Extensive dredge mining and road construction in specific watersheds have degraded aquatic and riparian habitat conditions. The U.S. Forest Service (2007b) also indicated that some livestock, timber harvest, and motorized recreational use had contributed to local disturbances at stream crossings, meadows, and within riparian habitats.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but needs to be managed to protect steelhead habitat in the Chamberlain Creek population area.

1. Degraded habitat from noxious weeds - the spread of noxious weeds can increase soil erosion and decrease native plant density.
2. Degraded riparian condition and water quality due to recreational use - impacts from recreational use can impact riparian vegetation, increase sediment delivery, and spread noxious weeds.

Hatchery Programs

There is no history of hatchery releases in the Chamberlain Creek steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Straying and interbreeding of hatchery-origin fish from other populations with Chamberlain Creek natural-origin steelhead remains a potential risk to the population's life history diversity. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Chamberlain Creek steelhead (an A-run population), and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through the abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for Chamberlain Creek steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The primary strategy for this remote population is continued protection of relatively unimpaired habitat, particularly in the Chamberlain, Bargamin, and Sabe Creeks steelhead spawning areas (see Figure 6.3-4). Active watershed restoration in specific tributaries heavily impacted by past land uses may also benefit this steelhead population. Active restoration of the stream channel could improve steelhead habitat in both Crooked and Warren Creeks by enhancing shade and bank stability. Throughout the population, additional benefits will accrue by mitigating chronic sediment sources from roads, trails, stream crossings, and unauthorized vehicle use. Mitigation efforts to clean up, remove, and stabilize mine tailings and waste rock deposited in the stream channel and floodplains in Warren, Falls, Lake, and upper Crooked Creeks could benefit this steelhead population (Ecovista 2004).

Habitat Actions

The following habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in this population.

1. Identify and eliminate fish passage barriers that are blocking steelhead from accessing potential habitat.
2. In non-wilderness areas, reduce chronic sediment delivery to streams through obliteration, realignment, maintenance, or closure of roads, through restriction of unauthorized vehicle and all-terrain vehicle (ATV) travel, and through restoration of mine sites.
3. Rehabilitate stream channels impacted by historic mining.

Implementation of Habitat Actions

Responsibility for implementation of habitat recovery actions for this population lies largely within the jurisdiction of the U.S. Forest Service. Following the existing U.S. Forest Service Land and Resource Management Plan should provide the protection needed for this population. IDFG has management responsibility for fish and wildlife in this area. During Plan implementation, NMFS will work with these and other partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period. No specific habitat projects have been identified at this time for the Chamberlain Creek population.

A number of habitat restoration projects have already been completed within this population area. These restoration projects were aimed at restoring fish passage, road or trail realignment and maintenance, upland habitat protection, riparian area planting, and channel restoration.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Chamberlain Creek steelhead population is to continue managing the population for natural production. The strategy also calls to monitor strays and take actions to reduce straying where needed. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

Chamberlain Creek supports an A-run steelhead population. The harvest strategy is to support recovery by continuing to control harvest impacts through the abundance-based approach and existing fishery management programs that limit ESA impacts on natural-origin Snake River Basin steelhead. Tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest and other MPG actions alone will not produce the increases in survival needed for the Chamberlain Creek steelhead population and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies for the Idaho steelhead MPGs and populations.

6.3.7 Lower Middle Fork Salmon River Steelhead Population

The Lower Middle Fork Salmon River population is currently rated as maintained due to a tentative moderate abundance/productivity risk (NWFSC 2015). The population is targeted to achieve a proposed status of Highly Viable, which requires a minimum of very low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Highly Viable

The actions identified in this section, together with the actions defined in Chapter 4 and Section 6.1, aim to achieve the population's proposed status by addressing limiting factors and threats throughout its range and life cycle.

Population Status

This section of the recovery plan compares the Lower Middle Fork Salmon River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The ICTRT (2003) identified the lower Middle Fork Salmon River and its tributaries, up to and including Loon Creek as an independent steelhead population (Figure 6.3-6). Besides Loon Creek, the other major steelhead tributaries in this population are Camas Creek and Big Creek. A NMFS model of potential habitat for the Interior Columbia Basin, based on geomorphological characteristics, suggests that the historic distribution of steelhead could have included the mainstem Middle Fork, but current steelhead spawning in the mainstem of the Middle Fork Salmon River is uncertain. The Lower Middle Fork Salmon River population supports both B-run and A-run steelhead, with a moderate (15-40%) B-run component.

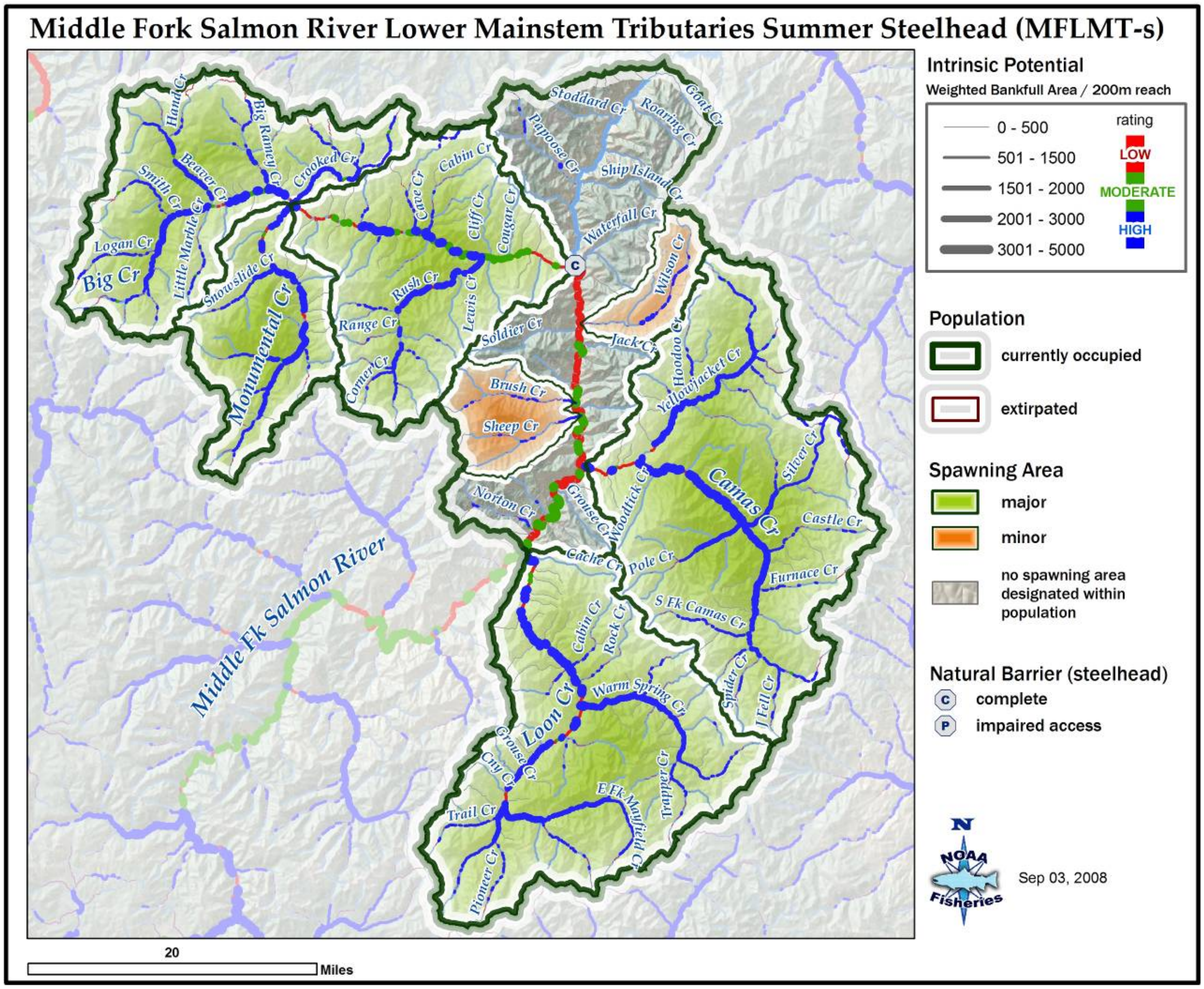


Figure 6.3-6. Lower Middle Fork Salmon River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT (2007a) classified the Lower Middle Fork Salmon River population as "Intermediate" in size and complexity based on historical habitat potential. A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the abundance threshold) to achieve a 5 percent or less risk ("low risk") of extinction over a 100-year timeframe. For this population to achieve a 1 percent or less risk ("very low risk") of extinction over 100 years, productivity would need to be at or greater than 1.29 recruits per spawner (R/S) at the abundance threshold of 1,000 spawners.

Abundance and Productivity

Population-specific abundance estimates are not available for most Snake River Basin steelhead populations, including the Lower Middle Fork Salmon population. Results from a recent genetic stock composition project allowed the NWFSC (2015) to estimate population spawning escapements with more precision than in the past. The project produced estimates of natural-origin abundance for several different stock groups, including a stock group consisting of the Chamberlain Creek population and two Middle Fork Salmon populations. Based on the genetic stock composition study, the NWFSC estimated a 10-year (2005-2014) geometric mean abundance of 2,213 for the stock group, which is below the combined minimum abundance thresholds 2,500 for the three populations. The 20-year estimated intrinsic productivity for the group was estimated at 2.38 (NWFSC 2015). The NWFSC (2015) tentatively rated abundance/productivity risk for the Lower Middle Fork Salmon population as moderate based on this information.

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status, including for this population. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The ICTRT has identified five major spawning areas (Camas Creek, Look Creek, Upper Big Creek, Lower Big Creek, and Monumental Creek - a Big Creek tributary) and two minor spawning areas (Brush Creek and Wilson Creek) within this population. All major and minor spawning areas are presumed to be occupied based on data collected during presence/absence and density monitoring for juvenile steelhead. The extensive branching of occupied spawning habitat leads to a very low spatial structure risk, which is adequate for the population to reach its proposed status (NWFSC 2015).

Diversity

The Lower Middle Fork Salmon River population supports both A-run and B-run steelhead, with a moderate (15-40%) B-run component. Genetic samples from this population were geographically cohesive and differentiated from other Salmon River steelhead populations, and there is no hatchery program in the Middle Fork Salmon River basin. Cumulative diversity risk is therefore low, which is adequate for the population to meets its proposed status (NWFSC 2015).

Summary

The Lower Middle Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity. Table 6.3-13 shows the population’s current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-13. Lower Middle Fork Salmon River steelhead population risk ratings integrated across the four viable salmonid population (VSP) metrics. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Lower Middle Fork Salmon River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

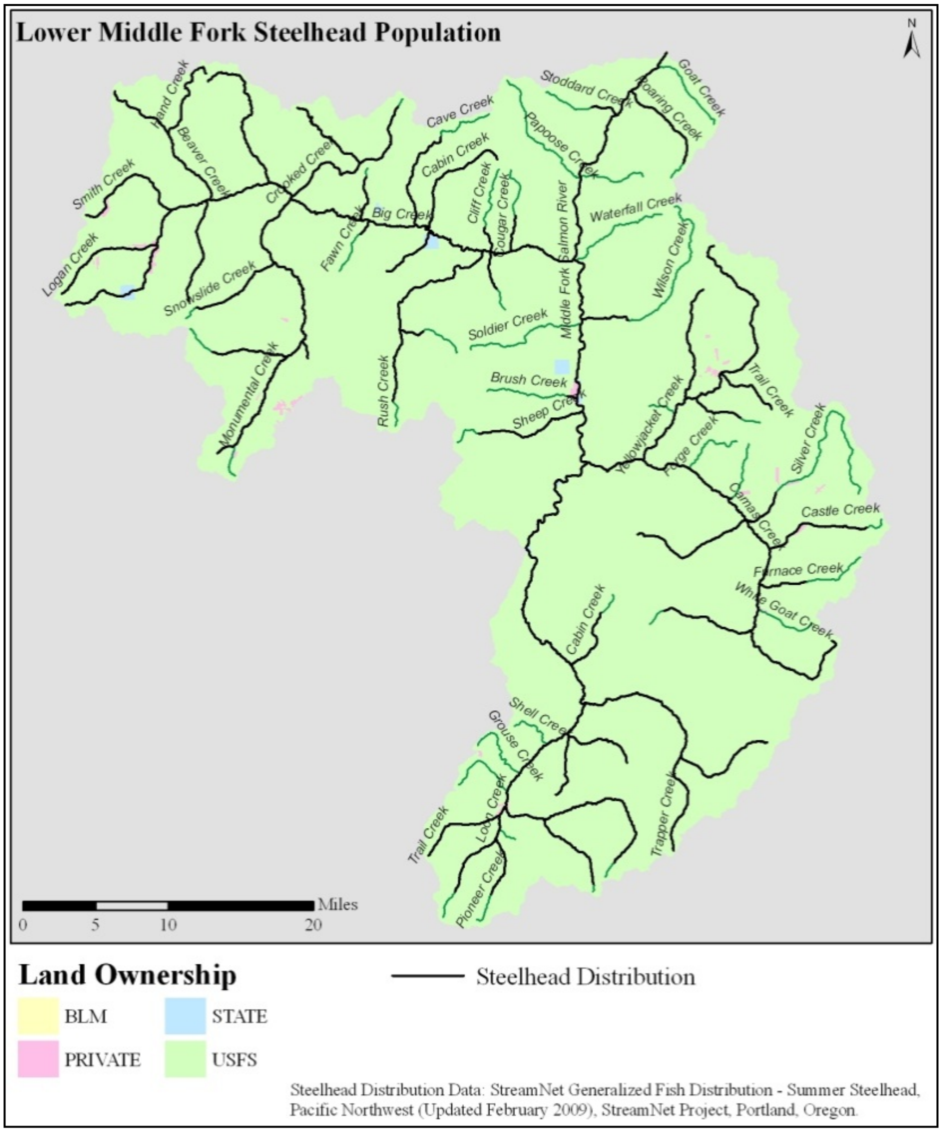
Natal Habitat

Habitat Conditions

The Lower Middle Fork steelhead population includes the Middle Fork Salmon River watersheds downstream from Loon Creek. Major watersheds within the Lower Middle Fork include Loon Creek, Camas Creek, and Big Creek. The geographic area encompassed within this population has a drainage area of approximately 1,731 square miles (4,482 km^2).

The Middle Fork Salmon River basin has a broad climate range with prevalent Pacific maritime regime in the western watershed to a more continental regime in the eastern area (IDEQ 2008). The region is generally characterized by warm summers and mild or cool winters. For the Middle Fork Salmon River basin, most precipitation occurs as snow during winter and early spring, while summers are generally dry. Western portions of the basin generally receive more precipitation. Stream flow peaks during the spring months from snow melt.

Aquatic habitats in the lower Middle Fork were rated as good to excellent (NPCC 2004, p. 2-138). There are about 1,942 km of stream within the population with about 1,285 km downstream of natural barriers. Major spawning areas designated for this population include Loon Creek, Camas Creek, Upper and Lower Big Creek, and Monumental Creek. Minor spawning areas were also designated for the smaller watersheds of Wilson and Brush Creeks (including Sheep Creek).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-7. Land ownership within the Lower Middle Fork Salmon River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land ownership within the Lower Middle Fork Salmon River population is primarily U.S. Forest Service (99.4%) with state (0.23%), and private (0.36%) combined at less than one percent (Figure 6.3-7). The Lower Middle Fork Salmon River is almost entirely contained within the Frank Church ─ River Of No Return Wilderness. Streams situated outside the wilderness area are subject to more land management related impacts than wilderness streams. There are no major human population centers in the Middle Fork Salmon River basin and private or state-owned lands within the wilderness are typically resort type developments.

Mining has occurred within the Middle Fork Salmon River watershed, with the scale of operations varying from individual placer operations to large-scale underground gold mines in the Big Creek drainage. Some underground mines were developed throughout the wilderness area, but there are no active mines in the Middle Fork Salmon River watershed. However, the mining company AIMMCO is currently conducting mineral exploration for gold at the Golden Hand mine site in Big Creek.

Historically, livestock were raised adjacent to mining camps to provide food and pack animals for hauling. Suitable areas near the mines provided open pasture for grazing although winter livestock production was not possible in the upper watersheds. Today grazing is largely limited to areas around guest ranches for pack animals. Some grazing continues to occur along the middle reach of Camas Creek at Meyers Cove. Timber harvest within the wilderness has been limited to post and pole, firewood, and minimal commercial harvest around the periphery of the wilderness. The primary disturbance affecting timber stands within the Middle Fork watershed is natural wildfire. Today, recreation is the most widespread land use of the watershed.

The IDEQ has found that several stream segments in this population are not fully supporting their assessed beneficial uses (Table 6.3-14). For this population, these impaired stream segments are listed under the Clean Water Act, section 4a (impaired waters than have an EPA-approved TMDL) (IDEQ 2014).

Table 6.3-14. Stream segments in the Lower Middle Fork Salmon River steelhead population identified as impaired in IDEQ’s Integrated Report (IDEQ 2009, IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 4a-TMDLs		
Camas Creek - Castle Creek to Silver Creek	Temperature, water	2.8
Camas Creek - Duck Creek to Forge Creek	Temperature, water	3.8
Camas Creek - Forge Creek to Yellowjacket Creek	Temperature, water	3.6
Camas Creek - Furnance Creek to Castle Creek	Temperature, water	2.7
Camas Creek - Silver Creek to Duck Creek	Temperature, water	2.2
Camas Creek - source to South Fork Camas Creek	Temperature, water	47.1
Camas Creek - South Fork Camas Creek to White Goat Creek	Temperature, water	1.6
Camas Creek - White Goat Creek to Furnance Creek	Temperature, water	1.9
Camas Creek - Yellowjacket Creek to mouth	Temperature, water	4.4
Castle Creek - source to mouth	Temperature, water	25.5
Duck Creek - source to mouth	Temperature, water	11.0
Silver Creek - source to mouth	Temperature, water	14.6
Silver Creek - source to mouth	Temperature, water	48.1

Waterbody	Impairment/Cause	Stream Miles
Yellowjacket Creek - Hoodoo Creek to Jenny Creek	Temperature, water	1.6
Yellowjacket Creek - Little Jacket Creek to Hoodoo Creek	Temperature, water	0.8
Yellowjacket Creek - source to Trail Creek	Temperature, water	48.5
Yellowjacket Creek - source to Trail Creek	Temperature, water	5.4
Yellowjacket Creek - Trail Creek to Little Jacket Creek	Temperature, water	3.0

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, we conclude that the habitat limiting factors for the Lower Middle Fork steelhead population are sediment and migration barriers. Table 6.3-15 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. This section discusses each limiting factor, using information from U.S. Forest Service reports, IDEQ reports, and the Salmon Subbasin Assessment and Management Plan.

Areas of concern for habitat conditions are primarily in the Big Creek and Camas Creek drainages. Sediment delivery associated with roads and other activities was identified as a problem in the Monumental Creek drainage (particularly the headwaters to Fall Creek) and in lower Camas Creek (particularly in lower Silver Creek). Mines and their associated roads, dumps, processing facilities, and ponds were considered a problem in several of watersheds (Upper Monumental, Big, and Cabin Creeks). Degradation of habitat conditions was noted from livestock grazing in the Meyers Cove area of Camas Creek (Hardy and Andrews 1989). Road stream crossings may create steelhead passage barriers in Big Creek, and diversions structures create passage barriers in Camas Creek. Chemical pollutants were also identified by NPCC (2004) as a concern. However, there are no stream segments currently listed for a chemical or mining related pollutant within the Lower Middle Fork steelhead population.

Table 6.3-15. Primary limiting factors identified for the Lower Middle Fork Salmon River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream. Mining reclamation.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers.

1. *Excess Sediment*

Conditions reported for the Lower Middle Fork Salmon suggests that sediment may have a minor impact on abundance and productivity of steelhead. IDEQ (2008) presented a brief history of stream habitat concerns related to the Thunder Mountain area. They reported that mining activities have occurred in the headwaters of Monumental Creek for over a century with four inactive mines in the Monumental Creek drainage, including the 40-acre Dewey Mine and the 235-acre Sunnyside Mine. Mallet (1974), as cited in IDEQ (2008), identified detrimental conditions in Monumental Creek due to mining pollution and siltation. In 1981, activities at the Golden Reef Joint Venture Mine resulted in an influx of sediment pond wastewater into Monumental Creek and Mule Creek. In 1983, several tons of settling pond sludge from the Dewey Mine spilled into Mule Creek. Habitat surveys conducted by IDFG and U.S. Forest Service identified extremely turbid conditions and severely degraded fish habitat (50% less habitat as a result of the spill), and 51 percent embeddedness. High flows in 1986 flushed out most of the fine sediments, reducing embeddedness to 19 percent in Monumental Creek downstream of the contaminant source. Later, Ries and Burns (1989), as cited in IDEQ (2008), documented an improving trend in substrate conditions, but identified sediment effluent as continuing to degrade habitat. Nelson et al. (1996), as cited in IDEQ (2008), noted a highly significant decreasing trend in cobble embeddedness over a 1983 -1994 study period, which indicates improving sediment conditions. Current sediment conditions in the Thunder Mountain area appear stable.

The information presented above suggests that sediment levels have returned to normal although the area may be inherently geomorphically unstable. Although streams in the Monumental Creek watershed are not currently listed as impaired by IDEQ (2014), sporadic sediment problems linked to past mining activities can limit proper habitat function and become a limiting factor given the right circumstances. However, it appears that future sediment events will be less likely to occur if the Thunder Mountain rehabilitation project is completed. The Thunder Mountain Mine Restoration Project will include the clean-up of mining operations in the Monumental Creek drainage area (IDEQ 2008). The restoration project includes the removal of the ford at the confluence of Monumental Creek and Coon Creek, which will improve fish habitat and decrease sediment delivery. The project also specifies removal of structures and mining equipment and reshaping and re-vegetation in the Dewey Mine area. The final step in the restoration calls for the removal of road sections leading to the Dewey and Sunnyside Mines.

Increased sediment levels also occur in Camas Creek due to livestock grazing. In the Camas Creek watershed a livestock exclosure system in conjunction with four hardened stream crossings was established in the mid-90s by the U.S. Forest Service and IDFG. In their annual report Hardy and Andrews (1989) noted degraded riparian and aquatic habitat conditions in Camas Creek associated with a history of agriculture and livestock grazing on private land. These authors believed that habitat conditions limited anadromous fish spawning and rearing (Hardy and Andrew 1989). IDEQ (2008) indicated that the benefits of the livestock exclosure project have been largely negated because of maintenance and continued livestock access within the enclosure. Stream channel improvements have been slow to accrue, if at all, within this project site (IDEQ 2008). Degraded riparian areas and elevated sediment may therefore continue to limit natural production of steelhead in this section of the Camas Creek watershed.

2. *Migration Barriers*

Several fish passage barriers in this population may be blocking steelhead from accessing potential habitat. Currently, steelhead migration corridors are considered in good-to-excellent condition in Monumental Creek in the Big Creek drainage. A natural partial barrier exists on Monumental Creek about 16 miles upstream its confluence with Big Creek. Roosevelt Lake was formed by a large mud slide that blocked Monumental Creek in 1909 and is a barrier to Chinook salmon spawning but not to steelhead, which are still found above the lake. In the area of the Thunder Mountain access road, IDEQ (2008) noted several stream crossings that may not allow fish passage at all flows and life stages. In the Camas Creek drainage on Silver Creek there is an earthen dam above the Rams Creek confluence that historically blocked steelhead from accessing upper Silver Creek. The earthen dam has been altered such that steelhead may now be able to access suitable habitat in upper Silver Creek. A push up diversion dam on the mainstem of Loon Creek at the Double D Ranch is a barrier to upstream fish passage and a partial barrier to downstream fish passage. This structure needs to be replaced, diversion rates reviewed, and appropriate screening completed. Migration barriers likely have a small impact on this population.

In summary, stream habitat in the Lower Middle Fork Salmon steelhead population is extensive and of high quality (NPCC 2004, p. 1-35). Factors affecting habitat quality reported for the Lower Middle Fork Salmon River steelhead population are very limited. Because most of the population lies within a protected wilderness, the lower Middle Fork Salmon watersheds have not been significantly impacted by habitat fragmentation associated with land uses, development, and habitat conversion (NPCC 2004, p. 3-26). Limiting factors for the Lower Middle Fork Salmon River steelhead population largely appear to be legacy effects from mining. Mining impacts should be remediated to maintain aquatic habitats consistent with wilderness designation. The road system and livestock grazing may also create localized sources of sediment and migration barriers.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but needs to be managed to protect steelhead habitat in the Lower Middle Fork Salmon River population area.

1. Reduced flow and habitat access from water diversions – Existing water diversion structures should be reviewed to assure that appropriate fish screens are in place and that adequate water is left instream for fish passage.
2. Degraded water quality from mining exploration and development – Without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters. Historic mine sites also have the potential to deliver toxic contaminants to surface waters.

3. Degraded habitat from noxious weeds - Spread of noxious weeds can increase soil erosion and decrease native plant density.
4. Degraded habitat conditions from recreational use – Impacts to steelhead habitat from recreational use are currently minimal but should continue to be monitored. Assuring that off-highway vehicle (OHV) use is restricted to existing U.S. Forest Service roads and trails will minimize impacts.

Hatchery Programs

There is no history of hatchery releases in the Lower Middle Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Straying and interbreeding of hatchery-origin fish from other population areas with natural-origin fish in this B-run steelhead population remains a potential risk to the population’s life history diversity. Currently, the risk posed by natural spawning of returning hatchery fish is impossible to quantify because of a poor understanding of current population sizes. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Lower Middle Fork Salmon River steelhead, which include both B-run and A-run fish, and to other Salmon River populations. Most harvest-related mortality for steelhead returning to the Salmon River MPG occurs in the mainstem Columbia River from the mouth upstream to McNary Dam during fisheries targeting fall Chinook salmon, including tribal gillnet and dip net fisheries. Salmon River B-run steelhead experience higher harvest rates than the A-run steelhead because they are larger and more susceptible to catch in the gillnet gear, and because their timing coincides with the return of fall Chinook salmon. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for Lower Middle Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

The recovery strategy for the Lower Middle Fork Salmon River steelhead population is to continue protection afforded under wilderness designation while correcting possible sources of sediment from inactive mine sites, roads, and grazing. Continued maintenance of access and system roads will reduce potential sediment sources. Lastly, migration barriers should be investigated and corrected if warranted.

Priority Stream Reaches

Given the limited land use impacts within the Lower Middle Fork Salmon River steelhead population, most stream reaches do not require habitat recovery actions. Priority stream reaches for recovery actions are Monumental Creek, Camas Creek, and Loon Creek. These streams are major spawning areas, have high intrinsic potential for steelhead, and have potential habitat problems.

Habitat Actions

The following habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in the Lower Middle Fork Salmon watershed and contribute to maintaining and restoring the VSP parameters while moving the population towards a highly viable status.

1. Continue protection of aquatic habitats in streams within the Frank Church ─ River Of No Return Wilderness.
2. Stabilize known sources of sediment from historic mining and reduce sediment delivery from roads and livestock grazing in Monumental, Camas, Big, and Cabin Creeks (Ecovista 2004, p. 52).
3. Assess passage barriers and eliminate barriers blocking access to potential steelhead habitat.

Implementation of Habitat Actions

Responsibility for implementation of the habitat actions for this population lies largely within the jurisdiction of the U.S. Forest Service. Following the existing U.S. Forest Service Land and Resource Management Plan should provide the protection needed for this population. The Nez Perce Tribe is pursuing habitat restoration projects with Payette National Forest in the Big Creek watershed, including the Thunder Mountain Mine Restoration Project.

Table 6.3-16 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-16. Habitat Recovery Actions Identified for the Lower Middle Fork Steelhead Population. All of these projects are in the Big Creek watershed.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Barriers	Address 3 barriers	BPA Contract # 2007-127-00: East Fork of South Fork Salmon River Passage Restoration	N/A
Sediment Toxic Contaminants (*Potential Limiting Factor*)	Improve 5 road miles, and 102.6 riparian acres		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Lower Middle Fork Salmon River steelhead population is to continue managing the population for natural production. The strategy also calls to collect information on the natural population, and to monitor the population for strays from Salmon River MPG hatchery programs and take necessary action to reduce spawning of hatchery strays with natural-origin steelhead. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Lower Middle Fork Salmon River supports a B-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Lower Middle Fork Salmon River steelhead population to achieve highly viable status and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan provide additional direction.

6.3.8 Upper Middle Fork Salmon River Steelhead Population

The Upper Middle Fork Salmon River steelhead population is currently rated as maintained due to a tentative moderate abundance/productivity risk (NWFSC 2015). The population is targeted to achieve a proposed status of Viable, which requires low abundance/productivity risk. The overall spatial structure and diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Viable

The actions identified in this section, together with the actions defined in Chapter 4 and Section 6.1, aim to achieve the population's proposed status by addressing limiting factors and threats throughout its range and life cycle.

Population Status

This section of the recovery plan compares the Upper Middle Fork Salmon River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The Upper Middle Fork Salmon River population was considered an independent population because it is geographically separated from other spawning areas. Population delineation was also supported by genetic differentiation from lower Middle Fork Salmon River samples and a significant habitat break between the two populations (ICTRT 2003). The population includes fish spawning in the Middle Fork mainstem and its tributaries upstream from Loon Creek (Figure 6.3-8). The Upper Middle Fork Salmon River population consists of both B-run and A-run steelhead, with a moderate (15-40%) B-run component.

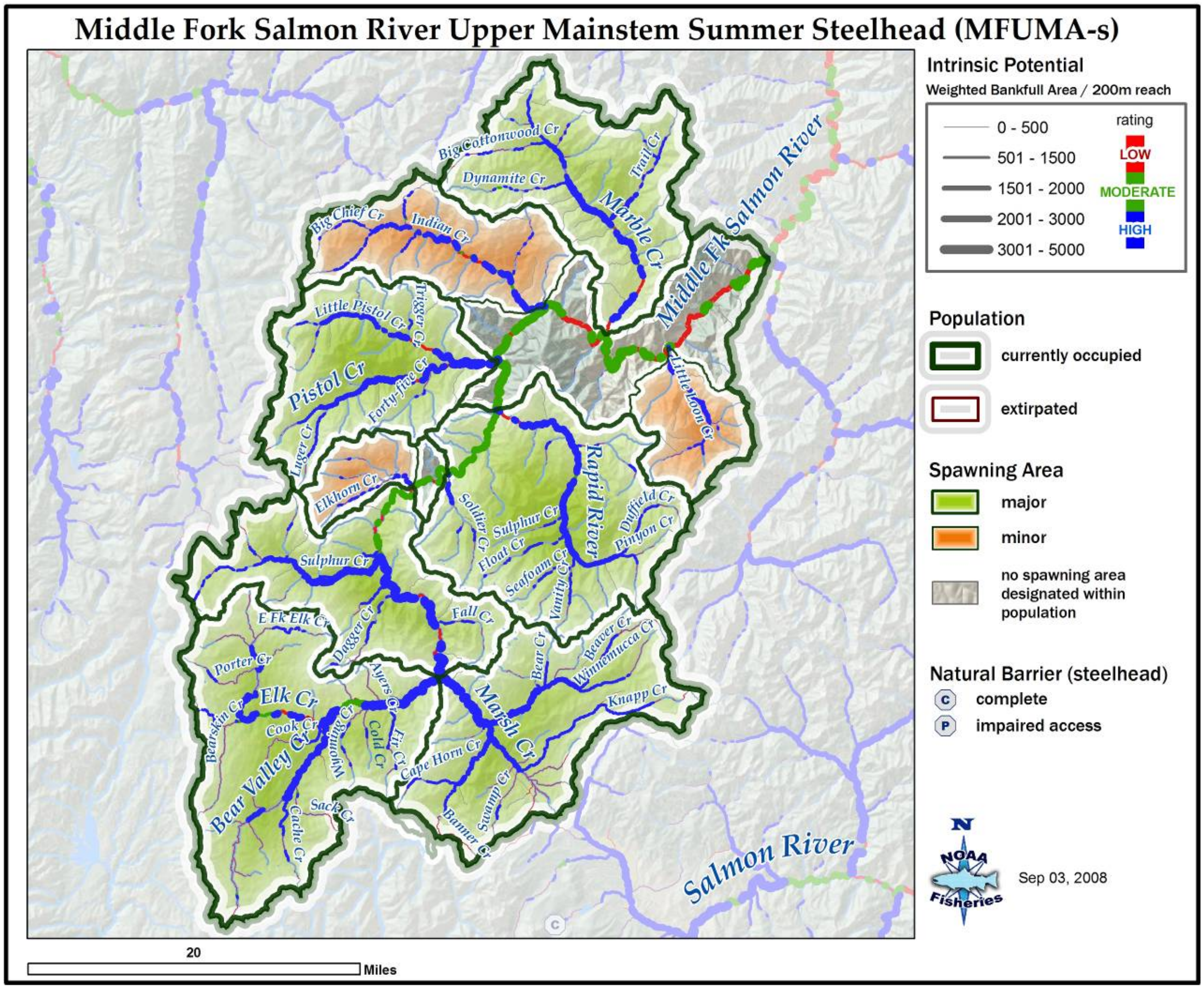


Figure 6.3-8. Upper Middle Fork Salmon River summer steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT (2007) classified the Upper Middle Fork Salmon River population as “Intermediate” in size and complexity based on historical habitat potential. A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the abundance threshold) to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe.

Abundance and Productivity

Population-specific abundance estimates are not available for most Snake River Basin steelhead populations, including the Upper Middle Fork Salmon population. Results from a recent genetic stock composition project allowed the NWFSC (2015) to estimate population spawning escapements with more precision than in the past. The project produced estimates of natural-origin abundance for several different stock groups, including a stock group consisting of the Chamberlain Creek population and two Middle Fork Salmon populations. Based on the genetic stock composition study, the NWFSC estimated a 10-year (2005-2014) geometric mean abundance of 2,213 for the stock group, which is below the combined minimum abundance thresholds 2,500 for the three populations. The 20-year intrinsic productivity for the group was estimated at 2.38 (NWFSC 2015). The NWFSC (2015) tentatively rated abundance/productivity risk for the Upper Middle Fork Salmon population as moderate based on this information.

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status, including for this population. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The ICTRT has identified six major spawning areas (Bear Valley, Marsh Creek, Upper Middle Fork including Sulphur Creek, Rapid River, Pistol Creek, and Marble Creek) and three minor spawning areas (Elkhorn Creek, Indian Creek, and Little Loon Creek) within this population. Spawning is widely distributed across the population. Direct observations of redds or mature adults have been made in a number of the larger tributaries including the Marsh Creek and Bear Valley Creek drainages, Sulphur Creek and Loon Creek. Juvenile steelhead, most likely the progeny of anadromous parents, have been observed in and collected from nearly every tributary to the Middle Fork Salmon River that is large enough to support steelhead. The extensive branching of occupied spawning habitat leads to a very low spatial structure risk, which is adequate for the population to reach its proposed status (NWFSC 2015).

Diversity

The major life history strategies historically represented in the population are unknown, but the population is currently classified as consisting of both B-run and A-run steelhead. A single genetic sample for the population showed no similarity to Salmon River hatchery samples, and there is no hatchery program in the Middle Fork Salmon River basin. Cumulative diversity risk is therefore low, which is adequate for the population to meets its proposed status (NWFSC 2015).

Summary

The Upper Middle Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity (NWFSC 2015). A population-specific monitoring program will be necessary to reduce the uncertainty of this rating. We assume that increases are needed in abundance and productivity for this population to reach its proposed status of viable. Table 6.3-17 shows the population’s current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-17. Upper Middle Fork Salmon River steelhead population risk ratings integrated across the four viable salmonid population (VSP) metrics. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Upper Middle Fork Salmon River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

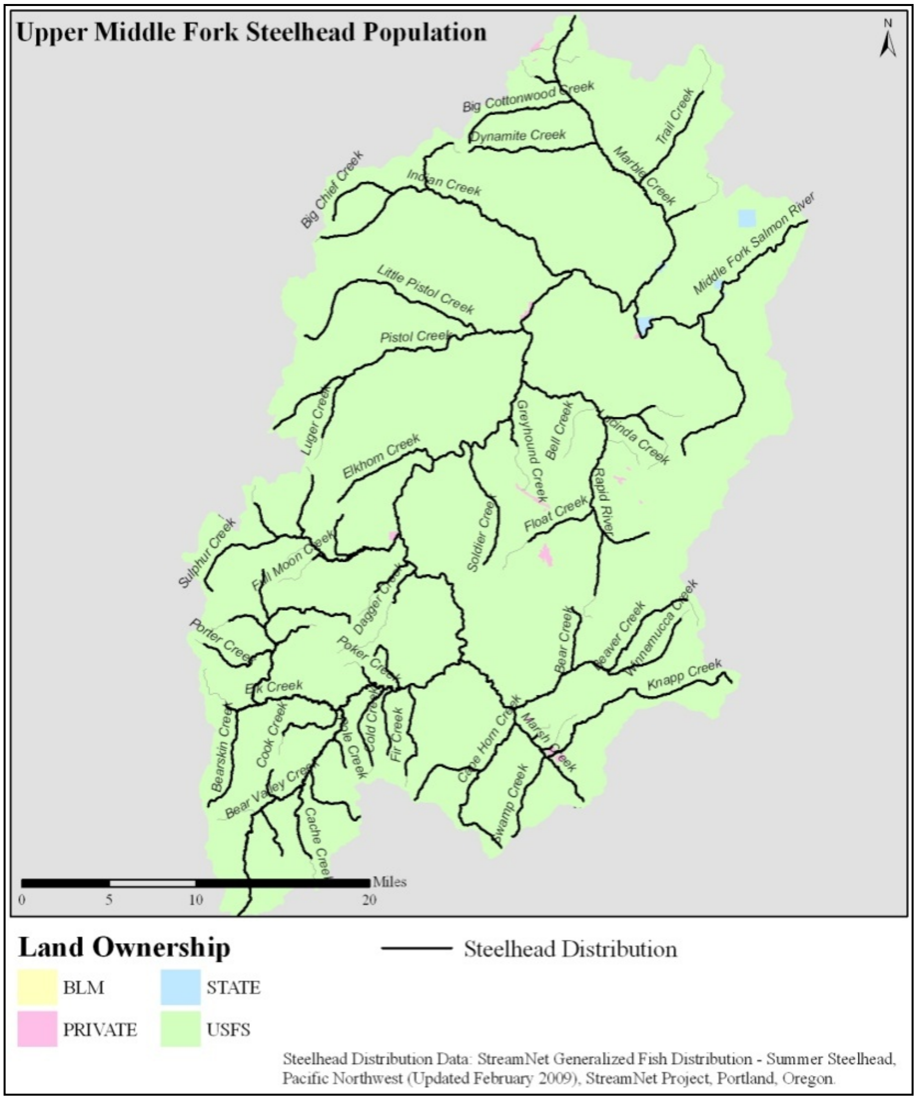
This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Upper Middle Fork Salmon River steelhead population includes the Middle Fork Salmon River watersheds upstream from Loon Creek. Major watersheds within the Upper Middle Fork include Marble Creek, Elkhorn Creek, Rapid River, Pistol Creek, Sulphur Creek, Marsh Creek, and Bear Valley Creek. The geographic area encompassed within this population has a drainage area of approximately 1,144 square miles (2,964 km^2).

The Middle Fork Salmon River basin has a broad climate range with prevalent Pacific maritime regime in the western watershed to a more continental regime in the eastern area (IDEQ 2008). For the Middle Fork Salmon River basin, most precipitation occurs as snow during winter and early spring, while summers are generally dry. Western portions of the basin generally receive more precipitation. Stream flow peaks during the spring months from snow melt. Aquatic habitat conditions in the Middle Fork Salmon River were rated as good to excellent (NPCC 2004, p. 2-138). There are about 1,476 km of stream within the population with about 1,148 km downstream of natural barriers.



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-9. Land ownership and steelhead distribution in the Upper Middle Fork Salmon basin. . [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land ownership within Upper Middle Fork Salmon River population is primarily U.S. Forest Service (99.57%), with state (0.20%) and private (0.24%) combined at less than one percent (Figure 6.3-9). The Upper Middle Fork Salmon River is almost entirely contained within the Frank Church ─ River Of No Return Wilderness. Streams situated outside the wilderness area are subject to more land management related impacts than wilderness streams. There are no major human population centers in the Middle Fork Salmon River basin, and private or state-owned lands within the wilderness are typically resort type developments.

The IDEQ is required by the Clean Water Act to assess all surface waters in Idaho and determine whether they meet state water quality standards and support their beneficial uses (e.g., cold-water aquatic life and salmonid spawning). The results of this assessment are included in the Integrated 03(d)/305(b)) Report. Table 6.3-18 includes stream segments in this population that are not fully supporting their assessed beneficial uses (impaired stream segments) and are listed in IDEQ's 2008 Integrated Report under the Clean Water Act, section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters that have an EPA-approved TMDL) (IDEQ 2009, 2014).

Table 6.3-18. Stream segments in the Upper Middle Fork Salmon River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2009, 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d)-Impaired Waters Needing a TMDL		
Bear Valley Creek - 4th order (Cache Creek to Elk Creek)	Sedimentation/Siltation	7.4
Bear Valley Creek - 5th order	Temperature, water	11.2
Section 4c-Waters Impaired by Non-pollutants		
Elkhorn Creek - source to mouth	Other flow regime alterations	29.01
Section 4a- Impaired Waters with EPA-Approved TMDLs		
Beaver Creek - Bear Creek to mouth	Temperature, water	5.3
Knapp Creek - source to mouth	Temperature, water	28.1
Marsh Creek - Beaver Creek to mouth	Temperature, water	5.5
Marsh Creek - Knapp Creek to Beaver Creek	Temperature, water	4.5
Marsh Creek - Knapp Creek to Beaver Creek	Temperature, water	0.8
Marsh Creek - source to Knapp Creek	Temperature, water	20.7
Marsh Creek - source to Knapp Creek	Temperature, water	1.1
Winnemucca Creek - source to mouth	Temperature, water	3.7
Winnemucca Creek - source to mouth	Temperature, water	12.9

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Stream habitat in the Upper Middle Fork Salmon River is well protected and in relatively good condition. Past land use activities that degraded stream habitat, such as mining and intensive livestock grazing, have now ceased. Potential habitat limiting factors such as sediment and temperature have largely been addressed and continue to improve.

The following section discusses the potential limiting factors for habitat within the population, using information from IDEQ reports and the Salmon Subbasin Assessment and Management Plan (IDEQ 2008; NPCC 2004; Ecovista 2004).

1. *Excess Sediment*

Fine sediment can harm steelhead and their habitat by smothering redds and spawning gravels, filling in pools used by juveniles for cover, or reducing the availability of aquatic insects (food). Excess fine sediments can affect abundance and productivity by reducing spawning habitat quality, incubation success, and by decreasing juvenile rearing habitat quality.

IDEQ (2014) listed 7.4 miles of Bear Valley Creek (Cache Creek to Elk Creek) as impaired by sediment. In Bear Valley Creek, there is a history of mining and livestock grazing that has contributed to excess sediment in the system. These land use activities no longer occur, although the legacy effects are still seen in channel and substrate conditions. Between 1956 and 1959, dredge mining of private land occurred in Upper Bear Valley Creek, resulting in the obliteration of 17,000 linear feet of Bear Valley Creek and 10,000 linear feet of tributary channels (IDEQ 2008). In 1969 an attempt was made to correct a portion of the dredged area. The lower reaches of Casner Creek and the dredged section of Bear Valley Creek were diverted and channelized. The diversion failed several times, most notably in a 1984 flood event that resulted in massive downstream erosion and erosion of tailing materials. As a result, the Shoshone-Bannock Tribes became involved and a more comprehensive remediation project was initiated. This second rehabilitation effort (1984 to 1989) brought about an upward trend in water quality (USFS 2000, as cited in IDEQ 2008).

IDEQ (2008) provided a history of livestock grazing in the Bear Valley Creek area. Early records of exact numbers and locations of livestock grazing do not exist. By 1930, there already were reports of overgrazing (Boise and Challis National Forests 1975, as cited in IDEQ 2008). In the 1960s, a deferred rest rotation system of pasture management was initiated on the Bear Valley C&H Allotment. Sheep grazing declined during the mid-60s to mid-70s, and in 1995 the area grazed by sheep was converted into a cattle allotment.

Monitoring of the area resulted in stricter livestock grazing allotment requirements in the Bear Valley and Elk Creek areas, which made it more difficult for the permittees to continue grazing in this area. In the upper watershed, particularly within the Bear Valley Creek watershed, including Elk Creek, the Bonneville Power Administration negotiated a buyout of grazing allotments that were identified as a significant cause of sediment loading from streambank erosion. This buyout began in 1998 and was completed in 2001, and a significant improvement has accrued in some areas. Additionally, the Shoshone-Bannock Tribes have initiated streambank stabilization projects and riparian planting to alleviate excess erosion. There has been no grazing in the watershed since 2001, when the livestock allotments were retired.

The mainstem segment of Bear Valley Creek has shown improvement over the years with a reduction in percent surface fines and an increase in streambank stability to near reference conditions (IDEQ 2008). The segments have been recommended for delisting and/or movement in to category 4b of IDEQ’s integrated report. (Stream segments in category 4b do not require a TMDL because other pollution control measures are in place and the streams are expected to meet water quality standards in the near future). Similarly, Bearskin Creek (an Elk Creek tributary) has also been recommended for movement into category 4b of the integrated report. Streambanks in Bearskin Creek are stable (91%-100%) yet percent fines are high (71%-95%). The amount of high sediment in Bearskin Creek may be a combination of naturally high sediment loads and low stream gradients (41% response reaches) combined with past land management activities. In Elkhorn Creek, IDEQ (2008) found little evidence of sediment levels above natural conditions. In North Fork Elkhorn Creek, outside the wilderness, streambanks were over 98 percent stable and percent surface fines were 21 percent, which is comparable to reference conditions. An old mine site approximately 100 meters from the stream upstream of a BURP site showed not sediment impacts to the stream. Aerial photos analyzed by IDEQ showed no significant mass wasting events or human influenced sources of sediment.

Due to the improving sediment conditions, it is likely that the sediment-impaired waters in the Upper Middle Fork will attain water quality standards in a reasonable period with passive restoration. With U.S. Forest Service leadership this is a reasonable approach. Monitoring with adaptive management should be adequate to assure attainment of sediment reduction goals.

2. *Elevated Water Temperature*

Elevated water temperatures may adversely affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions (Spence et al. 1996). IDEQ (2014) reported stream temperature impairments for 11.2 miles in the Bear Valley Creek watershed and 82.6 miles in the Marsh Creek watershed. IDEQ (2008) noted evidence of accelerated stream bank recession rates in a number of streams including Bear Valley Creek, potentially resulting in increased channel width and increased water temperatures. Increased thermal loading is frequently caused by alteration of riparian vegetation and/or channel geometry. Furthermore, bank stability is expected to increase over time as the stream recovers from past land uses, which will likely lead to reduced channel width and a possible decrease in summer stream temperatures. In 2008, IDEQ determined that since water quality standards were already being implemented in a reasonable time that would meet IDEQ criteria, TMDLs did not need to be developed for Bear Valley and Elk Creeks.

IDEQ (2008) developed temperature TMDLs for Marsh Creek and its tributaries Knapp, Beaver, and Winnemucca Creeks. The temperature TMDLs establish shade targets based on potential natural vegetation. Beaver Creek and Winnemucca Creek showed the greatest lack of shade, with both streams needing more than 50 percent reduction in solar loads. Both of these streams suffer from increased channel width as a result of morphological instability. Excessively wide channels result in less shade provided to the channel by the riparian vegetation (IDEQ 2008).

3. *Passage Barriers*

In the past, culverts on Casner, Cub, Fir, and Sack Creeks did not allow fish passage, but all impassable culverts have now been replaced. In 2005, the U.S. Forest Service and Valley County replaced culverts on Casner and Cub Creeks to allow fish passage (IDEQ 2008). The U.S. Forest Service replaced a culvert on FS Road 579 at Fir Creek with a bridge in 2009, and replaced three culverts on FS Road 582 at Sack Creek with a bridge in 2010. Passage barriers are no longer a limiting factor.

Summary of Current Habitat Limiting Factors and Threats

Aquatic habitats in most of the Upper Middle Fork Salmon steelhead population are abundant and in very good condition (NPCC 2004, p. 1-35). Factors affecting habitat quality reported for the Upper Middle Fork Salmon River steelhead population appear to be few. Because much of the population lies within a protected wilderness, the Upper Middle Fork Salmon has not experienced widespread habitat fragmentation associated with land use, development, and habitat conversion (NPCC 2004, p. 3-26).

Active restoration in some parts of the Upper Middle Fork Salmon has occurred to correct the effects of historic mining and livestock grazing. Cessation of these land use activities and habitat rehabilitation efforts over the last 20 years have allowed habitats to recover such that sediment levels are returning to near reference conditions. Priorities for habitat recovery should be continued protection of habitat, control of potential sources of sediment, and analysis of temperature conditions in Bear Valley Creek.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but needs to be managed to protect steelhead habitat in the Upper Middle Fork Salmon River population area.

1. Altered hydrology due to water diversions – It is unknown whether or not the handful of small water diversions in the Upper Middle Fork population bypass adequate flows, provide for fish passage, and have adequate screening in place.
2. Degraded riparian habitat due to grazing impacts – Assuring that the ESA section 7 consultations on U.S. Forest Service grazing allotments remain current should minimize any effects from grazing.
3. Habitat degradation from noxious weeds – The spread of noxious weeds can increase soil erosion and decrease native plant density. Annual grasses have the ability to alter the fire regime allowing for larger, more frequent fires.
4. Habitat degradation from recreational use – Impacts to steelhead habitat from recreational use are currently minimal but should continue to be monitored.
5. Reduction or removal of American Beaver (*Castor Canadensis)* – Beaver dams can substantially alter river ecoystems and provide the following possible stream habitat benefits: higher water tables; reconnected and expanded floodplains; more hyporheic exchange; higher summer base flows; expanded wetlands; improved water quality; and greater habitat complexity. Programs should be developed to encourage beaver activity in areas with low potential for beaver/human conflict and to implement beaver mimicry structures in areas with high potential for beaver/human conflict.

Hatchery Programs

There is no history of hatchery releases in the Upper Middle Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population.

Straying and interbreeding of hatchery-origin fish from other population areas with natural-origin fish in this B-run steelhead population remains a potential risk to the population's life history diversity. Currently, the risk posed by natural spawning of returning hatchery fish is impossible to quantify because of a poor understanding of current population sizes. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River and Salmon River continue to pose a threat to Upper Middle Fork Salmon River steelhead, which include both B-run and A-run fish, and to other Salmon River populations. Most harvest-related mortality for steelhead returning to the Salmon River MPG occurs in the mainstem Columbia River from the mouth upstream to McNary Dam during fisheries targeting fall Chinook salmon, including tribal gillnet and dip net fisheries. Salmon River B-run steelhead experience higher harvest rates than the A-run steelhead because they are larger and more susceptible to catch in the gillnet gear, and because their timing coincides with the return of fall Chinook salmon. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for Upper Middle Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

The strategy for dealing with habitat limiting factors is to continue protection afforded under wilderness designation, along with identification and control of possible sources of sediment from inactive mine sites and roads. Continued maintenance of access and system roads will reduce potential sediment sources and prevent potential migration barriers (e.g., culverts) from developing. Analysis of stream temperature, channel condition, and riparian function in Bear Valley Creek should prove useful in determining if active and passive rehabilitation efforts to date have been sufficient to recover aquatic habitat.

Priority Stream Reaches

The high priority stream reaches are those with intrinsic potential for steelhead in the major and minor spawning areas, shown in Figure 6.3-8.

Habitat Actions

The following habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in the Upper Middle Fork Salmon watershed.

1. Protect existing habitat to allow sediment levels and bank stability to return to reference conditions over time and to prevent any new degradation.

2. Control potential source of sediment from roads and inactive mine sites.

Implementation of Habitat Actions

Implementation of the habitat actions for this population will occur primarily through efforts of the Upper Salmon Basin Watershed Program partners. Following the existing U.S. Forest Service Land and Resource Management Plan should provide the protection to habitat needed for this population. IDFG has management authority for fish and wildlife in this area. During Plan implementation, NMFS will work with these partners to identify and prioritize habitat actions through the adaptive management process for each 5-year implementation period. No specific habitat projects have been identified at this time for the Upper Middle Fork Salmon River population.

Several habitat restoration projects have been completed within this population. Projects implemented to improve habitat conditions include streambank stabilization, passage barrier removal and replacement, riparian vegetation planting, riparian area fencing, stream structure enhancement, and stream and floodplain restoration. Future efforts will build on these accomplishments.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Upper Middle Fork Salmon River steelhead population is to continue managing the population for natural production. The strategy also calls to monitor the population for strays from Salmon River MPG hatchery programs and take necessary action to reduce spawning of hatchery strays with natural-origin steelhead. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Upper Middle Fork Salmon River supports a moderate proportion of B-fish. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest, and other MPG actions alone will not produce the increases in survival needed for the Upper Middle Fork Salmon River steelhead population and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.9 Panther Creek Steelhead Population

The Panther Creek steelhead population is currently rated as high risk due to a high spatial structure risk and a tentative moderate abundance/productivity risk (NWFSC 2015). The Panther Creek population is targeted to achieve a proposed status of Viable, which requires low abundance/productivity risk and no higher than moderate spatial structure risk. The diversity rating is sufficiently low for the population to reach its proposed status.

Current Status	Proposed Status
High Risk?	Viable

The actions identified in this section, together with the actions defined in Chapter 4 and Section 6.1, aim to achieve the population's proposed status by addressing limiting factors and threats throughout its range and life cycle.

Population Status

This section of the recovery plan compares the Panther Creek population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

This population includes the Panther Creek drainage, as well as main Salmon River tributaries from Panther Creek downstream to Chamberlain Creek (not including the Middle Fork Salmon River) (Figure 6.3-10). The primary main Salmon River tributaries in the population are Owl Creek, just downstream from Panther Creek, and Horse Creek. Steelhead in Panther Creek may have been largely eliminated in the 1950s due to water quality impacts from the Blackbird Mine (Rieffenberger et al. 2008); however, steelhead persisted in Owl Creek and other main Salmon River tributaries. Extensive mine site reclamation activities over the past 15 years have partially restored water quality in Panther Creek and its tributaries, and steelhead are likely recolonizing the upper Panther Creek drainage. The Panther Creek population is an A-run steelhead population.

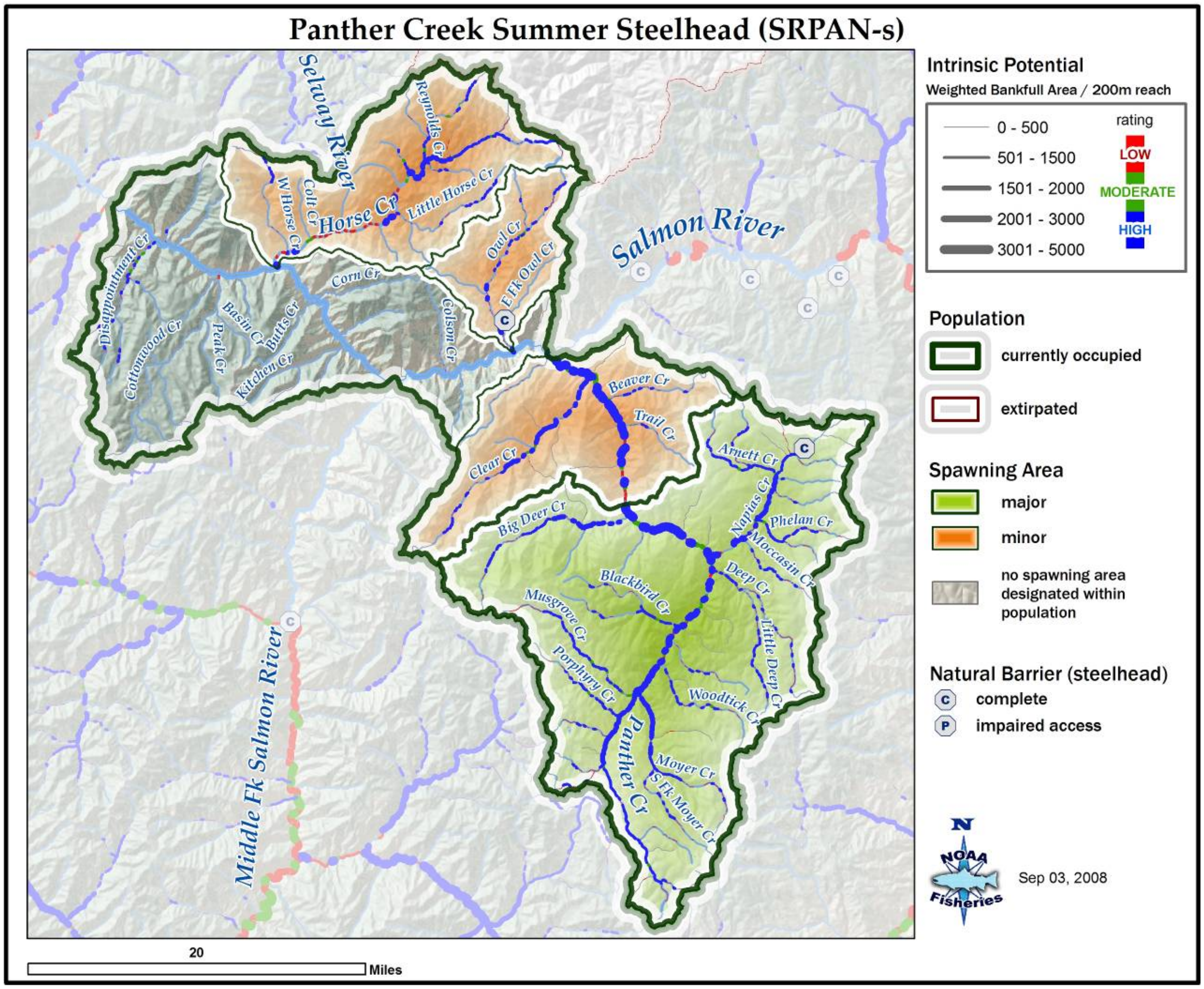


Figure 6.3-10. Panther Creek steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Panther Creek population as "Basic" in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Basic has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk ("low risk") of extinction over a 100-year timeframe.

Abundance and Productivity

Population-specific abundance estimates are not available for many Snake River Basin steelhead populations, including the Panther Creek population. The NWFSC (2015) used a recent genetic stock composition study to estimate abundance for some Snake River populations or groups of populations. However, there was insufficient data to generate estimates of natural-origin steelhead escaping to this population.

NWFSC (2015) therefore carried forward the provisional moderate risk rating for abundance and productivity from prior five-year status reviews, which was based on the aggregate abundance of A-run steelhead passing Lower Granite Dam.

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for those populations where new information is available. NMFS will update this section with this new information when it becomes available.

Spatial Structure

The ICTRT has identified one major spawning area (Upper Panther Creek) and three minor spawning areas (Lower Panther Creek, Owl Creek, and Horse Creek) within the Panther Creek steelhead population. All three historic minor spawning areas are occupied, but the Upper Panther major spawning area was classified by the ICTRT (2008) as unoccupied, due to the possible elimination of the steelhead from this area by heavy metal contamination from the Blackbird Mine. The NWFSC (2015) gave the population a high spatial structure risk. Because water quality has improved in Panther Creek after extensive mine reclamation work, steelhead may again be spawning in upper Panther Creek and its tributaries. Steelhead/rainbow trout juveniles have recently been found in Deep, Little Deer, Big Deer, South Fork Big Deer, and lower Blackbird Creeks (Rieffenberger et al. 2008). Documentation of steelhead spawning in Upper Panther Creek would reduce the population’s spatial structure risk to low. Spatial structure risk needs to be moderate for this population to meet its proposed status.

Diversity

The diversity risk for this population is driven by the extensive anthropogenic impacts to a major part of the population and by the history of past hatchery releases in Panther Creek. The elimination of steelhead from upper Panther Creek has altered distribution across habitat types and may have influenced major life history strategies. Distribution across different habitat types has changed substantially in that the distribution across the Southern Forested Mountains ecoregion has shrunk with the loss of the Upper Panther major spawning area. The effect of mine-related habitat impacts on major life history strategies or pathways is unknown but may be significant due to the range and duration of anthropogenic impacts to stream habitat in upper Panther Creek. It is currently presumed that only A-run type fish historically occupied the population.

There is currently no hatchery program in this population, but there have been hatchery releases in the past in the Panther Creek drainage. In 1977, and from 1982 to 1989, either steelhead fry, pre-smolts, smolts or adults (or combinations of these life-stages) were released into Panther Creek. The fish released were from the Pahsimeroi and Sawtooth Fish Hatcheries. The Pahsimeroi Fish Hatchery steelhead program was founded from Hells Canyon A-run stock and the Sawtooth Hatchery program was based on both local and Hells Canyon stocks. The number of smolts released each year from 1985 to 1988 ranged from 237,900 to 299,700. Numbers of adults released each year from 1983 to 1986 ranged from 121 to 677. More recently, eyed steelhead eggs were planted in Panther Creek for supplementation purposes from 1992 to 1996. The diversity of the natural population may have been substantially influenced by these hatchery releases, particularly given the assumed low density of steelhead in Panther Creek following the habitat degradation caused by the Blackbird Mine in the 1950s. However, a single genetic sample from this population showed no similarity to hatchery samples and was geographically consistent.

The factors described above lead to a tentative moderate diversity risk rating, which is sufficiently low for the population to reach its proposed status of viable (NWFSC 2015).

Summary

The Panther Creek steelhead population is currently at high risk due to a high risk rating for spatial structure risk (NWFSC 2015). Spawning surveys will be necessary to confirm whether steelhead are currently spawning in upper Panther Creek, which would reduce the population's spatial structure risk to low. A population-specific monitoring program is also necessary to reduce the uncertainty of the tentative moderate risk rating for abundance/productivity. Table 6.3-19 shows the population's current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-19. Panther Creek steelhead population risk ratings integrated across the four viable salmonid population (VSP) metrics. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M	HR Panther Creek
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

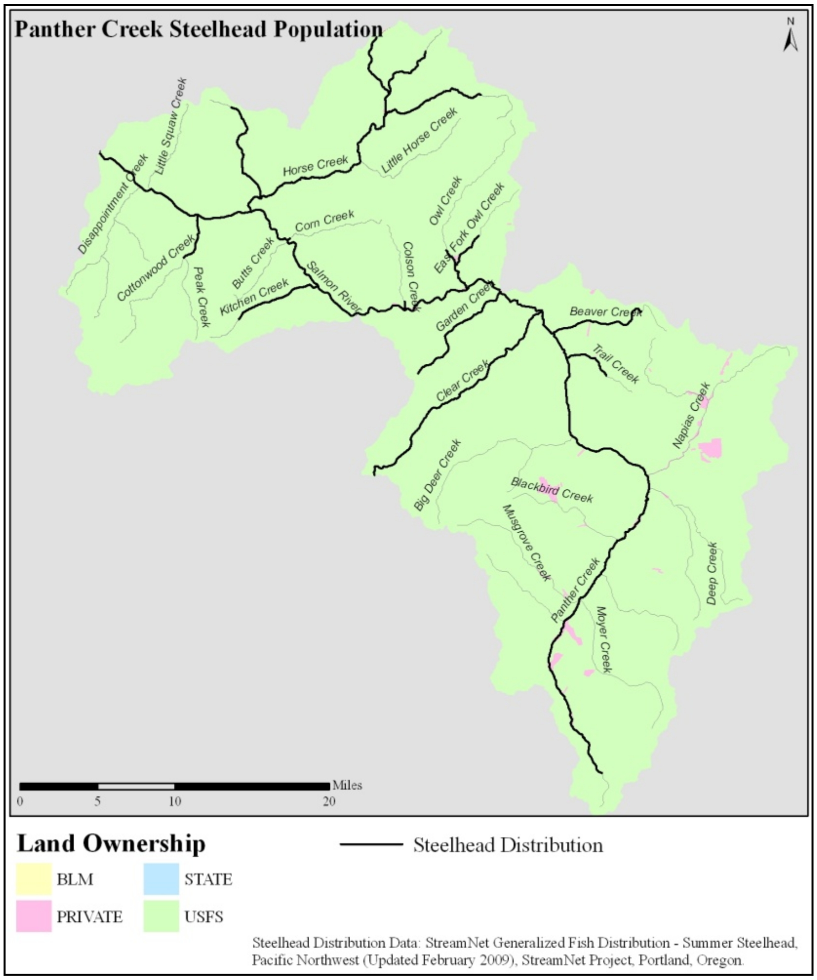
This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Panther Creek steelhead population includes the Salmon River and its tributaries upstream from the confluence of Chamberlain Creek (excluding the Middle Fork Salmon River watershed) to the confluence with Panther Creek. Major watersheds within the population include Panther Creek, Horse Creek, and Owl Creek. The geographic area encompassed within this population has a drainage area of approximately 993 square miles (2,572 km^2). The region is generally characterized by cold winters and warm dry summers. The majority of the annual precipitation occurs in the late fall and early spring with most precipitation occurring as snow with infrequent thunderstorms in the summer months. Stream flow peaks during the spring months from snow melt. Of the 1,059 km of stream within the population, approximately 710 km are accessible to fish.

There is only one major spawning area (Upper Panther Creek) designated for this population and three minor spawning areas (Lower Panther, Horse Creek, and Owl Creek).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-11. Land ownership within the Panther Creek steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land ownership within the Panther Creek population is primarily U.S. Forest Service (99.2%), with private at less than one percent (0.8%) (Figure 6.3-11). Small pockets of private ownership are concentrated in the drainages of Napias, Blackbird, and upper Panther Creeks. Land use in this population has included mining, logging, road construction, grazing, and recreation. The predominant human impact on the steelhead population has been past mining activity (NPCC 2004, p. 2-142).

Panther Creek historically supported large runs of steelhead, but these runs gradually declined during the 1940s when extensive mining activities began near Blackbird Creek. Stream habitat in Panther Creek was severely degraded by acid and heavy metal drainage from the Blackbird Mine, which operated from 1949-1967. Acid mine drainage resulted in elevated concentrations of copper in Panther Creek downstream from the mine, which eliminated most aquatic life by the early 1960s. However, extensive mine site reclamation activities over the past 15 years have partially restored water quality in Panther Creek and its tributaries, such that salmonid habitat is improving. Chinook salmon redds have been documented in mainstem Panther Creek starting in 2004 (IDFG 2007). No population-specific information is available on steelhead spawning, but steelhead may also be spawning in Panther Creek.

The largest tributary in the Upper Panther Creek major spawning area is Napias Creek. Napias Falls, a natural cascade starting one mile upstream from the mouth, may be a migration barrier to steelhead. Napias Creek above the falls is not designated critical habitat for either steelhead or Chinook salmon. NMFS once concluded that Chinook salmon could pass the current configuration of the falls at river flows of about 50 cubic feet per second (cfs) (NMFS 1998) and later at FR 64 CFR 57402 determined it likely constitutes a naturally impassable barrier for Chinook. Monthly mean discharge in upper Napias Creek, upstream from multiple tributaries which contribute additional flow, was 109 cfs in May and 99 cfs in June between 1992 and 2010 (USGS 2011), making it, at the very least, an important source of flow for Upper Panther Creek. Therefore, the Napias Creek watershed will be included in the description of habitat limiting factors and threats.

The IDEQ’s Integrated (303(d)/305(b)) Report identifies stream segments that are not fully supporting their assessed beneficial uses. These impaired stream segments are listed in the report under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an EPA-approved TMDL) (IDEQ 2009, 2014) (Table 6.3-20).

Table 6.3-20. Stream segments in the Panther Creek steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5-Impaired Waters Needing a TMDL		
Big Deer Creek - South Fork Big Deer Creek to mouth	Copper	2.98
South Fork Big Deer Creek - Bucktail Creek to mouth	Copper	0.52
Panther Creek - Napias Creek to Big Deer Creek	Copper	6.08
Panther Creek - Blackbird Creek to Napias Creek	Copper	6.97
Panther Creek - Blackbird Creek to Napias Creek	Copper, Cause Unknown	5.5
Trail Creek - source to mouth	Combined Biota/Habitat Bioassessments*	9.49
Section 4c-Waters Impaired by Non-pollutants		
None		0.0
Section 4a-Impaired Waters with EPA-Approved TMDLs		
None		0.0

*The Combined Biota/Habitat Bioassessment cause is assigned to a waterbody when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.
For example, a review of the benthic organisms present in a water body may indicate there is a water quality problem; however, the cause of the problem may not be apparent from the available data.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS concluded that the habitat limiting factors for the Panther Creek population are chemical pollutants, sediment, temperature, riparian conditions, surface water diversions, and migration barriers. Table 6.3-21 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. The following section discusses each of the limiting factors, using information from U.S. Forest Service reports, IDEQ reports, and the Salmon Subbasin Assessment and Management Plan (USFS 2005a; Rieffenberger et al. 2008; IDEQ 2001a; NPCC 2004; Ecovista 2004).

Table 6.3-21. Primary limiting factors identified for the Panther Creek steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Water Quality (Metals)	Pollutants can affect salmonid growth, development, and survival and can have both lethal and sublethal affects.	Improve degraded water quality and maintain unimpaired water quality.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Restore riparian condition and control sources of sediment.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Improve degraded water quality and maintain unimpaired water quality. Restore riparian condition.
Riparian Condition	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Restore riparian habitat condition to increase habitat complexity and large woody debris recruitment.
Stream Flow, Entrainment	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels). Juvenile fish entrainment occurs through unscreened irrigation diversions. Young salmon are at risk when they are diverted into canals or diversion ditches.	Increase instream flow, and screen irrigation diversion structures.

1. *Degraded Water Quality (Metals)*

Abundance and productivity of this population have been reduced by historic mine-related chemical contamination of surface water. The current spatial structure of this population has also been shaped by poor water quality conditions related to mining; steelhead in Panther Creek were likely extirpated in the 1950s due to chemical contamination (ICTRT 2008), but may now be reestablishing as water quality improves.

Sections of Panther Creek, Big Deer Creek, and South Fork Big Deer Creek are impaired due to copper contamination, totaling about 16 stream miles (IDEQ 2014). As reported by IDEQ (2001a), cobalt and copper were mined and milled at the site from 1917 to 1967. The main period of extraction followed World War II, from 1949 to 1967. No commercial mining has occurred at Blackbird Mine since 1967. Because of the nature of the rock ore being mined, cobalt, arsenic, copper, iron, and acid drainage were water quality concerns (Mebane 1994, as cited in IDEQ 2001a). Since the initiation of clean-up efforts at Blackbird Mine in the 1990s, substantial progress has been made in reducing acid and heavy metal contamination in Panther Creek streams and meeting required water quality standards. Salmonids are beginning to reoccupy lower Blackbird Creek and Big Deer Creek downstream of the South Fork of Big Deer Creek (Rieffenberger et al. 2008). Although fish populations have increased along main

Panther Creek, populations still appear to be depressed (Rieffenberger et al. 2008). Despite extensive mine reclamation efforts, contaminated soils and tailings piles still have the potential to deliver copper and other metals to streams during high streamflow events.

2. *Excess Sediment*

Currently, none of the streams within the Panther Creek population are reported to be impaired as a result of sediment. However, reported watershed conditions and sediment levels suggest elevated sediment may be affecting abundance and productivity of the Panther Creek steelhead population. The amount of disturbed area in a watershed is often used as an indicator of the potential adverse effects to aquatic resources. The U.S. Forest Service (2005a) used percent disturbance (from clear cut logging, fire, or mining) and road density within watersheds to assess watershed condition in Panther Creek. In the upper Panther Creek watershed the overall watershed condition was considered low risk (USFS 2005a), suggesting a low risk for sediment delivery to streams. In the middle Panther Creek watershed the overall watershed condition was rated as high risk. Total disturbance area for the watershed was 35.5 percent, with most of the disturbance created by fire (31% of the watershed). High road densities in Blackbird, Deep, and the Copper Creek subwatersheds also contribute to the high risk rating. Panther Creek, Copper Creek, and Blackbird Creek roads encroach on their respective streams for most of their length. In the Napias Creek watershed the overall watershed condition was rated as moderately high. Fire was the largest contributor to disturbance area (16% of the watershed) in the Arnett Creek subwatershed, which also has high road densities. In lower Panther Creek the overall watershed condition was rated as high risk, with 50 percent of the watershed classified as disturbed. Total disturbed area was dominated by fire (49% of the watershed) but road densities were low. The high levels of ground disturbance in Middle Panther Creek, Napias Creek, and Lower Panther Creek suggest that sediment delivery to streams may be high in these watersheds.

To directly assess sediment conditions in Panther Creek, the U.S. Forest Service (2005a) used sediment core samples of stream substrate to determine the suitability of the substrate for fish. The Forest Plan standard for sediment levels in resident fish streams is less than 28.7 percent fine sediment and the standard in anadromous fish streams is less than 20 percent fine sediment. Sediment sampling reported for many streams in the Panther Creek drainage often exceeded standards for fine sediments (USFS 2005a). In the upper Panther Creek watershed, upstream from the confluence of Moyer Creek, sediment monitoring from 1993 to 2004 showed that 33 percent (23 of 70) of the samples collected exceeded sediment standards. However, no stream consistently had sediment levels above standards, and no samples collected after 1996 were considered “functioning at unacceptable risk.” In the middle Panther Creek watershed, 39 percent (14 of 36) of the samples collected exceeded sediment standards. Deep and Woodtick Creeks met the sediment standard in most years. Big Deer Creek and Little Deep Creek did not meet standards in most years. In the Napias Creek watershed, 47 percent (34 of 73) of samples collected exceeded sediment standards. Napias Creek below Jefferson Creek was the only station of six stations evaluated that consistently met standards. At the mouth of Arnett Creek, there were no samples above the standards. In the lower Panther Creek watershed (downstream from Big Deer Creek), 63 percent (34 of 54) of the samples collected exceeded sediment standards. Sediment samples collected in lower Panther Creek and Clear Creek exceeded standards but the high sediment levels were likely in response to the Clear Creek wildfire in 2000. Sediment cores from sample sites throughout the Panther Creek thus suggest that sediment is elevated in middle Panther Creek, Napias Creek, and lower Panther Creek, matching the conclusions from the watershed disturbance assessment.

Logging occurred in the Owl Creek drainage from the early 1930s up to the late 1980s. In 1985, a large fire burned 27,000 acres in Owl Creek, increasing sediment loads to the streams; however, sediment sampling in 1999 shows that the upper reaches of the creek are improving (IDEQ 2001a). Warren and Anderson (2010) observed excellent instream habitat conditions and good riparian habitat conditions, indicating the stream was recovering well from the fire.

Given the watershed and sediment conditions described, sediment is likely to affect abundance and productivity of steelhead in the middle Panther Creek, Napias Creek, and lower Panther Creek watersheds. Sediment in the upper Panther Creek watershed and Owl Creek watershed does not appear to be a limiting factor for steelhead.

3. Elevated Water Temperature

Stream temperatures (7-day running maximum temperatures) recorded in the Panther Creek watershed from 1993 to 2004 sometimes exceeded PACFISH standards (USFS 2005a), suggesting possible temperature impacts to steelhead. U.S. Forest Service (2005a) reported the following temperature conditions in the Panther Creek drainage: In the upper Panther Creek watershed, stream temperatures were mostly within standards except for the Panther Creek mainstem and the mouths of Musgrove and Moyer Creeks, which had temperatures above standards for anadromous fish. In the middle Panther Creek watershed, stream temperature met standards in most years in Woodtick, Deep, Little Deep, and Big Deer Creeks and at one station on Panther Creek above Big Jureano Creek. Stream temperatures did not meet standards in Blackbird Creek at the mouth and in most years on Panther Creek at two stations, one above Napias Creek and the other above Deep Creek. In the Napias Creek watershed, stream temperature met standards in Moccasin and Arnett Creeks and in Napias Creek above Sharkey Creek. Stream temperature did not meet standards in Napias Creek just above Arnett Creek and from Phelan Creek to Moccasin Creek. At the mouth of Napias Creek stream temperature met standards in more than half of the years examined. Lower Napias Creek below Napias Falls tends to cool down as compared to the headwater reaches. Steelhead habitat in Napias Creek below Napias Falls is “functioning appropriately” in terms of temperature regime (USFS 2005a). In the lower Panther Creek watershed, Panther Creek at the mouth did not meet standards in all years. It is likely that many stream reaches in the lower Panther Creek watershed similarly exceed temperature standards (USFS 2005a), due in part to recent wildfire. Although Clear Creek, the major tributary in lower Panther Creek, met temperature standards in the 1990s, canopy cover was completely removed over the lower 7 miles of Clear Creek during the Clear Creek Fire of 2000.

Stream temperature is likely affecting steelhead abundance and productivity. Sporadic exceedances of temperature standards in the Upper Panther Creek watershed may merely reflect the range of natural conditions. More consistent temperature exceedances in the middle and lower reaches of Panther Creek, Napias Creek, Blackbird Creek, and Clear Creek may be linked to wildfire and to land use activities that have reduced riparian function. Fire can increase stream temperatures through the removal of riparian vegetation, leading to decreased shade and to unstable streambanks, which in turn can lead to increases in channel width. Lack of shade and wider stream channels allow more sun directly on the stream. Temperature impacts to Clear Creek are likely the result of fire-related conditions. These conditions are likely to improve over time with natural revegetation of hill slopes and riparian areas. Temperature impacts to other stream reaches in Panther Creek may be the result of human land uses, such as mining, grazing, and road-building, which have removed riparian vegetation.

4. *Degraded Riparian Conditions*

Degraded riparian conditions in the middle Panther Creek, Napias Creek, and lower Panther Creek watersheds may be reducing population abundance and productivity through changes in habitat quality. The U.S. Forest Service (2005a) described riparian conditions throughout the Panther Creek drainage. In the middle Panther Creek watershed, loss of functionality of riparian areas is related to historic mining, roads, and some grazing. Riparian areas along Panther Creek and Blackbird Creek have been adversely affected by roads and mining activities. On rare occasions, cattle graze along mainstem Panther Creek, but most of the grazing along perennial fish-bearing streams occurs along upper Deep Creek, Little Deep Creek, and upper Copper Creek. Grazing has adversely affected short segments of upper Spring Creek and Copper Creek.

Loss of large riparian trees has also affected stream complexity and stability. Large woody debris and pool frequency and quality do not meet desirable conditions in most reaches surveyed. Because of road encroachment and lack of large woody debris along main Panther Creek, pools are lacking. In general, streambank stability meets PACFISH standards, except for Blackbird Creek where streambanks are extremely unstable following years of mining and mine clean-up activities. Recent projects to stabilize these streambanks may mitigate this into the future. Most of the riparian areas along Blackbird Creek lack deep-rooted riparian vegetation species that hold streambanks together. In the Napias Creek watershed, loss of functionality of riparian areas is related to historic mining and grazing. Many stream reaches along Arnett, Napias, Phelan, Sharkey, and Rabbit Creeks have been placer or dredge-mined (USFS 2005a). Riparian conditions along some of these reaches have recovered, whereas continued cattle grazing has retarded recovery in other areas. Additionally, livestock grazing has affected riparian functionality along several reaches where historic mining never occurred such as upper Sawpit Meadows, Cat Creek, and Moccasin Creek. Overall, habitat elements such as large woody debris, pool frequency and quality, and streambank stability are below standards, and suggest poor riparian conditions.

In lower Panther Creek, there are no active grazing allotments along perennial streams. Riparian condition and function is improving as deciduous vegetation is recovering rapidly along most streams that were burned in the Clear Creek wildfire of 2000. Large woody debris before the Clear Creek fire was deficient in most areas, but U.S. Forest Service (2005a) estimated that LWD was increasing following the fire. Pool frequency and quality were below desirable conditions in 8 of 12 surveyed reaches in 1991. After the fire, riparian conditions in Lower Panther Creek below Beaver Creek, and in Clear Creek and Garden Creek, were severely degraded by the 2002 and 2003 thunderstorms and subsequent debris torrent. Most pool-forming features, such as boulders and LWD, were moved above the high water mark or completely transported out of the system. However, U.S. Forest Service (2005a) estimated that once fire-killed trees were recruited to stream channels, LWD would again play an active role in the formation of pools. Streambank stability along main Panther Creek met PACFISH standards in 1991, except for a couple of low gradient reaches just above the mouth of Clear Creek. After the thunderstorms and subsequent debris torrents, bank stability along lower Panther Creek below Beaver Creek, lower Clear Creek below Rancherio Creek, and Garden Creek was substantially reduced.

5. Migration Barriers

Migration barriers have affected the abundance, productivity, and spatial structure of the Panther Creek population. Several natural and man-made migration barriers exist in the Panther Creek steelhead population. For many years water chemical contamination and acid drainage from Blackbird Creek and Big Deer Creek, from the Blackbird Mine, essentially blocked steelhead migration up and down Panther Creek. More recently, observations of Chinook salmon spawning in Panther Creek suggest that water quality has improved (Rieffenberger et al. 2008). It is reasonable to assume that water quality conditions that allow Chinook salmon to migrate, spawn, and rear in Panther Creek also allow steelhead migration and recolonization.

In the Blackbird Creek watershed, the lower quarter-mile of West Fork Blackbird Creek has been placed into an artificial concrete channel across the tailings impoundment (Rieffenberger et al. 2008). At the lower end, the concrete channel plunges approximately 60-70 feet. This channel is both an upstream and downstream barrier to all fish species. Sections of main Blackbird Creek downstream of Meadow Creek have also been placed in a concrete channel to prevent leaching. There is a small dam and reservoir located along Blackbird Creek just upstream from Meadow Creek. Although both of these features are upstream barriers to fish passage, the barriers were created as part of remedial actions for historic mine impacts and are likely permanent.

Other artificial barriers also exist in the Panther Creek drainage, including in the Napias Creek and Woodtick Creek watersheds. In the Napias Creek watershed, the headgate associated with the Phelan Creek five ditch affects fish passage (Rieffenberger et al. 2008). Natural barriers occur at Devlin Falls along upper Napias Creek and at a talus slope along lower Moccasin Creek. Napias Falls, a natural cascade starting one mile upstream from the mouth, may be a migration barrier to steelhead at some streamflows. There is also a natural cascade located in lower Big Deer Creek that blocks migration of bull trout, steelhead trout, and Chinook salmon (Rieffenberger et al. 2008). In Woodtick Creek, one culvert has been identified as a fish barrier.

Although not likely a barrier to upstream migration, an unscreened water diversion in the lower segment of Owl Creek presents a possible entrainment hazard to fish migrating downstream (Warren and Anderson 2010).

6. *Reduced Streamflow during Critical Periods*

Streamflow reductions in this population could affect steelhead abundance and productivity, but impacts to spatial structure are negligible. Surface water withdrawals are scattered throughout the basin for irrigation and for mining purposes. U.S. Forest Service (2005a) listed 138 water rights within the Panther Creek drainage totaling an estimated 46 cfs. The Idaho Department of Water Resources (IDWR) water rights database showed 75 water rights in 2009, with maximum diversion rates greater than 0.02 cfs, distributed across 103 points of diversion, and with a combined maximum diversion rate of 125.94 cfs (IDWR 2008). Reductions in streamflow, particularly in tributaries, may be reducing the amount of available habitat for salmonids.

Summary of Current Habitat Limiting Factors

Freshwater habitat in the Panther Creek steelhead population has been degraded from its historical condition. Mining, grazing, logging, and roads have affected freshwater habitat quality (USFS 2005a; IDEQ 2001a). The historic impacts of chemical contamination from the Blackbird Mine essentially eliminated steelhead runs in Panther Creek (USFS 2005a; Rieffenberger et al. 2008), but water quality is now improving to the point where the reestablishment of salmon and steelhead populations in the drainage may be possible. Nonetheless, land use activities have reduced water quality, increased sedimentation and stream temperatures, reduced connectivity and adversely affected riparian condition and function. Each of these factors may act cumulatively or independently to adversely affect steelhead.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but needs to be managed to protect steelhead habitat in the Panther Creek population area.

1. Degraded water quality due to new mineral exploration and development – The Idaho Cobalt Project includes the development of an underground mine, a waste disposal site, and associated facilities on the Salmon – Challis National Forest near the Blackbird Mine site. The mine plans have successfully undergone ESA section 7 consultation for steelhead and Chinook salmon (NMFS 2008c). NMFS determined that the proposed mining project is not likely to jeopardize the continued existence of the species, in part due to several conservation measures included in the mine plan of operations: all effluent from the proposed mine will be treated before entering streams, water quality downstream from the mine will be monitored for heavy metals, and fish tissue will also be monitored for potential bioaccumulation of metals. Nonetheless, large-scale mining operations like the Idaho Cobalt Project pose a threat to salmonid habitat if water quality treatment measures are not successful.

2. Degraded habitat from noxious weeds – The spread of noxious weeds can increase soil erosion and decrease native plant density. Annual grasses have the ability to alter the fire regime allowing for larger, more frequent fires.
3. Degraded habitat functions and water quality due to wildfire – Severe wildfires can increase sediment delivery to streams, stream temperatures, and the vulnerability of streams to other disturbances. Additional disturbances in watersheds affected by the Clear Creek wildfire of 2000 should be avoided.
4. Reduction or removal of American Beaver (*Castor Canadensis)* – Beaver dams can substantially alter river ecosystems and provide the following possible stream habitat benefits: higher water tables; reconnected and expanded floodplains; more hyporheic exchange; higher summer base flows; expanded wetlands; improved water quality; and greater habitat complexity. Programs should be developed to encourage beaver activity in areas with low potential for beaver/human conflict and to implement beaver mimicry structures in areas with high potential for beaver/human conflict.

Hatchery Programs

Currently, no hatchery releases occur in the Panther Creek steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Hatchery releases did occur in the past. In 1977, and then from 1982 to 1989, steelhead were released into Panther Creek from the Pahsimeroi and Sawtooth Fish Hatcheries. The number of steelhead smolts released each year from 1985 to 1988 ranged from 237,900 to 299,700. Numbers of adults released each year from 1983 to 1986 ranged from 121 to 677. The ICTRT determined that spawner composition for the Panther Creek steelhead population may have been substantially influenced by the six continuous years of planting hatchery adults and smolts (ICTRT 2010). More recently (1992-1996) eyed steelhead eggs have been planted in Panther Creek for supplementation purposes. Currently, hatchery-origin steelhead from the mainstem Salmon River that could stray into the Panther Creek population represent a potential threat to the Panther Creek population. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fisheries Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Panther Creek steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for South Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

Priority stream reaches for habitat actions in this population are those with high intrinsic potential in: (1) The upper Panther major spawning area, and (2) the lower Panther minor spawning area. Within the upper Panther major spawning area, the Napias Creek drainage is of lower priority since the falls on lower Napias Creek may be a barrier to steelhead migration. However, this drainage does have suitable habitat for steelhead spawning and rearing.

The Upper Salmon Basin Watershed Program Technical Team prioritized stream reaches in the Salmon River upstream from the Middle Fork Salmon River confluence in a report titled Screening and Habitat Prioritization for the Upper Salmon Subbasin (SHIPUSS) (USBWP 2005), and updated the priorities in 2012 (USBWP 2012). The SHIPUSS report prioritized reaches based on a scoring system that considered stream connectivity, stream size, and habitat and fisheries information on a weighted basis. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. The SHIPUSS report ranks all stream reaches in the Panther Creek drainage as Priority I, indicating a large potential for habitat actions to benefit the Panther Creek steelhead population. The document is available at: http://modelwatershed.org/resources/library/.

For this population to recover, water quality must be suitable for adult spawning, juvenile rearing, and adult and juvenile migration. Chemical contamination from Blackbird and Big Deer Creeks could hinder the population’s recovery. The EPA is the lead agency for dealing with mine-related issues, and CERCLA-related remedial actions for the Blackbird Mine will continue to occur under EPA’s direction, separate from this recovery plan.

Habitat Actions

The following habitat actions, ranked by priority, are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed, and contribute to maintaining and restoring the VSP parameters while moving the population toward its proposed status of viable. Based on assessments of Panther Creek stream conditions (IDEQ 2001a; USFS 2005a; Rieffenberger et al. 2008), the quality of fish habitat could be improved by reducing the effects of mining, grazing, and roads. The habitat problems identified by these reports were water quality, sediment, temperature, migration barriers, and riparian condition. Many of the habitat issues identified for the Panther Creek population can be addressed by restoring riparian function and water quality.

1. Restore water quality in Blackbird Creek, Big Deer Creek, and Panther Creek so that steelhead migration, spawning, and rearing are no longer affected by chemical contamination of surface water or by unstable sediments from historic mining. This is the first priority for Panther Creek. However, EPA will continue to administer CERCLA-related remedial actions for the Blackbird Mine area, separate from this recovery plan.
2. Address sediment, temperature, and poor riparian conditions that degrade current and potential spawning and rearing habitat for steelhead. Improving riparian habitat conditions will lead to improvement in instream sediment and temperature conditions. Riparian habitats have been

affected by historic mining (Napias and Blackbird Creeks), roads along streams, and livestock grazing. Reducing road densities where feasible and continued road maintenance will reduce potential sediment sources. Managing livestock grazing allotments so that riparian vegetation is near potential natural vegetation will benefit sediment and temperature conditions.

3. Evaluate and upgrade existing irrigation diversions to ensure that diversions bypass adequate instream flow, provide for fish passage, and are adequately screened.
4. Eliminate fish migration barriers within the population that are blocking access to potential steelhead habitat.

Implementation of Habitat Actions

Implementation of habitat actions for this population will likely occur through the work of the Upper Salmon Basin Watershed Program partners. The U.S. Forest Service manages 99 percent of the land in this population area. EPA will continue to administer CERCLA-related remedial actions for the Blackbird Mine, separate from this recovery plan. During Plan implementation, NMFS will work with these partners to identify and prioritize needed habitat actions through the adaptive management process for each 5-year implementation period. No specific habitat projects have been identified at this time for the Panther Creek population.

Many habitat restoration projects have already been completed in the Panther Creek watershed. These projects included placement of instream structures and fish passage improvements, as well as riparian fencing, road and trail work, and modifications to surface water diversions. The Panther Creek drainage is also undergoing a substantial cleanup effort designed to reduce the legacy of mining-related impacts. Future habitat restoration efforts will build on these accomplishments.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Panther Creek steelhead population is to continue managing the population for natural production. The strategy also calls to monitor the population for strays from Salmon River MPG hatchery programs and take necessary action to reduce spawning of hatchery strays with natural-origin steelhead. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

Panther Creek supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest and other MPG actions alone will not produce the increases in survival needed for the Panther Creek steelhead population and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.10 Lemhi River Steelhead Population

The Lemhi River steelhead population is currently rated as maintained, with tentative moderate abundance/productivity risk and moderate diversity risk (NWFSC 2015). The population is targeted to achieve a proposed status of Viable, which requires low abundance/productivity risk. The current spatial structure and diversity ratings are sufficient for the population to reach its proposed status.

Current Status	Proposed Status
Maintained?	Viable

The actions identified in this section, together with the actions defined in Chapter 4 and Section 6.1, aim to achieve the population's proposed status by addressing limiting factors and threats throughout its range and life cycle.

Population Status

This section of the recovery plan compares the Lemhi River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The ICTRT (2003) distinguished Lemhi River steelhead as an independent population based on geographic isolation from other populations. In addition, the Lemhi River flows primarily through a dry intermontane sagebrush valley, which is a markedly different habitat type than other watersheds within the Salmon River basin, with the exception of the Pahsimeroi River. The population includes both the Lemhi River basin and the Salmon River and its tributaries from the Lemhi River downstream to the North Fork Salmon River (Figure 6.3-12). The Lemhi River population is an A-run steelhead population.

Current steelhead distribution is limited to the Lemhi River mainstem and its tributaries Hayden, Big Springs, and Bohannon Creeks. Most other tributaries have until recently been seasonally or permanently disconnected from the Lemhi River by irrigation diversion structures or low flows from water withdrawals, precluding access to anadromous fish. The recent stream reconnection projects, completed from 2007 through 2010, of Big Timber, Little Springs, Canyon, and Kenney Creeks should allow steelhead to reestablish in these tributaries, as should ongoing reconnection projects for Eighteenmile and Hawley Creeks. A NMFS model of potential habitat for the Interior Columbia Basin, based on geomorphological characteristics, suggests that these tributaries could support steelhead spawning and rearing if they were reconnected (NMFS 2006).

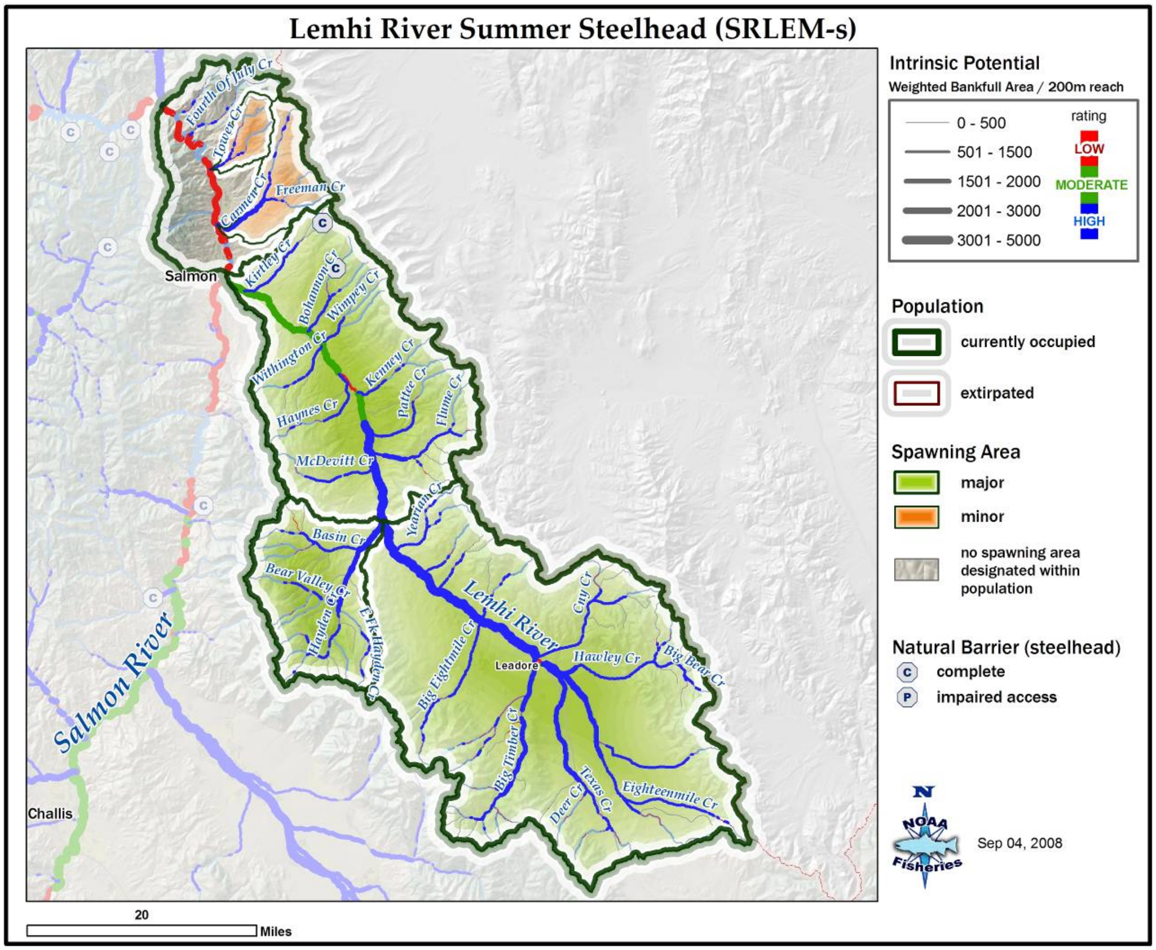


Figure 6.3-12. Lemhi River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Lemhi River population as "Intermediate" in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the abundance threshold) to achieve a 5 percent or less risk ("low risk") of extinction over a 100-year timeframe.

Abundance and Productivity

Estimates of natural-origin steelhead escaping into the Lemhi River population are available for three years (2010-12) based on PIT-tag recoveries (QCI 2013). Those estimates range from 428 to 680, all well below the ICTRT minimum threshold of 1,000 spawners for an Intermediate-size population (NWFSC 2015). The NWFSC did not generate spawner abundance and productivity estimates for this population because of the PIT-tag results were only available for three years; and because the genetic stock group containing this population, in the recent Snake River Basin steelhead genetic stock identification study, had a high potential for misclassification. It rated the Lemhi River population at moderate risk for current abundance and productivity (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for populations where new data is available. NMFS will update this section for this population when new information becomes available.

Spatial Structure

The ICTRT identified three major spawning areas (Upper Lemhi, Lower Lemhi, and Hayden Creek) and two minor spawning areas (Carmen Creek and Tower Creek) within this population (Figure 6.3-12). Both minor spawning areas are tributaries to the main Salmon River. Based juvenile distribution data, all three major spawning areas are currently occupied. Using adult weirs across the mouths of Carmen and Tower Creek, IDFG has recently detected both natural and hatchery-origin adults entering each of these streams during the survey period from mid- March to mid-May. These adult detections combined with juvenile survey data indicate that both minor spawning areas are currently occupied. The cumulative spatial structure risk for this population is low (NWFSC 2015).

Diversity

The diversity risk for this population is driven by lack of information on genetic diversity, uncertainty in the influence of anthropogenic disturbances on phenotypic variation, and the risk associated with hatchery steelhead programs.

Phenotypic variation for this population has likely been reduced due to altered habitat conditions in the Snake and Columbia River migration corridor and in spawning and rearing habitat within the population boundaries. In the migration corridor, reduced flows and elevated water result in a narrower window for successful smolt out-migration. Adult entry into the Snake River and migration through the lower Snake River in late summer and early fall is delayed because of elevated mainstem temperatures. It is hypothesized that adult upstream migration has changed from historic conditions due to temperature effects, but the magnitude of the change is unknown. Within the population boundaries, irrigation practices result in dewatering of the lower reaches of many tributaries for a significant part of the year. The disconnection of tributaries from the mainstem Lemhi River affects juvenile movement patterns and habitat use during freshwater rearing.

Hatchery steelhead are released into this population at multiple locations for both harvest augmentation and for supplementation of the natural population. Hatchery smolts are released into the main Salmon River near the Lemhi River confluence for harvest augmentation. These fish are primarily Pahsimeroi Hatchery A-run stock, which was derived from Hells Canyon (out-of-MPG) stock. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps, and are thus assumed to be spawning naturally. The number and proportion of natural spawners in this population that are hatchery-origin is unknown.

An additional diversity concern for this population is the effect of ongoing hatchery releases directly into the Lemhi River, and the recent management practice of releasing unmarked hatchery steelhead smolts and planting eyed eggs to supplement natural production. Hatchery smolts have been released into the population starting in 1968, and eggs, fry, pre-smolts, and adults have also been released in multiple years since that time. From 2001 to 2006, between roughly 116,000 and 260,000 unmarked hatchery steelhead smolts were released into the Lemhi River each year to supplement the population. At smolt-adult-return rates of 0.1-2.0 percent, returns from the smolt releases alone would range from 120 to 5,200 adults annually, and potentially could comprise a high proportion of total spawners in the population. Eyed eggs were also planted in the population from 1996 to 2002.

The factors described above lead to a moderate cumulative diversity risk, which is adequate for the population to reach its proposed status (NWFSC 2015).

Summary

The Lemhi River steelhead population is currently rated as Maintained due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity (NWFSC 2015). A population-specific monitoring program is necessary to reduce the uncertainty of this rating. Abundance and productivity will need to increase for the population to achieve its proposed status of viable. A diversity risk of moderate, on the other hand, is sufficiently low for the population to reach its proposed status. Table 6.3-22 shows the population's current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-22. Lemhi River steelhead population risk ratings integrated across the four viable salmonid population (VSP) metrics. The population does not meet population-level viability criteria.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	↑ V	M
	Moderate (6 – 25%)	M	M	**M Lemhi River**	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

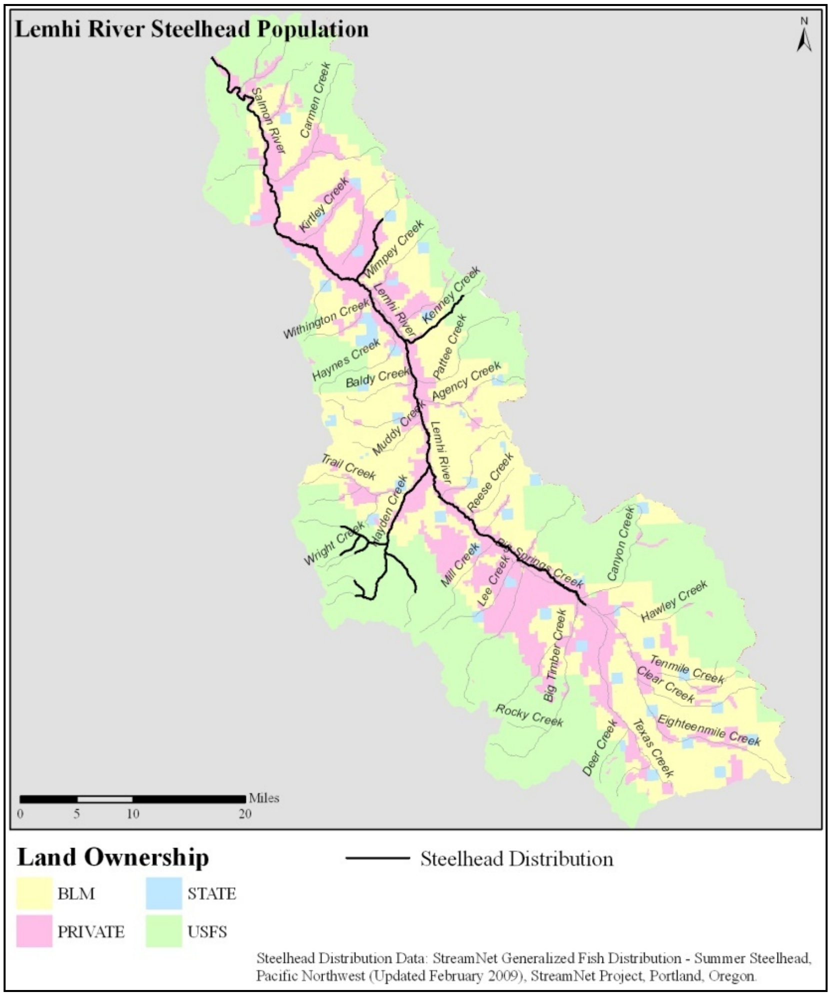
Natal Habitat

Habitat Conditions

The Lemhi River steelhead population area includes the Lemhi River basin and the Salmon River and its tributaries from the confluence of the Lemhi River to the confluence of the North Fork Salmon River. The population boundaries encompass 1,472 square miles (3,812 km^2). The drainage is semiarid, with most of the precipitation falling as snow in the higher elevations. The climate of the basin varies with changes in elevation from 4,100 feet to 11,000 feet. Annual average precipitation ranges from 7 inches at lower, drier elevations to 23 inches at higher elevations. Most of this occurs during winter months in the form of snow and in the spring and fall as rain (IDEQ 1999c).

The Lemhi River is a low gradient, spring-fed system that flows from the confluence of Texas and Eighteenmile Creeks near the town of Leadore to its confluence with the Salmon River at the town of Salmon. Peak flows generally occur in June and the lowest flows are experienced in August (IDEQ 1999c). Many streams within the basin have become disconnected from the Lemhi River because of irrigation withdrawals (IDEQ 1999c).

Land ownership within the Lemhi River basin is mostly U.S. Forest Service (42%), BLM (36%), and private (19%) with a much smaller portion of ownership under the state of Idaho (3%) (Figure 6.3-13). U.S. Forest Service lands occupy the upper benches and higher elevation forested lands. BLM lands are generally the low to mid elevation lands. The valley bottom lands are a mix of private, BLM and state ownership surrounding much of the mainstem Lemhi River and lower tributary stretches. The public lands are used for livestock grazing, timber, recreation, and a variety of other public uses. Private land management is mostly irrigated agriculture and livestock grazing in the valley bottom. Because of the ownership pattern in the Lemhi River basin, private ownership can have a large influence on steelhead habitats and production.



Lemhi River Steelhead Population

Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-13. Land-ownership pattern within the Lemhi River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

The Lemhi River basin has been degraded from its historic condition. Over a century of livestock grazing and instream flow alterations have substantially altered the vegetation, structure, and connectivity of the riparian zones in the Lemhi River basin. Altered riparian conditions exist throughout the population overlapping much of the currently occupied Chinook salmon and steelhead habitat (NPCC 2004, p. 3-22). The Lemhi River and nearly all of its tributaries are entirely or significantly diverted for irrigation purposes between late April and the end of October. Water claims on the major tributaries for the 30 watersheds presented in the Lemhi River Watershed and Subbasin Assessment totaled 787.4 cfs in 1999 (IDEQ 1999c). Many of the tributaries only reach the river during spring runoff. These seasonal variations in water quantity can have a severe effect on fish populations and movement as well as riparian vegetation within the basin (IDEQ 1999c). Historic mining also affected stream habitat in this population, and dredge piles along Kirtley and Bohannon Creeks show the legacy effects of past mining for gold.

IDEQ's 2012 Integrated 303(d)/305(b) Report includes stream segments listed under section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (EPA approved TMDLs) (IDEQ 2014). The following table displays impaired streams segments for the Lemhi River steelhead population and the impairments that prevent each stream reach from attaining its beneficial uses (Table 6.3-23). Although not all of these impaired stream reaches contain steelhead habitat or list impairments of direct concern to steelhead, the full list is included here to show the range of impairments to stream conditions within the Lemhi River steelhead population area.

Table 6.3-23. Stream segments in the Lemhi River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2009, IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d)		
Salmon River - Carmen Creek to North Fork Salmon River	Cause Unknown	16.1
Wallace Creek - source to mouth	Sedimentation/Siltation	7.9
Wallace Creek - source to mouth	Temperature, water	7.9
Salmon River - Pollard Creek to Carmen Creek	Cause Unknown	5.3
Texas Creek	Combined Biota/Habitat Bioassessments	14.9
Texas Creek	Sedimentation/Siltation	14.9
Section 4c-Waters Impaired by Non-pollutants		
Mill Creek - diversion (T16N, R24E, Sec. 22) to mouth	Low flow alterations; Other flow regime alterations	10.41
Walter Creek - source to mouth	Low flow alterations	7.84
Lemhi River - confluence of Eighteenmile and Texas Creeks	Low flow alterations	10.39
Texas Creek	Other flow regime alterations	14.93
Eighteenmile Creek - Hawley Creek to mouth	Low flow alterations	2.21
Little Eightmile Creek - diversion (T16N, R25E, Sec. 02) to	Low flow alterations	0.43
Sandy Creek - diversion (T20N, R24E, Sec. 17) to mouth	Low flow alterations	2.1
Sandy Creek - source to diversion (T20N, R24E, Sec. 17)	Low flow alterations	12.33
Bohannon Creek - diversion (T21N, R23E, Sec. 22) to mouth	Low flow alterations	1.36
Geertson Creek - diversion (T21N, R23E, Sec. 20) to mouth	Low flow alterations	11.44
Geertson Creek - source to diversion (T21N, R23E, Sec. 20)	Low flow alterations	14.71
Kirtley Creek - diversion (T21N, R22E, Sec. 02) to mouth	Low flow alterations	2.28
Section 4a-TMDLs		
Bohannon Creek - diversion (T21N, R23E, Sec. 22) to mouth	Sedimentation/Siltation	1.4
Bohannon Creek - source to diversion (T21N, R23E, Sec. 22)	Sedimentation/Siltation	13.6
Eighteenmile Creek - Clear Creek to Hawley Creek	Sedimentation/Siltation	8.4
Eighteenmile Creek - Divide Creek to Clear Creek	Sedimentation/Siltation	6.0
Eighteenmile Creek - Hawley Creek to mouth	Sedimentation/Siltation	2.2
Eighteenmile Creek - source to Divide Creek	Sedimentation/Siltation	29.7

Waterbody	Impairment/Cause	Stream Miles
Geertson Creek - diversion (T21N, R23E, Sec. 20) to mouth	Sedimentation/Siltation	11.4
Geertson Creek - source to diversion (T21N, R23E, Sec. 20)	Sedimentation/Siltation	14.7
Kirtley Creek	Sedimentation/Siltation	20.9
Kirtley Creek - diversion (T21N, R22E, Sec. 02) to mouth	Sedimentation/Siltation	2.3
McDevitt Creek - diversion (T19N, R23E, Sec. 36) to mouth	Sedimentation/Siltation	2.4
McDevitt Creek - source to diversion (T19N, R23E, Sec. 36)	Sedimentation/Siltation	4.4
McDevitt Creek - source to diversion (T19N, R23E, Sec. 36)	Sedimentation/Siltation	19.1
Sandy Creek - diversion (T20N, R24E, Sec. 17) to mouth	Sedimentation/Siltation	2.1
Sandy Creek - source to diversion (T20N, R24E, Sec. 17)	Sedimentation/Siltation	12.3
Wimpey Creek - source to mouth	Sedimentation/Siltation	19.7
Bohannon Creek - diversion (T21N, R23E, Sec. 22) to mouth	Temperature, water	1.4
Bohannon Creek - source to diversion (T21N, R23E, Sec. 22)	Temperature, water	13.6
Eighteenmile Creek - Clear Creek to Hawley Creek	Temperature, water	8.4
Eighteenmile Creek - Divide Creek to Clear Creek	Temperature, water	6.0
Eighteenmile Creek - Hawley Creek to mouth	Temperature, water	2.2
Eighteenmile Creek - source to Divide Creek	Temperature, water	29.7
Kirtley Creek - diversion (T21N, R22E, Sec. 02) to mouth	Temperature, water	2.3
Lemhi River - Kenney Creek to mouth	Temperature, water	24.6
Lemhi River (East Branch)-Eighteenmile & Texas Ck Confluence	Temperature, water	10.4
Lemhi River (West Branch) - Big Spring Creek	Temperature, water	6.6
Little Eightmile Creek	Temperature, water	0.4
Little Eightmile Creek-source to diversion	Temperature, water	25.0
Sandy Creek - source to diversion (T20N, R24E, Sec. 17)	Temperature, water	12.3

*The combined biota/habitat bioassessment cause is assigned to a waterbody on the 303(d) list (Category 5 of the integrated report) when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.

**"Cause Unknown" as an impairment is used by IDEQ when instream monitoring protocols indicate the stream segment does not support the beneficial uses but the cause of the problem is not clear and may not be identifiable until a full water body assessment or TMDL is completed. For example, a review of the benthic organisms present in a water body may indicate a water quality problem.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS conclude that the habitat limiting factors for the Lemhi steelhead population are reduced streamflow, passage barriers, juvenile fish entrainment, poor riparian conditions, sedimentation, and elevated stream temperatures. Table 6.3-24 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. Discussions of each limiting factor follow using information from IDEQ reports, the Salmon River Subbasin

Assessment and Management Plan, and the Idaho Model Watershed Plan (IDEQ 1999c, 2009; ISSC 1995; NPCC 2004; Ecovista 2004).

Table 6.3-24. Primary limiting factors identified for the Lemhi River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

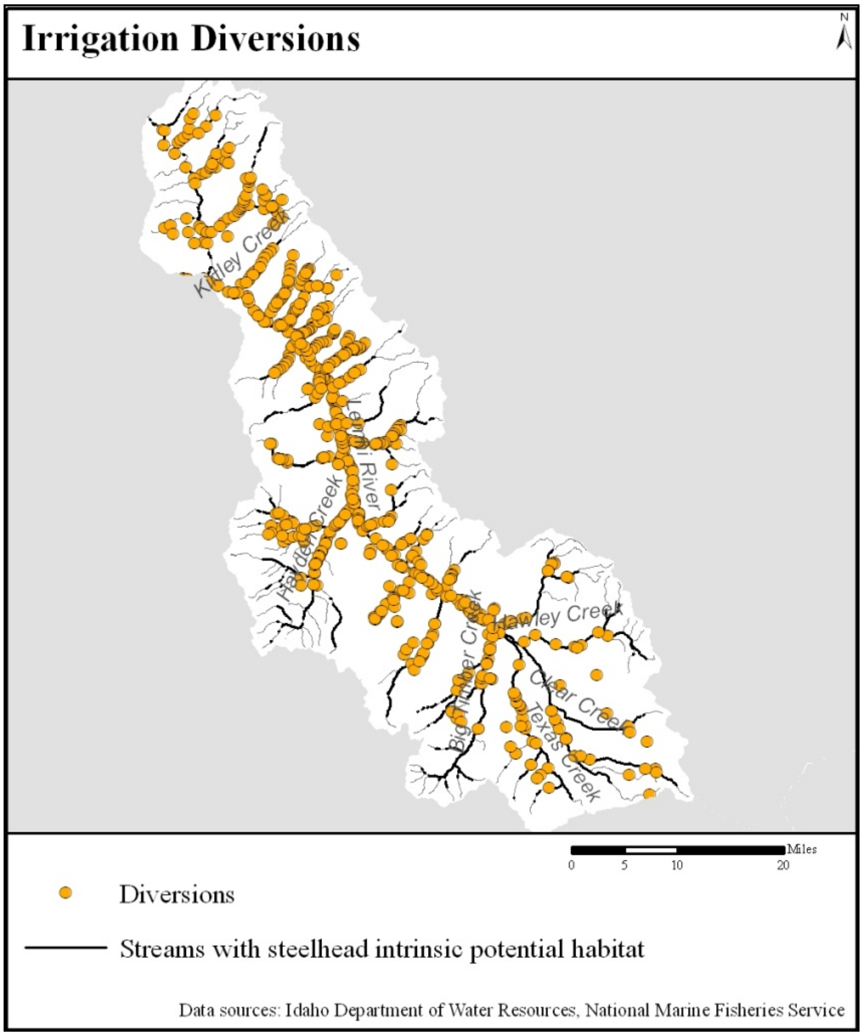
Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Stream Flow	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels).	Water quantity restoration actions to improve instream flow and stream connectivity.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Obstruction restoration actions to correct or remove fish passage barriers.
Entrainment	Juvenile fish entrainment occurs through unscreened irrigation diversions. Young salmon are at risk when they are diverted into canals or diversion ditches.	Eliminate entrainment through actions that prevent the loss of fish in irrigation diversion systems.
Riparian, Floodplain, and Instream Habitat Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and large woody debris recruitment (habitat complexity and pool formation).	Riparian and floodplain restoration actions to increase habitat complexity, large woody debris recruitment, shade, and bank stability.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream.

1. *Reduced Flow during Critical Periods*

Conditions reported for the Lemhi steelhead population suggest that reduced streamflow is the most important factor limiting abundance and productivity for this population. Streamflow conditions are also affecting spatial structure within the population by eliminating access to tributary habitat.

The NPCC (2004) identified disconnected tributaries (primarily through dewatering) as one of the major impacts on aquatic habitat quality and quantity for the Lemhi River basin. The Idaho Model

Watershed Plan (ISCC 1995) identified insufficient flows in the Lemhi River for adult migration below Agency Creek. Irrigation diversions that disconnect tributaries from mainstem Lemhi River have contributed to lost steelhead production in Texas Creek, Agency Creek, Wimpey Creek, Big Timber Creek, Big Eightmile Creek, Withington Creek, Sandy Creek, Little Eightmile Creek, Pattee Creek, Kenney Creek, and possibly others (ISCC 1995). Many of these streams have been listed by IDEQ (2009) as impaired by altered low stream flows (a non-pollutant impairment) (Table 6.3-23). Figure 6.3-14 shows the extent of irrigation diversions in the Lemhi River.



Data sources: Idaho Department of Water Resources, National Marine Fisheries Service

Figure 6.3-14. Surface water diversions in the Lemhi River steelhead population.

2. Migration Barriers

Conditions reported for the Lemhi steelhead population suggests that migration barriers reduce abundance and productivity of steelhead, and have probably affected spatial structure within the population. Migration barriers in this population are primarily caused by surface water withdrawals. One of the primary limiting factors for steelhead in the Lemhi River watershed is disconnected tributaries. Of the 30 tributaries to the Lemhi River, Hayden and Big Springs Creeks were historically the only tributaries that maintained connections to the mainstem year-round (NPCC 2004). Recently Big Timber, Little Springs, Canyon, and Kenney Creeks have been reconnected to the mainstem Lemhi River, and there are ongoing reconnection projects for Eighteenmile and Hawley Creeks.

Fish passage barriers in this population also exist at road-stream crossings. Culverts designed to pass stream flow underneath the road often create passage barriers to adults and juvenile fish. The Upper Salmon Basin Watershed Program maintains a database of culverts and bridges within in the Upper Salmon River basin, to be used as a planning tool to identify priorities for replacement to improve fish passage and watershed function. Within the Lemhi River steelhead population, 7 road crossings are currently identified as high priorities for replacement, on Texas, Canyon, Basin, Little Sawmill, Pratt, Tower, and Little Fourth of July Creeks (USBWP 2016). Additional road crossings on U.S. Forest Service lands may create fish passage barriers. As tributaries are reconnected to the mainstem Lemhi River through stream flow enhancement projects, addressing potential steelhead barriers at road-stream crossings will become more important for this population. Between 2010 and 2015, Upper Salmon Basin Watershed Program partners replaced culverts on Carmen, Canyon, Hawley, Wimpey, Bohannon, Pratt, Little Springs, and Agency Creeks.

3. Juvenile Fish Entrainment

Juvenile fish entrainment can occur through unscreened irrigation diversions. Installation of fish screens in the Lemhi River basin began in the late 1950s. Currently, fish screens are installed in accordance with screening standards established by NMFS (NMFS 2011). Approximately 100 irrigation diversions in the Lemhi River basin have been equipped with fish screens, primarily through the IDFG’s Fish Screen Program. On the Lemhi River mainstem, 70 existing diversions have been screened. An additional 32 diversions have been screened in the river’s tributaries, including 12 on Hayden Creek, 7 on Big Springs Creek, 5 on Wimpey Creek, 6 on Bohannon Creek, 2 on Kenney Creek, and 1 on Hawley Creek. As priority tributaries are being reconnected to the mainstem Lemhi River, Upper Salmon Basin Watershed Program partners are working with landowners to screen diversions on these tributaries. However, to date some of the diversions on reconnected tributaries remain unscreened and most of the diversions in the disconnected tributaries remain unscreened. Continued efforts to screen unscreened diversions should focus on the priorities identified by the Upper Salmon Basin Watershed Program partners.

4. Degraded Riparian, Floodplain, and Channel Conditions

Riparian and instream habitat conditions are degraded along much of the Lemhi River. The lower Lemhi River has been affected by numerous bank stabilization and channelization activities over the years. Trapani (2002) collected information on the Lemhi River in 1994 that suggested that riparian habitat function was below optimal condition for salmonids, particularly in terms of bank stability and pool frequency. NMFS (1996) standards classify streambank stability of greater than 90 percent as properly functioning, bank stability of 80 to 90 percent as functioning at risk, and streambank stability of less than 80 percent as not properly functioning. Streambanks in the Lemhi River were 75 percent stable from the mouth to Agency Creek, 85 percent stable from Agency Creek to Hayden Creek, and

61 percent stable from Hayden Creek to the town of Leadore (Trapani 2002), all either functioning at risk, or not properly functioning. Streambanks in Big Spring Creek were 54 percent stable and streambanks in Hayden Creek were 65 percent stable, both not properly functioning. The dominance of fast water habitat types in the Lemhi River also suggests a lack of pool forming structures that could be provided by a functional riparian zone. Fast water habitat types in the mainstem Lemhi River ranged from 75 to 92 percent of total habitat, resulting in pool habitat of only 8 to 25 percent of total habitat. A high percentage of fast water habitat types (greater than 80% of total habitat) was also noted in Big Springs and Hayden Creeks. Pool habitat is important for juvenile rearing and adult migration (resting pools) and can be formed and maintained by the presence of large woody debris and stable banks.

IDEQ’s TMDL for sediment in the Lemhi River prescribes a reduction in streambank erosion and anticipates that this reduction will result from an improvement in riparian vegetation density and structure. An increase in riparian vegetation should help armor streambanks, reduce lateral recession, trap sediment, and reduce the erosive energy of the stream. This, in turn, should reduce sediment loading. The TMDL prescriptions for sediment and stream surveys conducted by Trapani (2002) indicate that functional riparian communities are a key component in reducing sediment and improving habitat conditions for salmonids in the Lemhi River basin. The Idaho Model Watershed Plan noted that riparian habitat condition needs improvement in all areas, particularly in Big Springs Creek where degraded habitat conditions were considered a major limiting factor (ISCC 1995). Grazing impacts on Big Springs Creek are being reduced through various measures such as livestock fencing, and habitat conditions are improving. A reduction in the grazing impacts will play an important role in the recovery of riparian function.

5. *Excess Sediment*

Conditions reported for the Lemhi River steelhead population suggest that sediment reduces abundance and productivity of steelhead. As indicated by IDEQ (2014), some stream reaches in the Lemhi River basin have high levels of fine sediment. The Idaho Model Watershed Plan (ISCC 1995 also listed sediment as a limiting factor for salmonids in the Lemhi River, primarily in tributaries to the mainstem due to unstable streambanks and irrigation returns. Cobble embeddedness measured in three reaches of the Lemhi River ranged from 40 to 45 percent (Trapani 2002). This is well above the NMFS (1996) standards, which classify cobble embeddedness greater than 30 percent as not functioning properly. Cobble embeddedness in Big Springs Creek (53%) and Hayden Creek (38%) also appear to be above optimal conditions.

IDEQ has developed sediment TMDLs for the following tributaries to the Lemhi River: McDevitt, Eighteenmile, Sandy, Wimpey, Bohannon, Geertson, and Kirtley Creeks (Table 6.3-23). For these streams, sediment levels exceeded fine sediment targets for percent subsurface and surface fine levels. For the TMDL, the target for percent subsurface fines, measured using McNeil core samples, was set at 28 percent or less fine particles < 6.35 mm (0.25 in), not including substrate > 63.5 mm (2.5 in). The Salmon-Challis National Forest has a similar objective of 20 percent or less fine sediment < 6.35 mm (0.25 in.) in stream substrate down to 6 inches depth for streams supporting anadromous fish. In contrast, subsurface fine sediments measured for these streams varied from 29.8 to 38.0 percent. The TMDL target for surface fines, measured using Wolman pebble counts, was set at 20 percent or less for fine particles < 6.35 mm (0.25 in.) at riffles below pool tail-outs. Percent surface fines were more variable across sampling stations within these streams and varied from 1 to 68 percent, both above and below the target. Subsurface fine levels, however, are a better indicator of the capability of spawning habitat.

IDEQ (2009) reported that high sediment levels were caused by poor stream bank stability, poor riparian condition, and roads. In addition to the TMDL streams, IDEQ placed segments of Wallace, Mill, and Texas Creeks on the 303(d) list for sedimentation (IDEQ 2009). Wallace Creek is a tributary to the main Salmon River.

6. *Elevated Water Temperature*

Conditions reported for the Lemhi steelhead population suggest that high temperatures may be reducing abundance and productivity of steelhead. The Salmon River Subbasin Assessment and Management Plan rated temperature as having a moderate to high influence on habitat quality in the Lemhi River from the mouth upstream to the town of Leadore, including Big Springs Creek, which runs parallel to the upper Lemhi River (NPCC 2004, p. 3-22). The Idaho Model Watershed Plan (ISCC 1995) also listed temperature as a major limiting factor in Big Springs Creek. The plan found that elevated stream temperatures in the Lemhi River basin were likely caused by altered riparian vegetation and reduced stream flows through irrigation diversion withdrawals (ISCC 1995).

IDEQ has established stream temperature water quality standards to support cold-water biota and salmonid spawning. The cold-water biota standard is for stream temperatures not to exceed 22 °C (71.6 °F) with a maximum daily average no greater than 19 °C (66.2 °F). The standard for salmonid spawning is for stream temperatures not to exceed 13 °C (55.4 °F) with a maximum daily average no greater than 9 °C (48.2 °F) during spawning and incubation periods identified for individual species. Steelhead in the Lemhi River generally spawn in April and May. Elevated stream temperatures are most likely during base flow periods in late summer, thus having the most impact on rearing juveniles.

Based on the standards listed above, IDEQ (2009) placed Wallace, Eighteenmile, Little Eightmile, Sandy, and Bohannon Creeks on the 303(d) list for temperature impairment of cold-water aquatic life and/or salmonid spawning. Water temperatures measured in Eighteenmile Creek exceeded water quality standards for both cold-water biota and salmonid spawning, potentially due to warm irrigation return flows and reduced flow from irrigation diversions (IDEQ 2009). Temperatures in Little Eightmile Creek exceeded cold-water aquatic life standards, and temperatures in Sandy Creek exceeded both salmonid spawning and cold-water aquatic life standards. Measured water temperatures within Bohannon Creek exceeded standards for salmonid spawning, likely due to degraded riparian habitat conditions and reduced flow from irrigation diversion. IDEQ has now written temperature TMDLs for the Lemhi River and Eighteenmile, Little Eightmile, Sandy, Bohannon, and Kirtley

Creeks, with goals of increasing shade levels to that of potential natural riparian vegetation and decreasing stream temperatures (IDEQ 2012).

Summary of Current Habitat Limiting Factors

Freshwater habitat in the Lemhi River basin has been degraded from its historical condition. Stream dewatering, alterations to riparian areas, and increased fine sediments have affected freshwater habitat quality (NPCC 2004, p. 3-18). Over a century of livestock grazing and instream flow alteration has altered stream habitat and reduced the connectivity of habitat in the Lemhi basin (NPCC 2004). These alterations include loss of available habitat due to low flows and disconnected tributaries, excessive sedimentation, high stream temperatures from reduced shading, and bank instability. Each of these factors may act cumulatively or independently to adversely affect Lemhi River steelhead.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but needs to be managed to protect habitat for Lemhi River steelhead.

1. Reduced flow during critical period due to new water development - Because instream flows are already low due to irrigation withdrawals, new water development for agriculture or other purposes could further threaten steelhead habitat.
2. Loss of floodplain connectivity and function due to development - Residential development in floodplains and riparian zones can lead to loss of riparian vegetation, loss of floodplain function, and bank instability. Increased bank instability often leads to additional channel hardening projects (e.g. riprap). Local efforts to reduce this threat to stream habitat are ongoing. For example, the Nature Conservancy and Salmon Valley Stewardship are working with private landowners to educate them on riparian setbacks and retaining vegetation along streams and to develop conservation easement agreements.
3. Degraded habitat conditions due to noxious weeds - The spread of noxious weeds can increase soil erosion and decrease native plant density. Annual grasses have the ability to alter the fire regime allowing for larger, more frequent fires.
4. Reduction or removal of American Beaver (*Castor Canadensis*) - Beaver dams can substantially alter river ecosystems and provide the following possible stream habitat benefits: higher water tables; reconnected and expanded floodplains; more hyporheic exchange; higher summer base flows; expanded wetlands; improved water quality; and greater habitat complexity. Programs should be developed to encourage beaver activity in areas with low potential for beaver/human conflict and to implement beaver mimicry structures in areas with high potential for beaver/human conflict.

Hatchery Programs

No hatchery releases currently occur in the Lemhi River steelhead population area, but Salmon River releases occur below the Lemhi River for harvest augmentation. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps. Some of these steelhead from Salmon

River hatchery programs could potentially stray into the Lemhi River and spawn naturally. The number and proportion of natural spawners in this population that are hatchery-origin is unknown, but could affect the population's genetic diversity. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River and Salmon River continue to pose a threat to Lemhi River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, harvest-related impacts are currently controlled through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for South Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The Upper Salmon Basin Watershed Program Technical Team created a list of priority stream segments for salmonid habitat improvement projects in 2005 and updated the list in 2012 (USBWP 2012). This prioritization report, called Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin (SHIPUSS), considered multiple species, including spring/summer Chinook salmon, steelhead, and bull trout. Despite including other species, the SHIPUSS prioritization overlaps considerably with habitat that has intrinsic potential for steelhead and is therefore transferable to this recovery plan.

The SHIPUSS priority stream reaches identified in 2005 are shown in Figure 6.3-15. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2012). The 2012 report with an updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

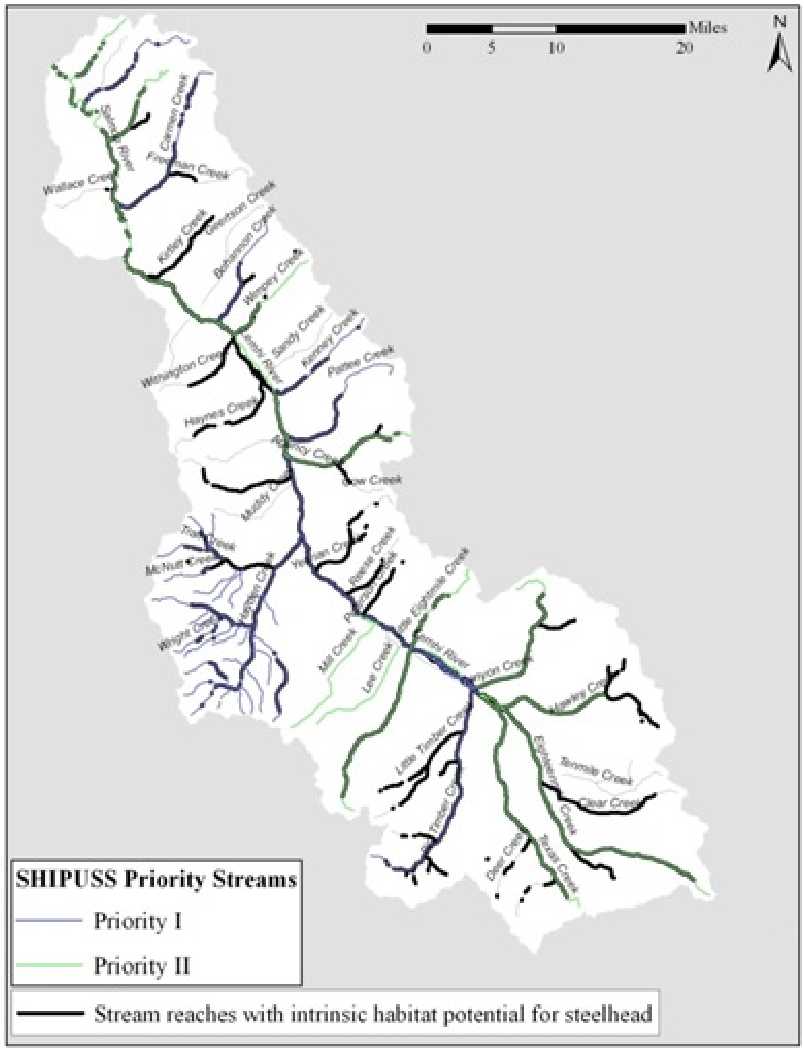


Figure 6.3-15. Priority stream reaches for the Lemhi River steelhead population (USBWP 2005). The list of priority streams was updated in 2012: http://modelwatershed.org/resources/library/.

Habitat Actions

The following habitat actions, ranked in priority order, are intended to improve productivity rates and increase the capacity for natural smolt production in the population.

1. Increase flows in the mainstem Lemhi River. Increasing stream flows is the highest priority action to increase abundance and productivity for this population. The upper mainstem Lemhi River currently supports steelhead spawning and increasing flow in this reach will likely increase productivity. Increasing instream flows in the mainstem Lemhi can be accomplished through water transactions such as permanent subordination agreements, long-term leases, and water right acquisitions.

2. Reconnect priority tributaries to the mainstem Lemhi River to allow steelhead to reach currently inaccessible tributary habitat and to increase flows to the mainstem Lemhi River. Reconnections may be necessary due to dewatering or manmade barriers.

3. Maintain the network of fish screens on diversions to continue to minimize effects of entrainment in water diversions. Continue to screen additional diversions in conjunction with the higher priority actions described above and in the context of the priorities set in the SHIPUSS report (USBWP 2012) for all of the populations in the upper Salmon River basin.
4. Improve riparian habitat conditions, thus improving instream conditions. This work should be done as implementation of the Lemhi River TMDL, which is designed to improve riparian conditions and reduce sediment (IDEQ 1999c). IDEQ prepared a TMDL for this basin in 1999 that concluded that streambank erosion and poor riparian habitat conditions along with roads and legacy mining are increasing sedimentation and erosion rates. NMFS recommends that restoration work start in the Lemhi River mainstem and in tributaries that are currently accessible to steelhead and Chinook salmon. As additional tributaries are reconnected to the mainstem Lemhi River, these newly accessible tributaries will also become priorities for riparian restoration. Riparian restoration should restore vegetation to the historical range of natural variability.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the work of the Upper Salmon Basin Watershed Program partners. Between these groups there is an excellent representation of private, state, and federal entities that manage land and other resources within the basin. These entities have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish conservation projects.

Numerous habitat restoration projects have already been completed in the Lemhi River drainage. Past projects have included instream flow enhancements, removal of barriers in the mainstem Lemhi River, reconnection of tributaries, riparian fencing, and channel reconstruction. Additionally, approximately 100 irrigation diversions in the Lemhi River basin have been equipped with fish screens.

Many completed or ongoing projects are aimed at reconnecting the upper Lemhi River tributaries for all or a substantial part of year, including Big Timber, Hawley, Eighteenmile, and Canyon Creeks. Kenny Creek and Little Springs Creek in the lower Lemhi River basin have also been reconnected. With these reconnects, lateral diversions have been breached, diversion points moved, irrigation efficiency increased, and lateral bypass routes eliminated. These actions have resulted in increased flows in tributaries and in the Lemhi River for short reaches until the water is reallocated. The Upper Salmon Basin Watershed Program partners will continue to implement projects to address limiting factors for this population that build on these accomplishments.

Table 6.3-25 shows habitat projects that have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with its various partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-25. Habitat Recovery Actions Identified for the Lemhi River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Streamflow	Protect 36.8 cfs flow, plus periodic 100 cfs 3-day channel maintenance flow (mainstem Lemhi)	BPA Contract # 1994-015-00: Idaho Fish Screening Project BPA Contract # 2007-394-00: Idaho Watershed Habitat Restoration-Lemhi BPA Contract # 2007-399-00: Upper Salmon Screen Tributary Passage BPA Contract # 2008-601-00: Upper Lemhi River-Acquisition BPA Contract # 2008-602-00: Upper Lemhi River-Restoration BPA Contract # 2008-608-00: Idaho MOA/Fish Accord Water Transactions	N/A
Entrainment	35 screens		
Barriers	Address 34 barriers (diversions and culverts)		
Instream Habitat Structure	Improve 11 instream miles		
Riparian and Floodplain Condition	Improve 10.75 riparian miles Protect 11.5 riparian miles Improve 5 wetland acres		

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Lemhi River steelhead population is to continue managing the population for natural production. The strategy also calls to monitor the population for strays from Salmon River MPG hatchery programs and take necessary action to reduce spawning of hatchery strays with natural-origin steelhead. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Lemhi River supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest and other MPG actions alone will not produce the increases in survival needed for the Lemhi River steelhead population to achieve viable status and the larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies for the Idaho steelhead MPGs and populations.

6.3.11 Little Salmon River Steelhead Population

The Little Salmon River population is currently rated as maintained, with a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity (NWFSC 2015). The surrogate A-run population used to estimate the population's current status is currently rated at moderate risk. The Little Salmon River population is targeted to reach this level of Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Proposed Status
Maintained?	Maintained

The proposed status for the Little Salmon River population suggests that no recovery plan actions directed specifically at this population are necessary. However, a conservative management approach should be pursued until population-specific data become available to more accurately describe the status of this population. Recovery actions in the Snake and Columbia River migration corridor, and spawning and rearing habitat actions aimed primarily at spring/summer Chinook, will further reduce the risk for this population.

Currently, there is a high degree of uncertainty in estimating the nature and timing of a population's response to various recovery strategies, determining the gap between the current status and the proposed status, and determining the amount of improvement necessary to achieve the viability target for this population. Due to this uncertainty, it is important to implement an adaptive management strategy, in conjunction with the ESA's 5-year status reviews and the actions described in the Research, Monitoring, and Evaluation chapter. If the initial actions do not produce the intended response, the actions will be adjusted to produce the additional needed improvement.

Population Status

This section of the recovery plan compares the Little Salmon River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

This population of A-run steelhead includes the Little Salmon River and its tributaries, as well as steelhead-supporting tributaries to the lower Salmon River, downstream from the mouth of the Little Salmon (Whitebird Creek, Skookumchuck Creek, Slate Creek, and several smaller tributaries) (Figure 6.3-16). These spawning areas were grouped based on their shared life history and the fact that the lower tributaries were not judged to be large enough to support an independent population alone. The population as a whole is separated from other upstream spawning areas by 75 km, a distance likely to preclude significant straying between areas. Hatchery steelhead are released into this population for both harvest augmentation and for supplementation of the natural population.

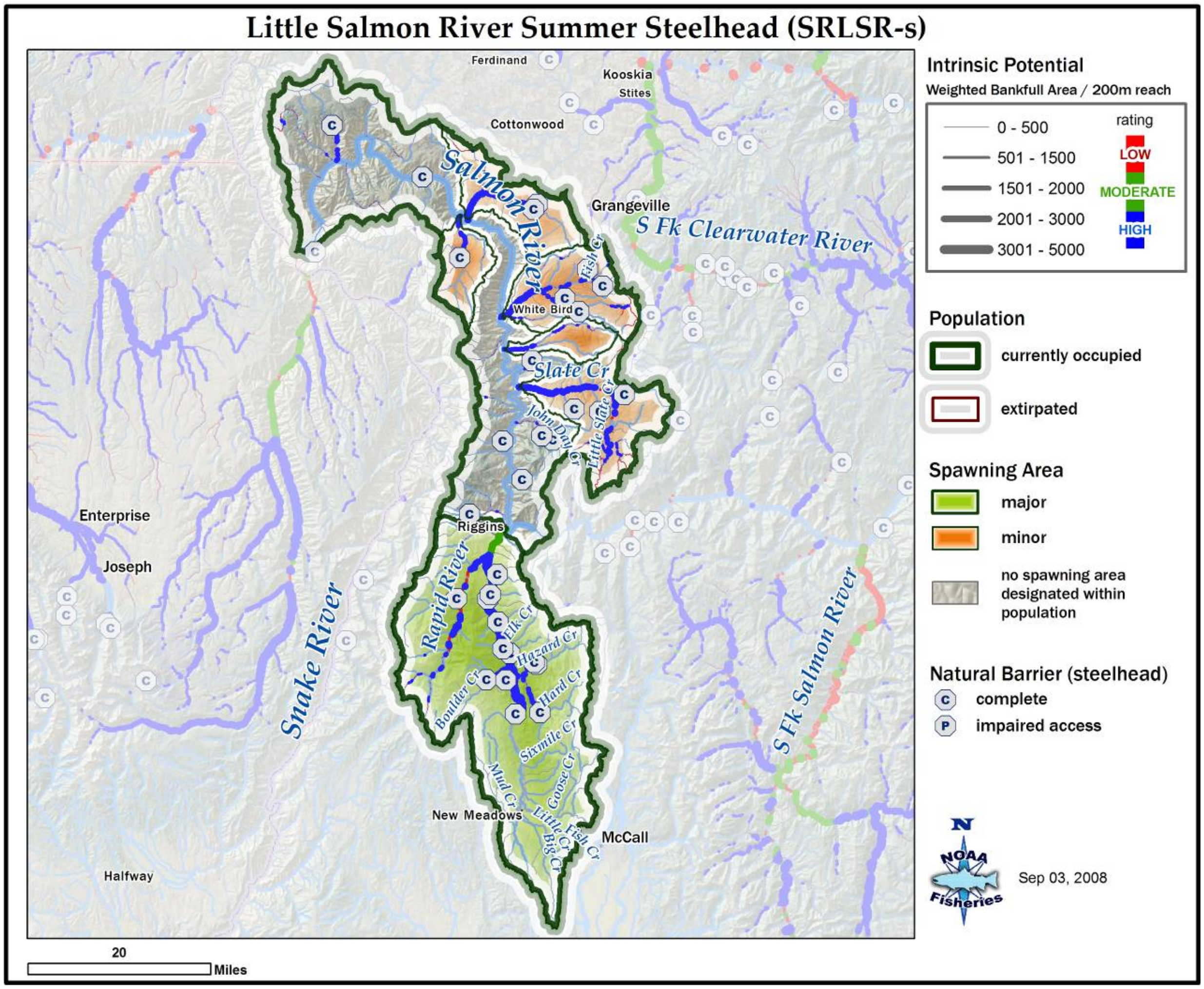


Figure 6.3-16. Little Salmon River summer steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Little Salmon River population as “Intermediate” in size and complexity based on total historical habitat potential (ICTRT 2007a). Because much of the potential habitat is outside of the population’s single major spawning area, however, this population is treated as “Basic” for abundance and productivity criteria, reflecting a more realistic biological scenario. A steelhead population classified as Basic has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe. For the Little Salmon River population to achieve a 25 percent or less risk (“moderate risk”) of extinction over 100 years, abundance and productivity targets are somewhat lower.

Abundance and Productivity

The NWFSC (2015) used results from a recent genetic stock composition study to estimate population spawning escapements for some Snake River populations. The Little Salmon River population was identified as a distinct population group within the genetic analyses, but it had a relatively high misclassification rate. The recent 10-year (2005-2014) geometric mean for natural-origin returns at Lower Granite Dam allocated to the Little Salmon River genetic group was 991 spawners (NWFSC 2015), which would exceed the minimum viability threshold of 500 for this Basic-size population. However, since the potential for contribution of hatchery spawners into natural areas is high for this population, the NWFSC was not able to calculate population productivity (NWFSC 2015). The NWFSC gave this population a tentative abundance/productivity rating of moderate risk (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for those populations where new information is available. NMFS will update this section with this new information for this population when it becomes available.

Spatial Structure

The ICTRT identified one major spawning area (Little Salmon River) and four minor spawning areas (Slate Creek, Rock Creek, Whitebird Creek, and Skookumchuck Creek) within the population. Although only one major spawning area was identified within the population, there is a large amount of branched intrinsic potential habitat available for spawning and rearing. Current spawning, inferred from juvenile steelhead surveys, occurs in the Little Salmon River and Rapid River drainages, as well as in numerous small tributaries to the mainstem Salmon River. The lowest minor spawning area, Rock Creek, is unoccupied, increasing the gap between this population and the next downstream population. However, this increase is relatively minor considering that the next population was historically greater than 25 km downstream. The cumulative spatial structure risk is therefore low, which is adequate for this population to maintain its proposed status (NWFSC 2015).

Diversity

The diversity risk for this population is driven by the potentially high proportion of hatchery-origin fish spawning naturally in the population and the uncertainty regarding the effectiveness of hatchery spawners. Hatchery fish are released into the Little Salmon River both for harvest augmentation and for supplementation of the natural population. Large numbers of hatchery steelhead smolts are released within the population for harvest augmentation under dam mitigation programs. Current releases of marked smolts for harvest augmentation use out-of-MPG stocks: Hells Canyon A-run stock and Dworshak Hatchery (Clearwater River) B-run stock. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps, and thus are assumed to be spawning naturally in the population. The prevalence of hatchery-origin spawners is assumed to be highest in the Little Salmon River drainage, exclusive of Rapid River.

An additional diversity concern for this population is the current management practice of releasing unmarked hatchery steelhead and planting eyed eggs to supplement natural production. Planned production releases for brood years 2008-2017 under the current *U.S. v. Oregon* TAC Interim Management Agreement for upriver Chinook, sockeye and steelhead fisheries include up to 220,000 unmarked steelhead smolts to be released into the Little Salmon River annually. At smolt-adult-return rates of 0.1-2.0 percent, returns from the smolt releases would range from 220 to 4,400 adults annually, and potentially could comprise a high proportion of total spawners in the population.

Due to the potentially high proportion of natural spawners that originate from hatchery programs, the cumulative diversity risk for this population is moderate, which is adequate for the population to maintain its proposed status (NWFSC 2015).

Summary

The Little Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity. A population-specific monitoring program is necessary to reduce the uncertainty of this rating. Table 6.3-26 shows the population's current and proposed status (both maintained) in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-26. Little Salmon River population risk ratings integrated across the four viable salmonid population (VSP) metrics.

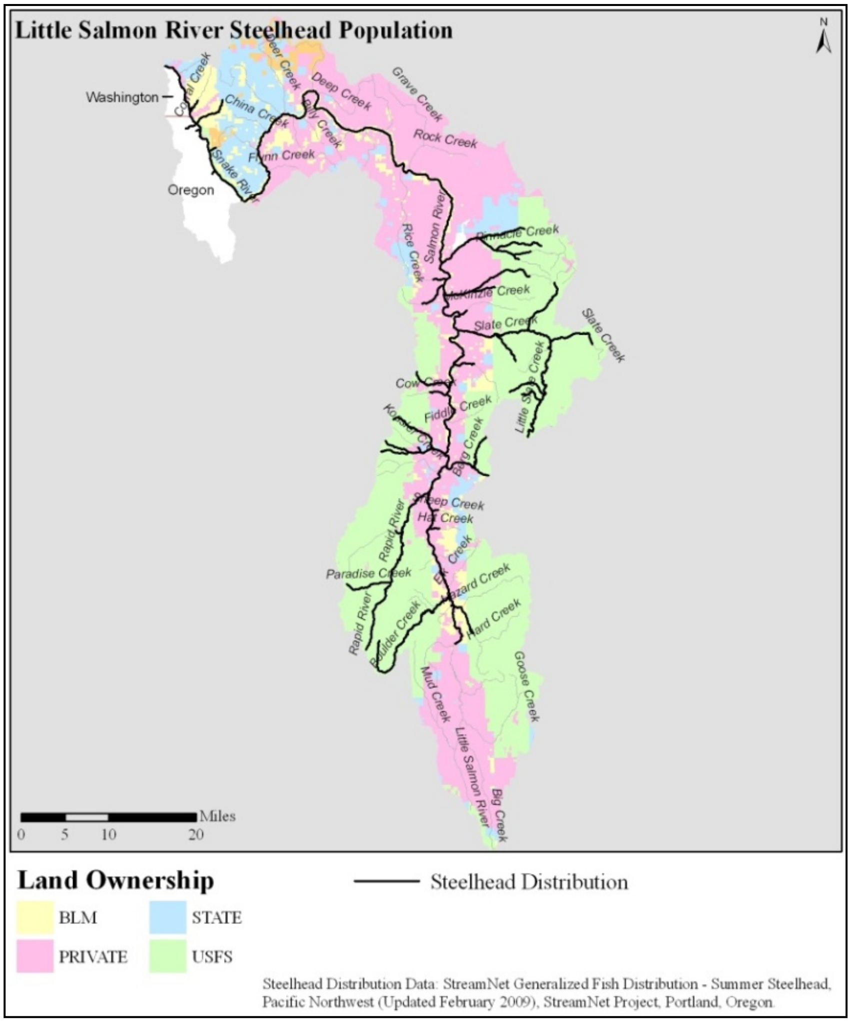
		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M Little Salmon River	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

This population is estimated to be currently meeting its proposed status of maintained, so no recovery plan actions directed specifically at this population are necessary at this time. However, the following sections on limiting factors and recovery strategies are included for several reasons. Considerable uncertainty is involved in achieving the proposed status for all of the populations within the Salmon River MPG, so further reducing the risk status for the Little Salmon River population could provide flexibility for meeting the delisting goal for the MPG. Due to lack of population-specific abundance and productivity data, there is also uncertainty associated with the conclusion that the Little Salmon River population is currently meeting its proposed status. Finally, further reducing the extinction risk for this population could be necessary for meeting goals beyond compliance with the Endangered Species Act, such as additional harvest by the state of Idaho or interested tribes.

Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-17. Land-ownership pattern within the Little Salmon River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Natal Habitat

Habitat Conditions

The Little Salmon River steelhead population includes the Salmon River and its tributaries from the confluence with the Snake River upstream to the Little Salmon River. The drainage area within this steelhead population is about 3,979 km^2 (1,536 mi^2). There are about 1,879 km of stream within the Little Salmon River population with less than half (895 km) occurring downstream from natural barriers (ICTRT 2008). Watersheds draining the southwest side of the Salmon River include the Little Salmon River and smaller streams such as Sherwin, Rice, Billy, and Cottonwood Creeks. Watersheds draining the northeast side of the Salmon River include Eagle, Deer, Rock, Whitebird, Skookumchuck, and Slate Creeks. With the exception of the Little Salmon River most of the streams are small, draining a diverse area of deeply dissected canyons, V-shaped valleys, or grasslands. The topography and climate varies from hot and dry to more cool and moist mountainous areas.

Steelhead are distributed throughout most of the area but are generally found in tributaries on the northeast side of the Salmon River and in the Little Salmon River and Rapid River (Figure 6.3-16). Stream size, natural barriers, and intermittent stream flow limit steelhead use in many of the smaller streams. The quality of steelhead spawning and rearing habitat in the Little Salmon was rated as mostly excellent while much of the Lower Salmon was rate as fair to good condition (NPCC 2004, p 1-36).

Land ownership within Little Salmon River steelhead population is primarily U.S. Forest Service (41%) and private lands (40%). The BLM, state of Idaho, and others make up the remaining 19 percent (Figure 6.3-17). Land ownership within the population is divided with private lands in the upper Little Salmon River and along the mainstem Salmon River, and with U.S. Forest Service lands occupying higher elevations downstream to Skookumchuck Creek. Downstream from Skookumchuck Creek the majority of the land ownership is private, state, and BLM. State and BLM lands are intermixed with private land along most of the Salmon River.

Land uses on non-federal lands include agriculture, logging, roads, livestock grazing, recreation, development, road construction, and water development uses. Mining was historically a major land use along the Salmon River and in the Florence area in the upper Slate Creek drainage. Land uses that occur on federal lands include timber harvest, roads, livestock grazing, mining, and recreation. These land uses have had varying levels of effects on riparian areas, water quality, stream channels, and fish habitat. Increased sedimentation and stream channelization have occurred in areas with logging and road building, and many of the large tributaries to the lower Salmon River have been altered by riparian degradation due to grazing, road construction, and development. State Highway 95, which runs along the Little Salmon River, has influenced the lower 55 km of the river. A series of rock falls halfway up the Little Salmon River blocks anadromous fish access to the Little Salmon headwaters (see Figure 6.3-16). Upstream from the falls aquatic and riparian habitat has been degraded and may contribute to stream temperature and sediment conditions downstream.

Increasing levels of recreation pose a threat to aquatic habitat in this area. Illegal ATV use has been identified as a resource concern in parts of the basin. Erosion, rutting, soil compaction, and damage to vegetation occurs as ATV users pioneer cross-country trails to access new areas (PNF 2003, p. III-169).

Along the Little Salmon River, recreational fishing has also begun to impact stream habitat. Much of the fishing is concentrated along a few miles of river, most of which is privately owned and managed. Although the influx of anglers over the last few years has benefited the local economy, it has also concentrated impacts on streambanks and private property in the areas fished. Impacts include damage to riparian vegetation and garbage and sewage dumped directly into the river (Ecovista 2004, p. 104).

IDEQ’s Integrated (303(d)/305(b)) Report identifies stream segments that are not fully supporting their assessed beneficial uses. These impaired stream segments are listed in Table 6.3-27 under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters that have an EPA-approved TMDL) (IDEQ 2009, 2014).

Table 6.3-27. Stream segments in the Little Salmon River steelhead population identified from Sections 4a, 4c, and 5 of the IDEQ 2008 303(d)/305(b) integrated report (IDEQ 2009, 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5- Impaired Waters Needing a TMDL		
Salmon River - Slate Creek to Rice Creek	Mercury	27.9
Salmon River - Slate Creek to Rice Creek	Mercury	27.9
John's Creek - 1st and 2nd order tributaries	Combined Biota/Habitat Bioassessments	44.3
Deer Creek - upstream from waterfall	Sedimentation/Siltation	4.5
Cottonwood Creek - source to un-named tributary	Sedimentation/Siltation	22.65
Billy Creek - source to mouth	Combined Biota/Habitat Bioassessments*	5.16
Rice Creek – tributaries	Sedimentation/Siltation	55.28
Salmon River - Slate Creek to Rice Creek	Mercury	27.88
Rock Creek - Grave Creek to mouth	Sedimentation/Siltation	3.73
Rock Creek - source to Grave Creek	Sedimentation/Siltation	85.49
Grave Creek - headwaters to unnamed trib	Sedimentation/Siltation	27.44
Grave Creek - unnamed trib to Rock Creek	Sedimentation/Siltation	3.38
Deep Creek - source to unnamed tributary	Water temperature; Nutrient/Eutrophication Biological Indi; Sedimentation/Siltation; Escherichia coli	28.30
Deer Creek – tributaries	Sedimentation/Siltation	20.88
Deer Creek - source to WF Deer Creek	Sedimentation/Siltation	26.89
Deer Creek - upstream from waterfall	Sedimentation/Siltation	4.50
Little Salmon River - Round Valley Creek to mouth	Sedimentation/Siltation	98.52
Mud Creek - source to mouth	Benthic-Macroinvertebrate Bioassessment	8.13

Waterbody	Impairment/Cause	Stream Miles
Section 4c-Impaired Waters with EPA-approved TMDLs		
Mud and Little Mud Creeks - 3rd order	Sedimentation/Siltation	8.1
John's Creek - 1st and 2nd order tributaries	Sedimentation/Siltation	44.3
Billy Creek - source to mouth	Sedimentation/Siltation	5.2
Rock Creek - 3rd order	Sedimentation/Siltation	6.6
Rock Creek - 4th Order	Sedimentation/Siltation	3.7
Billy Creek - source to mouth	Sedimentation/Siltation	5.2
Deep Creek - source to unnamed tributary	Sedimentation/Siltation	28.3
Little Salmon River - 5th order	Temperature, water	16.3
Little Salmon River - 4th order	Temperature, water	4.3
Rice Creek - 3rd Order	Temperature, water	8.9
Telcher Creek - 1st & 2nd order stream segments	Temperature, water	34.6
John's Creek - 1st and 2nd order tributaries	Temperature, water	44.3
Rice Creek - tributaries	Temperature, water	55.3
Rock Creek - 3rd order	Temperature, water	6.6
Rock Creek - 4th Order	Temperature, water	3.7
Section 4c- Waters Impaired by Non-pollutants		
Deep Creek - source to unnamed tributary	Other flow regime alterations: Physical substrate habitat alterations	28.30
Little Salmon River - 5th order	Physical substrate habitat alterations	24.88

*The combined biota/habitat bioassessment cause is assigned to a waterbody on the 303(d) list (Category 5 of the integrated report) when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS concluded that the habitat limiting factors for the Little Salmon River steelhead population are sedimentation, passage barriers, reduced streamflow, habitat complexity, and elevated stream temperatures. Table 6.3-28 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. Discussions of each limiting factor follow using information from U.S. Forest Service reports, IDEQ reports, and the Salmon Subbasin Assessment and Management Plan.

Table 6.3-28. Primary limiting factors identified for the Little Salmon River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Corrections or removal of fish passage barriers.
Stream Flow	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels).	Water quantity restoration actions to improve instream flow and stream connectivity.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmonids.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature.
Habitat Complexity	Reduced habitat quality as measured by pool frequency, pool quality, and sufficient LWD reduces juvenile rearing and adult holding.	Restoration of instream and riparian habitats.

1. *Excess Sediment*

Conditions reported for the Little Salmon River steelhead population suggest that elevated sediment levels are reducing population abundance and productivity. IDEQ (2014) has listed many streams in the population as impaired by sediment, including Deer, Deep, Grave, Rice, and Rock Creeks, as well as the Little Salmon River (Table 6.3-27). TMDLs have been completed for Rock and Deep Creeks while Deer, Graves, and Rice Creeks have been recommended for delisting for sediment (IDEQ 2009). In Deep and Rock Creeks, load allocations have been set and will require implementation of best management practices to address excess sediment loading. As indicated by IDEQ (2006), the Little Salmon River from Round Valley Creek to the mouth showed support of beneficial uses, but IDEQ was unable to analyze the effect of coarse sediment in the system.

Coarse sediment transported as part of the 1997 flood is potentially reducing salmonid spawning in the mainstem Little Salmon River and leading to channel aggradation. In 1997, flooding caused channel down-cutting, lateral movement of the river, and loss of riparian vegetation, leading to debris avalanches and slumps. Segments of Highway 95 were completely washed out and many nearby houses were partially or totally destroyed. As indicated by IDEQ (2006), the erosion hazard is high along the Little Salmon River from Round Valley Creek to Rattlesnake Creek. IDEQ proposes to list the Little Salmon River from Round Valley Creek to the mouth for habitat alteration and delist for sediment. IDEQ’s listing for habitat alteration recognizes that the system has changed due to the construction of the highway and the channel remains constricted, leading to potential coarse sediment loading problems.

In the Little Salmon River, the U.S. Forest Service (2007c) has indicated that sediment levels (surface fines and/or substrate embeddedness) are above proposed conditions in streams evaluated in the upper, middle, and lower Little Salmon River as well as Hazard Creek. Percent surface fines were variable over the analysis area, reflecting local subwatershed conditions and land uses. Observations indicate that roads, grazing, agriculture, and recreation are contributing factors to current sediment conditions. Overall road density and roads within riparian conservation areas were particularly high in the upper and middle Little Salmon River.

The U.S. Forest Service identified excess sediment as a threat in many subwatersheds of the Lower Salmon and Little Salmon Rivers (USFS 2007d). Table 6.3-29 shows the qualitative ranking given to each subwatershed to indicate the potential for sediment (as well as other factors) to limit salmonid spawning, rearing, or migration (1 - high risk, 2 - moderate risk, 3 - minor risk). Although excess sediment was mostly ranked as a minor or moderate threat, sediment concerns appear to be a widespread. The sources most frequently identified were road crossings and streamside roads.

Table 6.3-29. Threats identified by the Nez Perce-Clearwater National Forest for subwatersheds (HUC 6) in the Lower Salmon and Little Salmon Rivers. Risk ranking, threats to abundance and production, and primary and secondary sources were identified for different life stages of fish.

HUC6-Subwatersheds	Life Stage	Risk Rank*	Risk/Threat	Primary Source	Secondary Source
Salmon River-Fiddle Creek	Spawning	3	Excess Sediment	Road crossings	Mass wasting
Race Creek	Spawning	2	Excess Sediment	Streamside/upland harvest	Streamside roads
	Rearing	3	Lacks LWD	Timber Harvest	Streamside roads
Salmon River-China Creek	Spawning	3	Excess Sediment	Road crossings	Streamside roads
	Rearing	3	Excess Sediment		
	Rearing	3	Lacks LWD	Streamside roads	
	Rearing	3	Channel Simplification	Livestock Grazing	Invasive weeds
	Migration	3	Barrier	Road	
John Day Creek	Spawning	3	Excess Sediment	Road Crossing	Mast wasting
Salmon River-Sherwin Creek	Spawning	2	Excess Sediment	Streamside road	Road crossings
	Rearing	1	Channel Simplification	Road crossings	Streamside road
	Migration	2	Barrier	Road crossings	
Upper Little Slate Creek	Spawning	1	Excess Sediment	Road crossings	OHV trail crossings
	Spawning	2	Barrier	Road crossings	Streamside/upland harvest
	Rearing	1	Excess Sediment	Road crossings	Dredge mining
	Rearing	2	Channel Simplification	Livestock grazing	Dredge mining
	Rearing	2	Flow alteration	Streamside/upland harvest	Livestock grazing
	Migration	2	Barrier	Road crossings	Dredge mining

HUC6-Subwatersheds	Life Stage	Risk Rank*	Risk/Threat	Primary Source	Secondary Source
Lower Little Slate Creek	Spawning	2	Excess Sediment	Road cross	Upstream sources
	Spawning	2	Introgression	Non-native fish	
	Rearing	2	Excess sediment	Road crossings	Upstream sources
	Rearing	2	Competition	Non-native fish	
	Migration	3	Barrier	Trail Crossing	
Upper Slate Creek	Spawning	3	Excess sediment	Road crossings	
	Rearing	3	Flow alteration	Streamside/upland harvest	Road crossings
Lower Slate Creek	Spawning	1	Excess sediment	Road crossings	Upstream sources
	Rearing	2	Flow alteration	Streamside/upland harvest	
Salmon River-Mckenzie Creek	Spawning	3	Excess Sediment	Road Crossings	
Skookumchuck Creek	Spawning	2	Excess Sediment	Road Crossings	Streamside/upland harvest
	Rearing	2	Flow alteration	Road Crossings	Streamside/upland harvest
	Migration	3	Barrier	Road Crossings	
Deer Creek	Spawning	3	Excess sediment	Road Crossings	Livestock grazing
SF White Bird Creek	Spawning	1	Excess sediment	Road Crossings	Streamside/upland harvest
	Migration	2	Barrier	Road Crossings	Streamside/upland harvest
NF White Bird Creek	Spawning	1	Excess sediment	Road Crossings	
	Migration	1	Barrier	Road Crossings	
Rapid River-Copper Creek	Spawning	3	Excess sediment	Road Crossings	
Lower Rapid River	Spawning	3	Excess sediment	Road Crossings	
	Migration	3	Barrier	Road Crossings	
Little Salmon-Sheep Creek	Spawning	3	Excess sediment	Road Crossings	Mass wasting
Squaw Creek	Spawning	2	Excess sediment	Streamside road	Road Crossings
	Rearing	2	Lacks LWD	Streamside road	
	Migration	2	Barrier	Road Crossings	

1 - high risk, 2 - moderate risk, 3 - minor risk

2. Migration Barriers

In the Middle and Upper Little Salmon, the U.S. Forest Service (2007c) noted many man-made physical barriers in from road crossings and diversion structures. However, these potential barriers are upstream from a natural falls that blocks steelhead migration and are therefore beyond the scope of steelhead restoration efforts. In the Hazard Creek watershed, there are approximately 92 road-stream crossings. It is likely many of these crossings present barriers to fish passage (USFS 2007c), but most barriers are upstream from a natural waterfall 3.7 miles upstream from the mouth that blocks steelhead passage. In the Lower Little Salmon River, some culverts are barriers between Boulder Creek and its tributaries. Man-made barriers are also likely present on lesser tributaries in the Lower Little Salmon River, although some of the tributaries also have natural barriers blocking steelhead access. Migration barriers may also exist on tributaries on the Lower Salmon River, such as Deer Creek, which has a culvert on private land blocking access to upstream habitat.

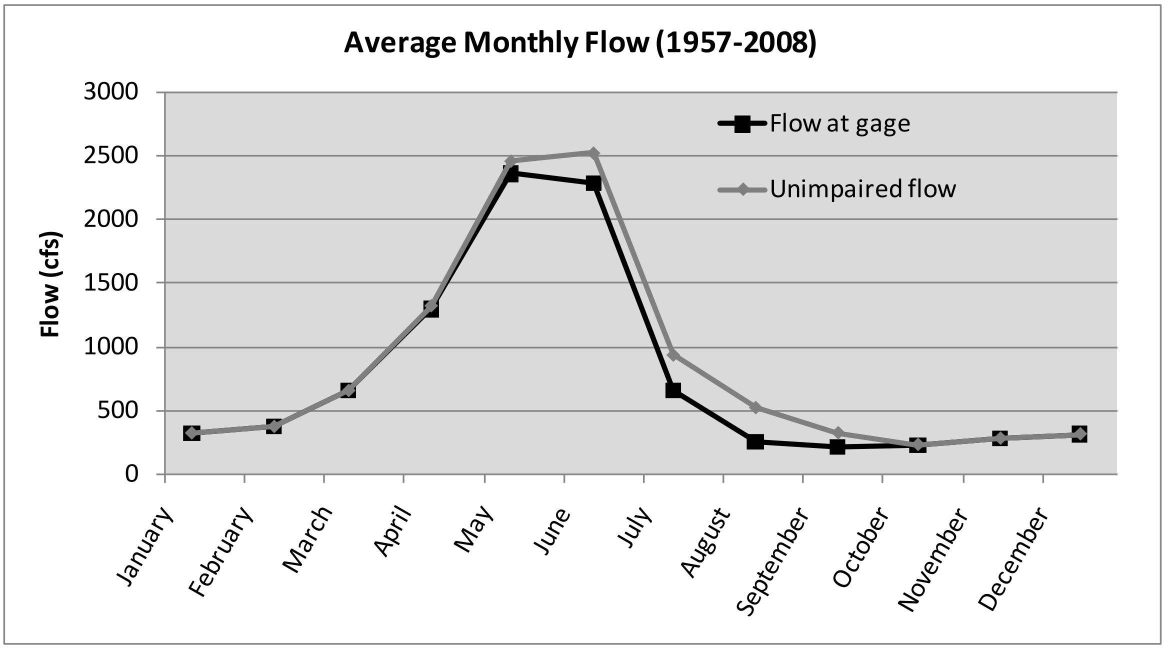


Figure 6.3-18. Mean monthly flow for the Little Salmon River at USGS gage at Riggins (USGS 13316500). The unimpaired flow at Riggins includes the gage flow added to estimated consumptive water use from irrigation.

In subwatershed summaries presented by the Nez Perce-Clearwater National Forest (USFS 2007a), the status of fish passage at many stream-road crossings was undetermined, including in the China, Sherwin, upper Little Slate, Skookumchuck, and White Bird subwatersheds in the Lower Salmon River, and Lower Rapid River and Squaw Creek subwatersheds in the Little Salmon River. A comprehensive inventory and assessment of potential man-made barriers to steelhead migration within the Little Salmon River population would provide valuable information for potential restoration opportunities.

3. Reduced Flow during Critical Periods

Water withdrawals for agricultural in upper Little Salmon River basin meadows are impairing summer base flows in main Little Salmon River, leading to a decrease in available habitat in Little Salmon River and to elevated stream temperatures. Figure 6.3-18 compares the average monthly flows from gage data to estimated unimpaired flows at the mouth of the Little Salmon River. Unimpaired flows were estimated by adding estimates of monthly consumptive water use from irrigation to the monthly gaged flows. Figure 6.3-18 shows that from July to September measured flows at the Little Salmon gage are substantially less than estimated unimpaired flows. Water rights in the Little Salmon River basin exist for a cumulative 679 cfs maximum diversion rate, which is greater than mean base flows for the Little Salmon River. Eighty-nine percent of irrigated acres in the basin occur in the upper meadows, above the passage barrier at RM 24 of the mainstem Little Salmon River and above the mouth of Round Valley Creek. The estimated consumptive use from irrigation taking place above Round Valley Creek during the growing season is 108 cfs. Water withdrawals in the upper meadows thus contribute to reduced flow and elevated temperature downstream in the Little Salmon River.

Water withdrawals also occur on tributaries to the main Salmon River and may reduce base flows in these tributaries. IDEQ has indicated altered hydrology in Deep Creek, a tributary to the Lower Salmon River (IDEQ 2009). Low or altered stream flows were also indicated in Trail Creek, Denny Creek, Skookumchuck Creek, Slate Creek, and potentially Squaw Creek.

4. *Elevated Water Temperature*

Stream temperature impairment was indicated on about 54 miles of stream in the population, including Deep Creek, Big Creek, and the Little Salmon River. Rice, Rock, Graves, and John's Creeks are also on the Section 4a list for temperature TMDLs. Average lack of shade for these streams was 12 to 32 percent.

IDEQ (2009) reported that in the upper reaches of the Little Salmon River (above the falls), high water temperatures are suboptimal for salmonids, primarily due to lack of shade. Given the high stream temperatures, IDEQ prepared a temperature TMDL in 2006 for the Little Salmon River upstream from Round Valley Creek. Because natural background conditions for stream temperatures in this watershed may exceed state water quality criteria, the TMDL called for restoring natural levels of riparian shade.

IDEQ has not developed a TMDL for temperature below RM 24 because water temperatures generally remain below 22 °C and support cold-water aquatic life (IDEQ 2006). As the Little Salmon River flows towards the Salmon River, larger tributary streams like Hazard/Hard Creek, Boulder Creek, and Rapid River contribute cooler water. However, between Little Salmon River mile 24 and the mouth of Hazard Creek, there is a 4.5-mile section of accessible steelhead critical habitat that does not support salmonid migration, spawning, or rearing (BLM 2000), likely due to high water temperatures. Below the mouth of Hazard Creek, the large water volume and cooler temperatures of Hazard Creek partially mitigate the impaired waters of the Little Salmon River. Summer snorkeling surveys found very few juvenile rainbow trout/steelhead upriver from Hazard Creek, while downriver from Hazard Creek the river had significantly more rainbow trout/steelhead (BLM 2000).

5. *Reduced Riparian Condition, Floodplain Connectivity and Channel Complexity*

Human-caused disturbances such as roads, timber harvest, livestock grazing, and development have affected habitat quality in the Lower Salmon River and Little Salmon River drainage. The Stream Habitat Index (SHI) calculated by IDEQ evaluates a range of habitat inventory parameters including bank stability, riparian cover, percent surface fines, pool quality, and large organic debris. Scores range from 1-3, with 3 being the highest score. SHI scores were 1 for all segments evaluated on the Little Salmon River (IDEQ 2006). Information provided by the U.S. Forest Service (2007a) also indicated some poor habitat conditions; pool frequency, pool quality, and LWD were deficient in streams throughout much of the Little Salmon River drainage. The lack of LWD and channel simplification were noted in several subwatersheds of the Lower Salmon and Little Salmon River (see Table 6.3-29 and Table 6.3-30). A major portion of the Little Salmon River has been riprapped to protect private land roads from the stream's natural processes. Highway 95 parallels the Little Salmon, eliminating floodplains that dissipate stream energy, and confining the stream to a narrow channel with high velocity flows that scour streambanks and channels.

Table 6.3-30. Limiting factors identified for streams in subwatersheds of the Little Salmon River below the natural falls (USFS 2007a).

Stream	Limiting Factors
Hazard Creek subwatershed streams	
Brown Creek	Sediment, road density
Hard Creek	Substrate embeddedness, barriers & other road effects
Hazard Creek	Substrate embeddedness, barriers & other road effects
Lower-Little Salmon subwatershed streams	
Trail Creek	Sediment, elevated summer temperatures, low flows, LWD, pools, man-caused barriers
Boulder Creek	Sediment/substrate embeddedness, barriers, road density
Sheep Creek	Lack of quality pools, sediment
Denny Creek	Barriers, low flows, lack of quality pools, sediment
Lockwood Creek	Lack of quality pools, channel & streambank scouring, lack of instream cover, sediment
Rattlesnake Creek	Lack of quality pools, channel & streambank scouring, barriers, lack of instream cover, sediment
Fall Creek	Lack of quality pools
Elk Creek	Lack of quality pools
Squaw Creek	Sediment, temperature, lack of quality pools, man-caused barriers, water diversion

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but need to be managed to protect steelhead habitat in the Little Salmon River population area.

1. Damage to riparian habitat by all-terrain vehicle use.
2. Concentrated fishing along the lower Little Salmon River could damage streambanks, riparian vegetation, and water quality.

Hatchery Programs

Excluding the Rapid River tributary, the Little Salmon River drainage has received large numbers of juvenile hatchery steelhead from the Salmon, Snake, and Clearwater drainages. Hatchery fish, classified as A-run based on size, ocean age, and timing characteristics have been introduced from Oxbow, Pahsimeroi, and Sawtooth hatcheries. Hatchery B-run steelhead stocked in the Little Salmon drainage are progeny of adult steelhead collected at Dworshak National Fish Hatchery on the North Fork of the Clearwater River. There is no steelhead broodstock collection facility located in the Little Salmon River drainage and returning hatchery fish that are not harvested probably spawn naturally. Thus, naturally produced steelhead in this drainage are likely a mixture of hatchery and naturally produced A-run and B-run fish (Kiefer et al 1992). Steelhead supplementation does not occur in Rapid River, and natural production maintains the run. The Rapid River steelhead run is classified for wild fish management.

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, possible demographic and life history changes, and increased competition for food and space. Hatchery-related limiting factors and threats for the Little Salmon River population and other Salmon River steelhead are further discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Little Salmon River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for Little Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The strategy for addressing limiting factors should first address limiting factors in major and minor spawning areas such as the Little Salmon River, Slate, White Bird, Skookumchuck, and Rock Creeks, while maintaining the quality of steelhead habitat in the relatively unimpaired Rapid River (see Figure 6.3-16).

Within these major and minor spawning areas, priority stream reaches for habitat restoration projects are those with intrinsic potential habitat with a focus on Slate, Whitebird, and Boulder Creeks. Restoration efforts to improve riparian habitat will enhance shade, provide recruitment of LWD, and increase bank stability. Throughout the population additional benefits will accrue by mitigating chronic sediment sources from roads, trails, stream crossings, and ATV use. Controlling sources of sediment may require road obliteration, realignment, conversion or closure, and public education. Assessment and correction of migration barriers will provide additional spawning and rearing habitat for steelhead. In addition, restoration efforts upstream of natural barriers such as the falls on the Little Salmon River to mitigate sediment and temperature concerns could benefit downstream spawning and rearing areas for steelhead but are a low priority compared to currently occupied steelhead habitat.

Habitat Actions

The following habitat actions, ranked by priority, are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed.

1. Reduce road-related impacts on tributaries to the Little Salmon River and main Salmon River through a combination of road closures, obliterations, decommissioning, relocations, reconstructions, and maintenance. Road-related impacts include degraded riparian areas and sediment delivery to streams.
2. Inventory stream crossings (e.g. bridges and culverts) and replace those on a priority basis that block steelhead from accessing suitable habitat or that deliver sediment to steelhead habitat.
3. Reduce floodplain and channel encroachment by roads or development. In areas not prone to frequent scouring of the channel and streambanks by flood events, restore degraded riparian conditions.
4. Reduce the impacts of water diversions in the population to minimize habitat loss and elevated temperatures caused by reduced base flows. Inventory diversions on stream reaches accessible to steelhead in the Little Salmon River, Whitebird Creek, and Slate Creek watersheds to ensure diversions are screened according to NMFS criteria.
5. Encourage private landowners to restrict grazing in riparian areas, and restrict livestock grazing in riparian areas on public lands.
6. Local governments should reduce future habitat damage from development along the mainstem Little Salmon River and mainstem Salmon River to minimize the need for instream and streambank stabilization projects involving hardening the stream banks (such as with riprap or bank barbs).

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the work of the U.S. Forest Service, IDFG, IDEQ, Nez Perce Tribe, and county soil and water conservation districts. Other entities working on habitat restoration in this population include IDWR, BPA, BLM, NMFS, The Nature Conservancy, and private landowners. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the watersheds. These entities have created an effective process for working together, providing technical reviews of proposed projects and working with interested parties to accomplish conservation on the ground.

The Nez Perce Tribe has been very active in designing and implementing projects on both public and private lands in this area. Due to the large percentage of private land ownership and rural development in the area, much of the potential habitat improvement projects for the Little Salmon River population will rely heavily upon the voluntary cooperation of private landowners. This private land ownership occurs primarily in the lower reaches of the Little Salmon and Lower Salmon River tributaries.

Many habitat restoration projects have already been completed in the Little Salmon and Lower Salmon Rivers. Numerous private landowners and governmental agencies have implemented conservation projects that have resulted in aquatic and riparian habitat and water quality improvements within the

Little Salmon River steelhead population. The projects have included fencing, riparian and streambank restoration, grazing and nutrient management plans, septic system upgrades, road management (decommission, stabilization, closure), trail restoration, and weed control. Future restoration actions will build on these accomplishments.

During Plan implementation, NMFS will work with the above groups and other partners to identify and prioritize needed habitat actions for each 5-year implementation period. No specific habitat projects have been identified at this time for the Little Salmon River population.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Little Salmon River steelhead population is to continue to limit hatchery releases in the population area and to manage for natural production in the Rapid River population upstream of the weir. The strategy includes reducing ecological and genetic risks associated with the hatchery programs by releasing acclimated fish from locally adapted broodstock at sites where these risks can be minimized or managed, and monitoring for straying within natural production areas. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Little Salmon River supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

While the Little Salmon River steelhead population has already achieved its proposed status of maintained, additional actions will be needed for the larger MPG to achieve viability. These actions will also safeguard against future risks to the population. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.12 Secesh River Steelhead Population

The Secesh River steelhead population is currently rated as maintained due to a tentative moderate risk rating for abundance/productivity (NWFSC 2015). The population is targeted to reach this level of Maintained, which requires no more than moderate abundance/productivity risk.

Current Status	Proposed Status
Maintained?	Maintained

The proposed status for the Secesh River population suggests that no recovery plan actions directed specifically at this population are necessary. However, the current rating of maintained is based on a tentative rating of moderate abundance/ productivity (NWFSC 2015). A conservative management approach should be pursued until population-specific data become available to more accurately describe the status of this population. Recovery actions in the Snake and Columbia River migration corridor, and spawning and rearing habitat actions aimed primarily at spring/summer Chinook, will further reduce the risk for this population.

While current best available information indicates that this population has achieved its proposed status, there is a high degree of uncertainty in estimating the population's current status, as well as the nature and timing of the population's response to various recovery strategies. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's 5-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If new information shows that this population has not achieved its proposed status, it is imperative to identify those actions that are most likely to yield additional improvement.

Population Status

This section of the recovery plan compares the Secesh River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

This population includes the mainstem Secesh and its tributaries and was defined primarily based on genetic information (ICTRT 2003) (Figure 6.3-19). Microsatellite samples from the Secesh were highly differentiated from other South Fork Salmon River samples. The Secesh River population includes both B-run and A-run fish, with a High proportion (>40%) of the B-run steelhead life history pattern.

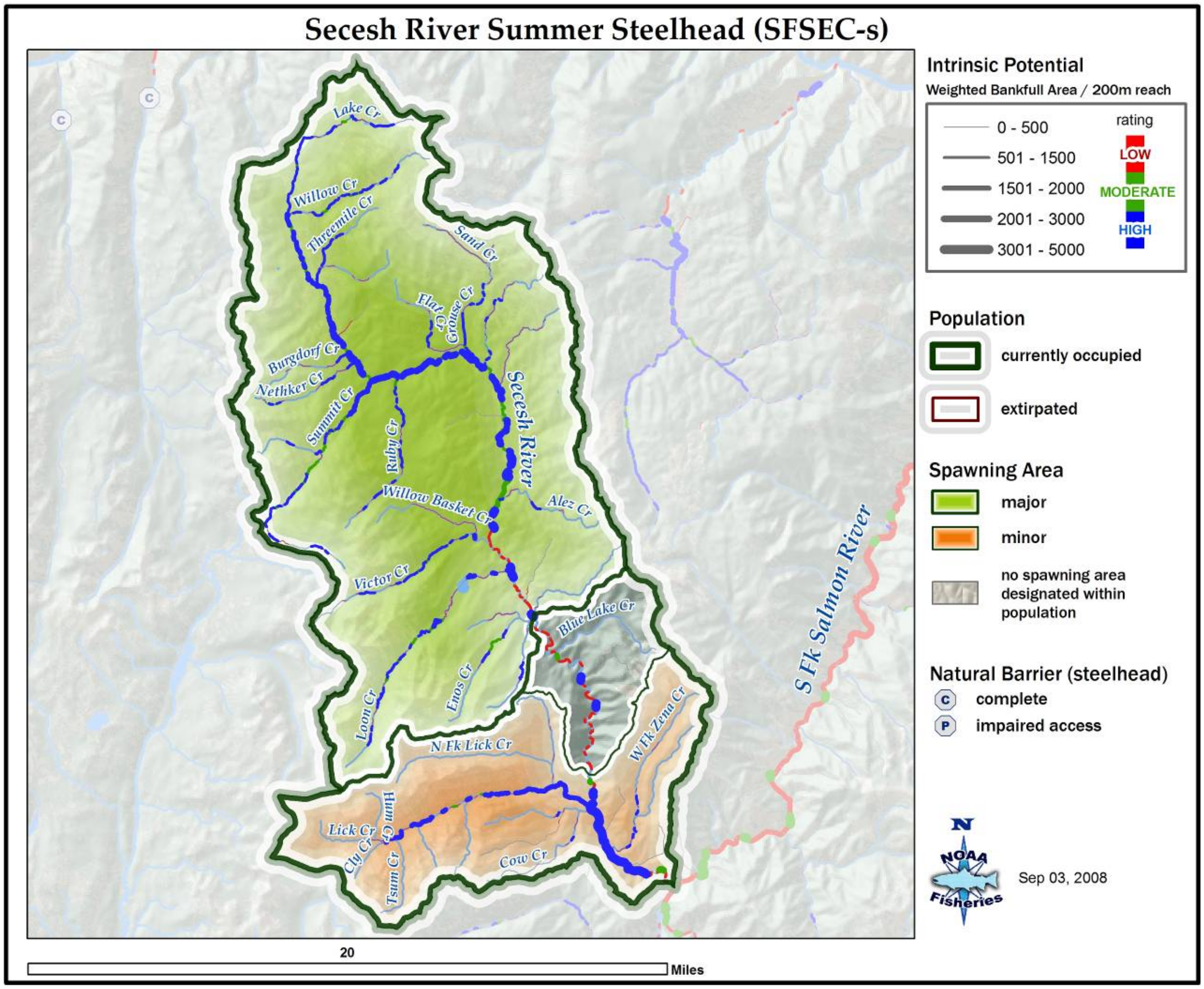


Figure 6.3-19. Secesh River summer steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Secesh River population as “Basic” in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Basic has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe. For the Secesh River population to achieve a 25 percent or less risk (“moderate risk”) of extinction over 100 years, abundance and productivity targets are somewhat lower.

Abundance and Productivity

Most Snake River Basin steelhead populations (including all of the Idaho populations) do not have direct estimates of annual spawning escapements. The NWFSC (2015) used results of a genetic stock identification study to estimate natural-origin abundance for different stock groups above Lower Granite Dam, including a stock group comprised of the Secesh and South Fork Salmon River steelhead populations. The results for this stock group had a relatively low misclassification potential. Based on the study results, the NWFSC estimated a 10-year (2005-2014) geometric mean natural-origin abundance of 1,028 for the stock group, which is below the sum of the minimum viability abundance thresholds for the two component populations (500 and 1,000). The estimated intrinsic productivity for this stock group is 1.80. This suggests that the combined abundance/ productivity risk for the populations is moderate (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status, including for this population. NMFS will update this section with this new information when the final recovery plan is adopted.

Spatial Structure

The ICTRT has identified one major spawning area (Upper Secesh) and one minor spawning area (Lick Creek) within this population. This limited spatial structure creates some inherent risk of extinction. However, because both spawning areas are currently occupied, based on juvenile surveys, the cumulative spatial structure risk is low, which is adequate for the population to meet its proposed status (NWFSC 2015).

Diversity

The major life history strategies historically represented in the Secesh population are unknown, but the population is currently classified as consisting only of B-run steelhead. Genetic data suggest that this population is well differentiated from other Salmon River populations. Hatchery-origin steelhead are not currently released into the population nor have they been released in the past. Cumulative diversity risk is therefore low, with is adequate for the population to meets its proposed status (NWFSC 2015).

Summary

The Secesh River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity. A population-specific monitoring program will be necessary to reduce the uncertainty of this rating. Table 6.3-31 shows the population’s current and proposed status in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-31. Secesh River population risk ratings integrated across the four viable salmonid population (VSP) metrics.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M Secesh River	M	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years. Arrow points to proposed risk status.

Limiting Factors and Threats Specific to Population

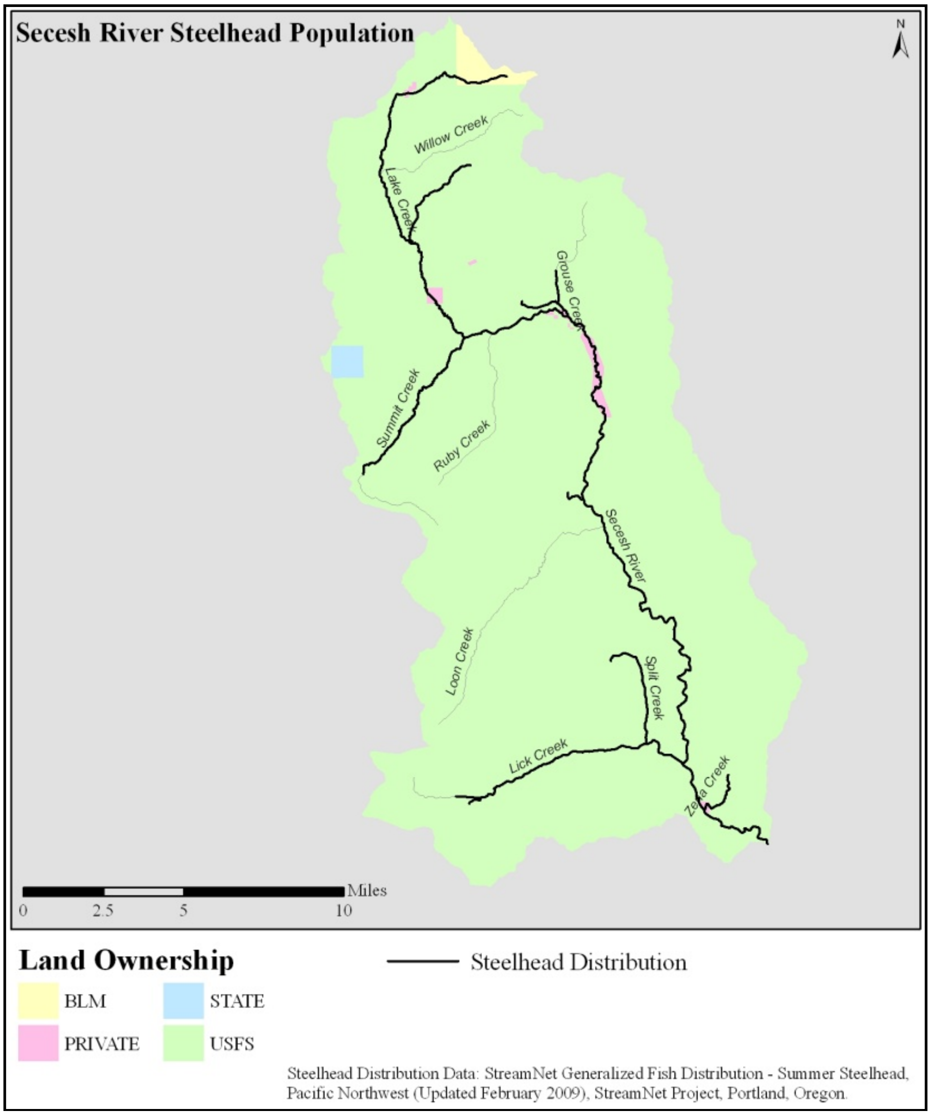
This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Secesh River steelhead population area includes the mainstem river and all tributaries. The Secesh River enters the main South Fork Salmon River near the confluence of the East Fork South Fork Salmon River. The geographic area encompassed within this population has a drainage area of approximately 1,063 square miles (642 km^2). The drainage is semiarid, with most of the precipitation falling as snow in the higher elevations. Precipitation averages about 31 inches per year. The heaviest precipitation usually falls as snow in November and December. Occasionally, storms move over the area producing warm rainstorms in late fall or early winter. These storms can cause significant rain-on-snow events, resulting in high flows. Peak stream discharge typically occurs during May and June following snow melt (IDEQ 2002a).

Steelhead habitat in the Secesh River population is characterized as mostly good to excellent quality (NPCC 2004, p 1-36). There are about 334 km of stream within the population with about 260 km downstream of natural barriers. Steelhead are distributed throughout the basin in the upper Secesh River, Summit Creek, Grouse Creek, and Lick Creek (Figure 6.3-19).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-20. Land-ownership pattern within the Secesh River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land ownership within the Secesh River steelhead population is primarily U.S. Forest Service (98.2%) with BLM (0.8%), state (0.4%), and private (0.6%) combined at less than two percent (Figure 6.3-20). The BLM administers the Marshall Mountain Mining District in the upper Secesh River. Private land is located along the Secesh River near Grouse Creek and scattered patches upstream from Summit Creek. State owned land is concentrated in one section upstream from Summit Creek.

The alluvial deposits in and along the Upper Secesh River were placer mined for gold in late nineteenth century and into recent years. Most activity was limited in scale. The South Fork Salmon River and its tributaries, including Johnson Creek and the Secesh River, are presently closed to recreational suction dredging due to concerns about fish habitat and water quality. Roads created for mineral exploration had few environmental considerations and were typically created for the shortest distance, easiest route, and least cost. Most of these roads currently serve little or no purpose in relation to mineral exploration and development (USFS 2007a). The problems associated with abandoned mine lands within the Secesh River drainage that might affect steelhead habitat include stream-connected surface erosion from mine exploration roads and mine access roads and potential chemical contamination of surface water from drums of unknown chemicals and abandoned equipment and machinery (USFS 2007a).

Roads and mining activities have disturbed riparian areas, reducing shade along some stream reaches. The U.S. Forest Service (2007a) reported a total road density of 1 mile/sq. mile for the Secesh analysis area with a concentration (1.5 miles/sq. mile) within riparian conservation areas. This equates to about 16 percent of roads located in riparian conservation areas, disturbing riparian habitat. However, indicators related to a functioning riparian zone such as pool frequency, pool quality, and streambank stability are considered to be functioning appropriately (2007a). The U.S. Forest Service (2007a) noted that stream temperature values were within the functioning-at-risk to functioning-at-unacceptable-risk range. These temperatures are considered to reflect a natural temperature regime because there is little evidence of land management effects on stream temperature except along the mainstem roads where shade is reduced.

A history of over utilization by sheep within the South Fork Salmon River led to a closure of many grazing allotments (IDEQ 2002a). Erosion and poor vegetation recovery resulted in a reduction of sheep numbers in the 1950s. In the 1960s, the sheep market crashed and most sheep grazing ended, and the allotments were shifted from sheep to cattle. By 1970, however, the U.S. Forest Service eliminated all cattle grazing allotments in the South Fork Salmon basin. Currently there are four sheep grazing allotments that occur within portions of the Secesh River drainage: Victor Loon, Marshall Mtn., Bear Pete, and Josephine (USFS 2007a). General use restrictions have been emplaced to limit grazing impacts to anadromous fish resources.

Timber harvest activity has been characterized for the South Fork Salmon basin by IDEQ (2002a). The highest volume of logging activity took place from 1950-1965 with an estimated 147 million board feet. A series of intense storms and rain-on-snow events between 1958 and 1965 created numerous landslides and slumps triggered by logging and associated road construction, inundating the South Fork Salmon River and some of its tributaries with heavy sediment loads (Platts 1972, as cited in IDEQ 2002a). Arnold and Lundeen (1968), as cited in IDEQ (2002a), estimated that in 1965 about 1.5 million cubic yards (about 7 times the normal load) of sediment was stored in the upper 59 miles of the South Fork Salmon River and its tributaries. The rain-on-snow events in the winter and spring of 1965 caused over 100 landslides, the majority of which were related to roads. Currently, timber management is limited to sales of utility poles, house logs, post and poles and fuel harvest. Areas in the Secesh impacted by these human activities included Zena Creek and the area near Lake Creek in the Upper Secesh watershed. The 1950s and 1960s were the busiest in terms of timber harvest and road construction. Mining activities were most intense in the 1940s and grazing impacts were greatest in the 1920s (IDEQ 2002a).

IDEQ's Integrated (303(d)/305(b)) Report identifies stream segments that are not fully supporting their assessed beneficial uses (IDEQ 2014). These impaired stream segments are listed in Table 6.3-32. Grouse Creek and other Secesh River tributaries are listed as impaired by high temperatures due to lack of shade. IDEQ has developed TMDLs for these streams.

Table 6.3-32. Stream segments in the Secesh River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5- Impaired Waters with an EPA-approved TMDL		
Secesh River - 1st and 2nd order tributaries	Temperature, water	146.9
Secesh River, Grouse, and Willow Basket Creeks - 3rd order	Temperature, water	7.1
Lick Creek - 3rd order (Prince Creek to Secesh River)	Temperature, water	6.2

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS conclude that the habitat limiting factors for the Secesh steelhead population are excess sediment and passage barriers. Table 6.3-33 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. A discussion of each limiting factor follows using information from U.S. Forest Service reports, IDEQ reports, and the Salmon Subbasin Assessment and Management Plan (USFS 2007a; IDEQ 2002a, 2009; NPCC 2004; Ecovista 2004).

Table 6.3-33. Primary limiting factors identified for the Secesh River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Steelhead	Management Objectives to Address Limiting Factors
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream and road improvement and rehabilitation to reduce sediment delivery to streams.
Migration Barriers	Migration barriers such as culverts and dams can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed, ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers.

1. *Excess Sediment*

Sediment in the Secesh River watershed has a moderate influence on habitat quality (NPCC 2004, p. 3-33). As reported by the U.S. Forest Service (2006), fine sediments have consistently been lower in the Lake Creek and Secesh River spawning areas than in the mainstem upper South Fork Salmon River spawning areas, except for the anomalous Threemile Creek site that continues to be influenced nearby unconsolidated mine spoils. The Threemile Creek site is functioning at risk and near functioning at unacceptable risk for intragravel fine sediments. Intragravel conditions at other Secesh monitoring sites appear to provide habitat with the potential for high salmon and steelhead embryo survival (USFS 2006). Conditions at the Threemile Creek site are unlikely to improve without stabilization of the finer mine tailings, but their influence appears to be restricted to a relatively small area.

The extensive road system has historically contributed high levels of sediment to streams in the Secesh River watershed. Following the Burgdorf Junction Fire, the Burned Area Emergency Rehabilitation Team recommended decommissioning 23.7 miles of mining roads in the watershed (USFS 2007a). The Payette National Forest has identified several opportunities to accelerate the rate of stream habitat improvement in the Secesh River watershed by decreasing road-related sediment delivery to streams. Some examples include the following roads: Marshal Meadows (Forest Road [FR] #325), Josephine Lake (FR #315), Grouse Creek (FR #325), Chimney Rock (FR #335), and Forest Highway #48 from Ponderosa Campground to Oompaul Creek. The Payette National Forest has also identified the following roads as needing stabilization and overall improvements to water management: (1) roads in Cow/Maverick Creeks; (2) the Crystal Mountain Mine access road; and (3) the abandoned/closed roads east of Corduroy Burgdorf Road (USFS 2007a).

2. *Passage Barriers*

Five culverts at road stream-crossings and one water diversion have been identified as passage barriers to salmonids in the Secesh watershed (BOR 2013b). The culverts creating passage barriers are on Burgdorf, Jeneatte, Willow, and Threemile Creeks. The water diversion barrier is on Zena Creek. Removal of these barriers would give steelhead access to additional spawning and rearing habitat.

Summary of Current Habitat Limiting Factors and Threats

Habitat limiting factors in the Secesh River steelhead population are linked to human-induced disturbances such as mining and road building. The inherently fragile parent geology combined with human disturbances and occasional heavy precipitation makes the basin susceptible to large sediment producing events that degrade habitat quality for steelhead. Roads located near streams limit stream shade and potential sources of large woody debris. Priorities for addressing limiting factors in the Secesh steelhead population should be reduction of sediment inputs from roads and removal of passage barriers. This may require road obliteration, realignment, conversion or closure. Elimination of potential hazardous materials at abandoned mine sites (drums of unknown chemicals) should be evaluated to prevent soil and water contamination.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of limiting factors, but need to be managed to protect habitat in the Secesh River population area.

1. Degraded habitat due to residential development - Without sufficient planning, development adjacent to spawning and rearing habitat could degrade the ecological function and ability of these areas to support steelhead.
2. Degraded habitat due to recreational use - The Secesh River watershed is becoming a popular destination for dispersed recreation, providing opportunities for hunting, fishing, ATV use, motorcycling, snowmobiling, hiking, skiing, mountain biking, and camping (PNF 2003, p. III-232). The increasing level of recreational ATV use is becoming a primary concern in the watershed, leading to additional vegetation loss and ground disturbance (Wagoner and Burns 2001, p. 44), which could increase sediment delivery to streams.
3. Degraded habitat from noxious weeds - A number of noxious weeds and exotic plants have been introduced into the watershed, particularly along the main travel ways. Noxious weeds can increase soil erosion and decrease native plant density.

Hatchery Programs

Hatchery-origin steelhead are not currently released into the Secesh River population, nor have they been released in the past. Further, strays from other hatchery programs are not known to be a problem for the population. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Secesh River steelhead, a high-proportion B-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for Secesh River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The priority stream reaches for habitat actions are reaches with intrinsic potential in the population's major spawning area, the Upper Secesh River above Enos Creek, and the minor spawning area, Lick Creek (Figure 6.3-19). Addressing limiting factors within these areas should focus on habitat protection, potential sources of sediment, and restoration of riparian habitat.

Habitat Actions

The following priority habitat actions are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed. Emphasis on reduction and stabilization of disturbed areas will improve watershed conditions while protection of intact areas will prevent further disturbances.

1. Improve and rehabilitate roads to reduce sediment delivery.
2. Reclaim or rehabilitate abandoned mine sites to reduce sediment delivery.
3. Address passage barriers on tributaries to the Secesh River.

Implementation of Habitat Actions

Implementation of habitat actions for this population will likely occur through the work of the U.S. Forest Service, IDFG, IDEQ, Nez Perce Tribe, and county soil and water conservation districts. Between these groups there is an excellent representation of tribal, local, state, and federal entities that manage land and other resources within the watershed. These groups have a record of implementing salmon conservation projects and programs in this drainage and in other areas within the state.

Many habitat restoration projects have already been completed in the Secesh River drainage. These projects included road graveling, road decommissioning, and a replacement of a Grouse Creek culvert with a bridge. The Nez Perce Tribe has decommissioned 36 miles of road between 1996 and 2012 (NPT 2013).

Table 6.3-34 shows habitat projects which have been identified for this population to address limiting factors. The table, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with the above groups and other partners to identify and prioritize needed habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-34. Habitat Recovery Actions Identified for the Secesh River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Passage	Address 2 barriers	BPA Contract # 2007-127-00: East Fork of South Fork Salmon River Passage Restoration*	N/A
Sediment	Improve 20 road miles		

* Since fish passage cannot currently be restored through the old Stibnite Mine Site on the East Fork South Fork Salmon River (due to lack of landowner consent), the Nez Perce Tribe and U. S. Forest Service have proposed several other high priority habitat restoration actions throughout the South Fork Salmon watershed, to be funded under this BPA habitat restoration contract.

Habitat Cost Estimate for Recovery

There are many uncertainties involved in predicting the course of recovery and in estimating total costs. Such uncertainties include biological and ecosystem responses to recovery actions as well as long-term and future funding. This recovery plan is dynamic and subject to change through the adaptive management process. Costs estimates for specific projects are provided where known. No cost estimates are provided for (1) baseline actions (programs that are already in existence, such as FCRPS mitigation), which are listed as Not Applicable (N/A); or (2) actions that need costs to be developed, which are listed as To Be Determined (TBD).

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Secesh River steelhead population is to continue managing the population for natural production. The strategy also calls to monitor the population for strays from Salmon River MPG hatchery programs and take necessary action to reduce spawning of hatchery strays with natural-origin steelhead. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Secesh River supports a B-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Natal habitat, hatchery, harvest and other MPG actions alone will not produce the increases in survival needed for the Secesh River steelhead population to achieve maintained status and larger MPG to achieve viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.13 North Fork Salmon River Steelhead Population

The North Fork Salmon River population is tentatively rated at maintained due to a tentative moderate risk rating for abundance/productivity (NWFSC 2015). The population is targeted to achieve this proposed status of Maintained, which requires no more than moderate abundance/productivity risk.

Current Status	Proposed Status
Maintained?	Maintained

The proposed status for the North Fork Salmon River population suggests that no recovery plan actions directed specifically at this population are necessary. However, a conservative management approach should be pursued until population-specific data become available to more accurately describe the status of this population. Recovery actions in the Snake and Columbia River migration corridor, and spawning and rearing habitat actions aimed primarily at spring/summer Chinook, will further reduce the risk for this population.

While current best available information indicates that this population has achieved its proposed status, there is a high degree of uncertainty in estimating the population’s current status, as well as the nature and timing of the population’s response to various recovery strategies. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA’s 5-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If new information shows that this population has not achieved its proposed status, it is imperative to identify those actions that are most likely to yield additional improvement.

Population Status

This section of the recovery plan compares the North Fork Salmon River population’s proposed status to its current status. The population’s current status is based on the ICTRT’s population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population’s current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The North Fork Salmon River steelhead population includes the North Fork Salmon River and the Salmon River and its tributaries from the North Fork Salmon River downstream to Panther Creek. Besides the North Fork Salmon River itself, Indian Creek is the most important tributary in this steelhead population. The ICTRT (2003) designated this population based primarily on the geographic distance of the primary spawning areas from other spawning aggregates, and on basin topography.

The current steelhead distribution in the North Fork Salmon River watershed is known largely through juvenile surveys. A NMFS model of potential habitat, based on geomorphological characteristics, suggests that the historic distribution of steelhead could have included much of the North Fork Salmon watershed, Indian Creek, and several tributaries draining into the Salmon River (NMFS 2006) (Figure 6.3-21). Current distribution defined by local agencies appears similar to this historic estimate. In the North Fork watershed, current steelhead distribution includes Hughes, Hull, Twin, Pierce, Dahlonega, and Sheep Creeks, as well as the North Fork Salmon River mainstem. For tributaries draining into the Salmon River, current distribution includes Pine, Spring, Moose, Squaw, and Indian Creeks.

The North Fork Salmon River population is an A-run steelhead population. Hatchery A-run steelhead of Hells Canyon stock were released into the North Fork between 1977 and 1994.

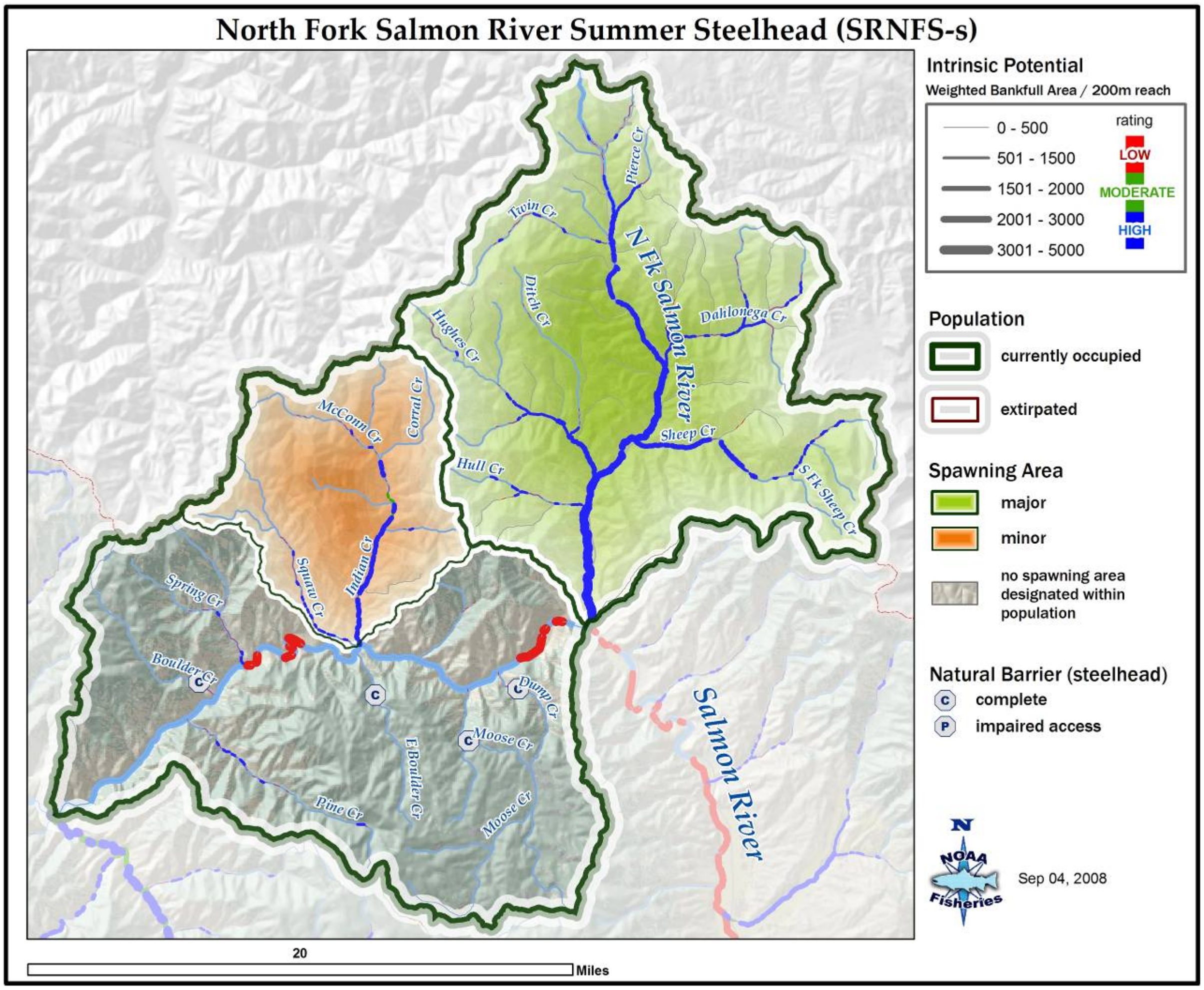


Figure 6.3-21. North Fork Salmon River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the North Fork Salmon River population as “Basic” in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Basic has a mean minimum abundance threshold of 500 natural-origin spawners with sufficient intrinsic productivity to achieve a 5 percent or less risk of extinction over a 100-year timeframe. In order for the North Fork population to achieve a 25 percent or less risk (“moderate risk”) of extinction over 100 years, abundance and productivity targets are somewhat lower.

Abundance and Productivity

The NWFSC (2015) used results from a recent genetic stock composition study to estimate population spawning escapements for several Snake River Basin steelhead populations. The NWFSC did not generate spawner abundance and productivity estimates for this population, however, because the genetic stock group containing this population showed a high potential for misclassification. The NWFSC tentatively rated the North Fork Salmon River population at moderate risk for abundance/productivity, based on past assessments of aggregate abundance for A-run steelhead passing Lower Granite Dam. (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for populations where new information is available. NMFS will update this section for this population when new information is available.

Spatial Structure

The ICTRT has identified one major spawning area (North Fork) and one minor spawning area (Indian Creek) within the North Fork Salmon River steelhead population, and this limited spatial structure creates an inherent extinction risk. However, because both historic spawning areas are currently occupied, the cumulative spatial structure risk is low, which is sufficient for this population to reach its proposed status (NWFSC 2015).

Diversity

The diversity risk for this population is largely driven by the occurrence of hatchery fish spawning in the population, from past direct releases of hatchery steelhead into the North Fork Salmon River and from ongoing potential straying of hatchery steelhead returning to the upper Salmon River.

Hatchery A-run steelhead were released into the North Fork Salmon River every year from 1977-1994, except 1992. It is assumed that all smolt releases were Pahsimeroi Hatchery A-run stock, which was derived primarily from Hells Canyon Snake River stock. In some years, natural spawners could have consisted of greater than 80 percent recruits from hatchery smolt releases. However, genetic analysis of the population has shown no similarity to hatchery samples.

Hatchery steelhead are currently released at numerous locations in the upper Salmon River for harvest augmentation. Current releases of hatchery smolts near the North Fork Salmon River are Pahsimeroi Hatchery A-run stock, which was derived from Hells Canyon stock. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps, and are thus assumed to be spawning naturally. The number and proportion of natural spawners in the North Fork Salmon River population that are from proximate mainstem Salmon River hatchery releases, or from release points upstream of this population, are unknown.

The past hatchery and the potentially high proportion of hatchery-origin spawners straying into the North Fork Salmon River and other Salmon River tributaries contribute to a cumulative moderate diversity risk for the population. A moderate diversity risk is adequate for the population to reach its proposed status (NWFSC 2015).

Summary

The North Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity. A population-specific monitoring program is necessary to reduce the uncertainty of this rating. Table 6.3-35 shows the population’s current and proposed status (both maintained) in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-35. North Fork Salmon River population risk ratings integrated across the four viable salmonid population metrics.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M North Fork Salmon R	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

Estimates indicate that this population is currently meeting its proposed status of maintained, so no recovery plan actions are directed specifically at the population at this time. However, the following sections on limiting factors and recovery strategies are included for several reasons. Considerable uncertainty is involved in achieving the proposed status for all of the populations within the Salmon River MPG, so further reducing the risk status for the North Fork Salmon River population could provide flexibility for meeting the delisting goal for the MPG. Due to lack of population-specific abundance and productivity data, there is also uncertainty associated with the conclusion that the North Fork Salmon River population is currently meeting its proposed status. Finally, further reducing the extinction risk for this population could be necessary for meeting goals beyond compliance with the Endangered Species Act, such as additional harvest of the state of Idaho or interested tribes.

Limiting Factors and Threats Specific to Population

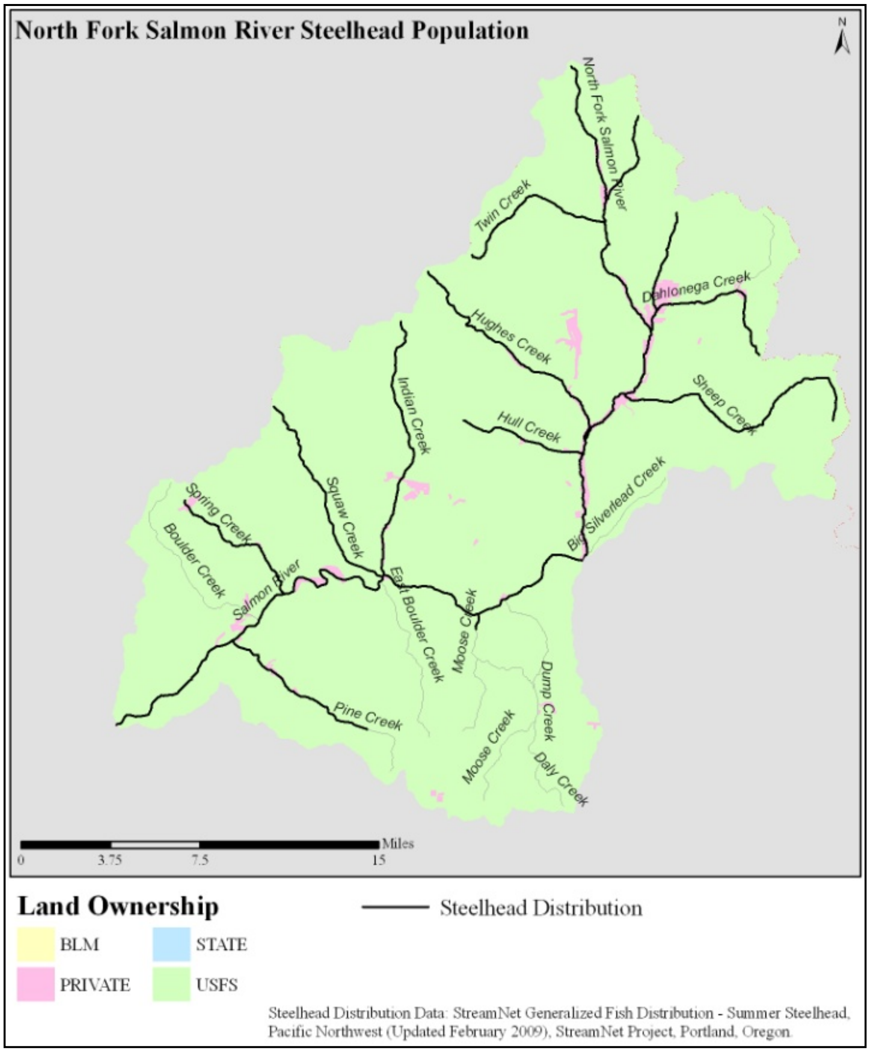
This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The North Fork Salmon River population is located along the Idaho-Montana border and includes the North Fork Salmon River watershed and all tributaries downstream to the confluence of Panther Creek. The population geographic boundary drains approximately 483 square miles. The climate of the Salmon River basin is highly variable, but near Salmon, Idaho the average annual precipitation is about 10 inches, mostly falling as snow during the winter and early spring. The weather for the region is characterized by warm summers and cool or mild winters.

Land ownership within the population is mostly U.S. Forest Service (97.8%). Private (2.1%) and state of Idaho (<1%) lands make up a very small portion of ownership in the population. The Salmon-Challis National Forest administers most of the land within the population boundaries, but private inholdings are located along many streams (Figure 6.3-22). Public lands are used for livestock grazing, timber, recreation, and a variety of other public uses. Private land management is mostly irrigated agriculture and livestock grazing in the valley bottom. Past human activities including mining, timber harvest, livestock grazing, and development have impacted this habitat for at least the last 130 years. At one time, hydraulic gold mining in the Gibbonsville area produced high levels of turbidity in the North Fork Salmon River and delivered large amounts of fine sediment to stream channels. Livestock grazing allotments occur within the Hughes Creek and Hull Creek drainages, but impacts from these activities have been declining (IDEQ 2001a).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-22. Land ownership in the North Fork Salmon River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

IDEQ's 2008 Integrated 303(d)/305(b) Report included stream segments listed under the Clean Water Act, section 5 (303d streams), section 4c (waters impaired by non-pollutants), and section 4a (EPA approved TMDLs) (IDEQ 2009). Only one stream segment in the population, Dump Creek, is listed as impaired. Dump Creek is listed for sediment along 5.04 miles. The creek has a natural barrier in the lower section that prevents upstream steelhead migration. In other locations sediment levels monitored with core sampling were variable, but most were functioning properly for quartzite parent geology (USFS 2010a).

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS conclude that the key habitat limiting factors for this population are lack of habitat complexity/riparian conditions, low stream flow, entrainment in unscreened irrigation diversions and migration barriers.

Table 6.3-36 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. The following section discusses each limiting factor using information from IDEQ reports, U.S. Forest Service habitat assessments, and the Salmon Subbasin Assessment and Management Plan.

Table 6.3-36. Primary limiting factors identified for the North Fork Salmon River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Habitat Complexity	Reduced habitat complexity from lack of sufficient LWD reduces pools formation juvenile rearing and adult holding.	Riparian restoration to increase habitat complexity and LWD recruitment.
Stream Flow	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels).	Water quantity restoration actions to improve instream flow and stream connectivity.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal fish passage barriers.
Entrainment	Juvenile fish entrainment occurs through unscreened irrigation diversions. Young salmon are at risk when they are diverted into canals or diversion ditches.	Eliminate entrainment through actions that prevent the loss of fish in irrigation diversion systems.

1. *Loss of Channel Complexity*

Past land use drastically reduced habitat complexity and pool frequency in the North Fork Salmon River population by removing riparian vegetation and altering LWD recruitment processes (USFS 2000). Current human activities may be further reducing LWD in stream channels.

While surveying the North Fork Salmon River channel in the 1990s, the Salmon-Challis National Forest and IDFG observed a significant reduction in the amount and quality of rearing habitat associated with deep pools and the amount and quality of spawning habitat. The biologists concluded that a major factor in this reduction was loss of LWD (USFS 2005b). Highway maintenance and private land practices remove LWD and debris jams from the stream channels, particularly the North Fork Salmon River mainstem, in order to reduce the risk to the numerous bridges crossing the river. This loss of LWD has led to loss of pool habitat (USFS 2007d). Furthermore, without LWD to reduce stream flow velocities, gravel and small cobbles are more likely to be washed downstream during high flows. The Salmon-Challis National Forest has observed a change in substrate from gravel and small cobbles to large cobbles and boulders in the North Fork Salmon River and a simultaneous reduction in suitable spawning habitat (USFS 2005b).

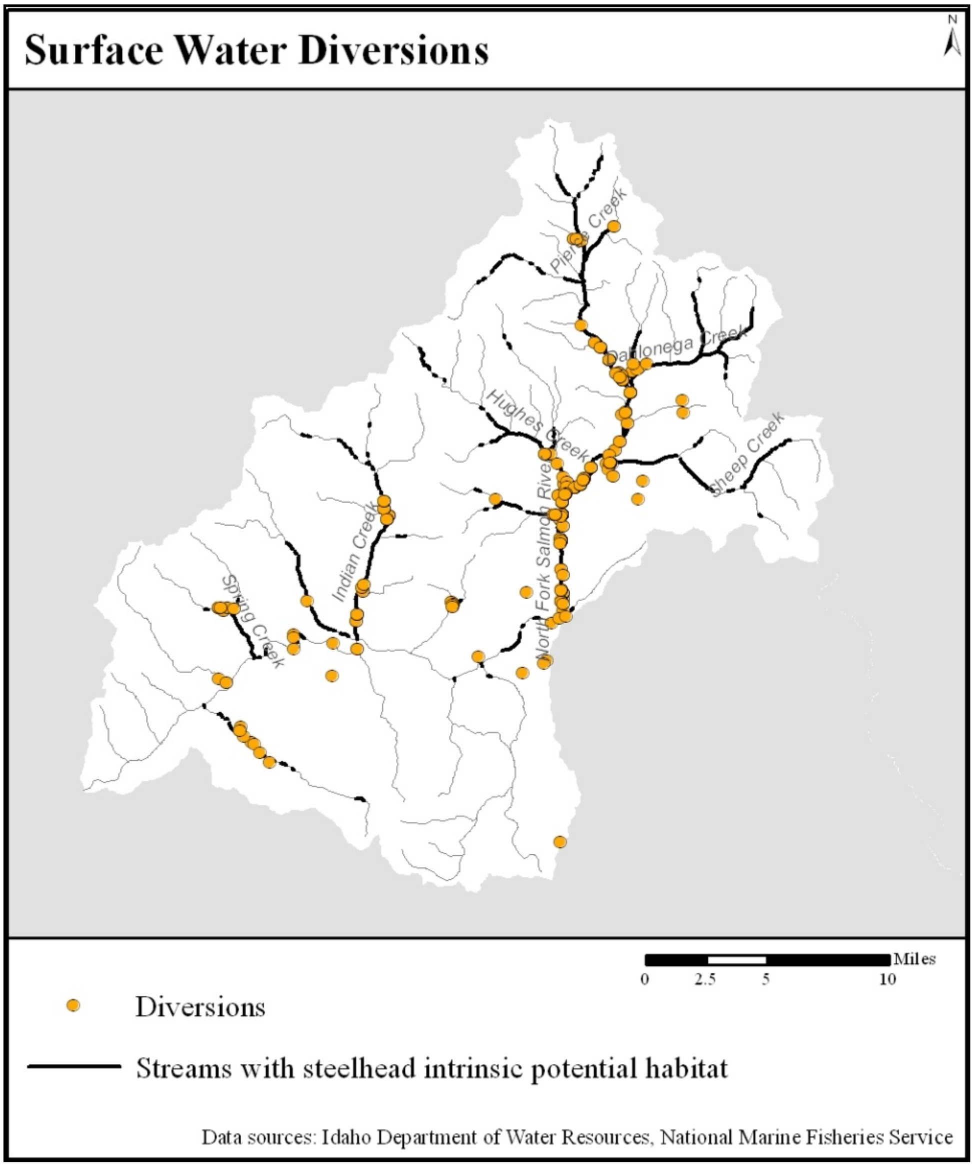
Stream restoration projects have increased habitat complexity in individual stream reaches in Indian Creek, Hughes Creek, and the North Fork Salmon River by placing logs and boulders. Many more stream miles in the population are currently limited by lack of habitat complexity and LWD, such that future projects could continue to incrementally increase abundance and productivity for steelhead.

In addition, grazing, road building, and hydraulic mining have all removed riparian vegetation and led to widespread bank instability (USFS 2000). Bank instability can cause wide, shallow channels that do not provide quality rearing habitat due to lack of cover and the potential for high temperatures. Where bank instability is impacting roads or private property, bank stabilization projects (e.g. riprap) are common. Streambanks with riprap often have simplified habitat, fewer undercut banks, and are less likely than natural streambanks to deliver large woody debris to streams (Schmetterling et al. 2001).

2. *Low Streamflow during Critical Periods*

Low streamflows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement. The effects of altered streamflows on steelhead due to irrigation withdrawals influence the quantity and quality of juveniles rearing habitat. Growth and survival of juvenile salmonids can be related to streamflow, and reduced streamflow can lead to decreased food availability (Nislow et al. 2004; Harvey et al. 2006). Juvenile salmonids generally stay close to escape cover, and as flow decreases, availability of escape cover also decreases (Hardy et al. 2006; [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.] Holecek et al. 2009). The numerous water withdrawals in the North Fork Salmon River population area may be limiting this population’s abundance and productivity by reducing the availability and quality of juvenile habitat.

Irrigation in the North Fork Salmon River population occurs on strips of private land along narrow stream valleys where ranchers grow alfalfa and hay or maintain pasture. While irrigation diversions are scattered throughout the population, diversions in the North Fork Salmon River and Indian Creek drainages have the most potential to affect the population (Figure 6.3-23). In the North Fork Salmon River drainage, irrigation diversions are known to cause reduced flows in Dahlonega Creek, Hughes Creek, and Hull Creek (USFS 2000). The effects of water withdrawals on North Fork Salmon River salmonids have not been studied as thoroughly as in neighboring populations like the Lemhi River and Pahsimeroi River, which both have broad valleys with much greater amounts of irrigation. Within the North Fork Salmon River population, the extent of irrigation is constrained by lack of arable land due to narrower valleys. Nonetheless, water rights exist for a cumulative 52.5 cfs of water to be diverted from the North Fork Salmon River drainage (IDWR 2008). In contrast, the U.S. Geological Survey (USGS) (Hortness and Berenbrock 2001) estimates that in the absence of irrigation diversions, August flow at the mouth of the North Fork Salmon River would exceed 28 cfs only 20 percent of the time, suggesting that irrigation diversions could substantially reduce summer flows within the watershed. On the other hand, Idaho Power Company reported mean measured August flows of 50.2 cfs, 53.1 cfs, and 39.7 cfs in 2005, 2006, and 2007 respectively (Idaho Power Company 2009). These measured flows during the irrigation season are of the same magnitude as the USGS's modeled unimpaired baseflows, suggesting a smaller impact to flows from irrigation diversions. The apparent conflict between these different sources of information could come from multiple factors, such as the high level of uncertainty associated with the USGS modeled unimpaired flow estimates or the possibility that irrigators may divert less stream flow than the water right maximums. Lack of long-term data on streamflow or irrigation diversions makes it difficult to quantify the effects of streamflow impairments on salmonids within the North Fork Salmon River watershed.



Data sources: Idaho Department of Water Resources, National Marine Fisheries Service

Figure 6.3-23. Location of surface water diversions within the North Fork Salmon River steelhead population.

Water withdrawals may also be limiting steelhead habitat in Indian Creek. Water rights exist for a cumulative 2.5 cfs of stream flow in the watershed, compared to an estimated unimpaired August base flow that exceeds 7.4 cfs only 20 percent of the time (Hortness and Berenbrock 2001), suggesting the potential for substantial streamflow reductions. In 2002 the Lemhi County Soil and Water Conservation District completed a project to consolidate diversions on Indian Creek in order remove passage barriers created by the old diversions and divert less water overall, enhancing instream flows (USBWP 2009). Again, because of lack of measurements on actual streamflow or water withdrawals, it is difficult to quantify the effects of streamflow impairments on steelhead habitat in this drainage.

Watershed reports show that reduced streamflow is limiting available habitat in a few specific tributary streams like Dahlonega Creek and Hughes Creek in the North Fork Salmon River drainage (USFS 2000). The available data are inconclusive on whether reduced flows are also impairing habitat in the North Fork Salmon River mainstem or in Indian Creek. However, the large number of irrigation water rights relative to summer streamflow levels in both these drainages means that there is potential for habitat impairment. As described above, reduced streamflow can limit juvenile habitat by leading to increased water temperatures, by reducing the volume of available rearing habitat, or by blocking passage between stream reaches. Temperature monitoring has not shown elevated stream temperatures, but this remains a possible effect from reduced flows (USFS 2007d). Reductions in available habitat and barriers to habitat, on the other hand, are likely currently reducing the abundance and productivity of this population. Very few restoration projects have so far addressed this limiting factor within the North Fork Salmon River population.

3. *Entrainment*

Unscreened irrigation diversions pose a threat to rearing streams in multiple streams in the population, particularly Dahlonega Creek, Hughes Creek, and Hull Creek in the North Fork Salmon River watershed (USFS 2000). Without screens, steelhead may enter diversions and become trapped. Many diversions on the mainstem North Fork Salmon River are now screened, but diversions throughout the rest of the population remain unscreened. As depicted Figure 6.3-23, the number of irrigation withdrawals indicates that the risk of entrainment is present throughout much of the population. The Upper Salmon Basin Watershed Program partners and IDFG are working with landowners to screen diversions.

4. *Migration Barriers*

The Salmon Subbasin Assessment reported that multiple barriers to fish migration exist in tributaries to the mainstem Salmon River within the North Fork Salmon River population boundaries (NPCC 2004). These tributaries are generally more important for steelhead than for Chinook salmon. During the reconstruction of Highway 93, numerous culverts that were previously fish migration barriers were replaced with larger culverts that improved fish migration. Rehabilitating culverts in Twin and Sheep Creeks has also improved connectivity within the North Fork Salmon River drainage (SCNF 1993 as cited in IDEQ 2001a).

Currently, there are man-made physical barriers (culverts and diversion dams) on both public and private lands that may affect this steelhead population. There are four fish migration barriers caused by culverts in the Hughes Creek drainage. Three of these culverts are in the engineering design phase and scheduled to be replaced with fish passable structures within the next five years, depending upon funding (USFS 2010a). A diversion dam on private land in Hull Creek creates a complete migration barrier to upstream fish passage. The diversion also leads to intermittent to subsurface flow for approximately 1.2 miles on Hull Creek. There is one partial migration barrier culvert in lower Hull Creek. This culvert may not be a total barrier to fish passage, but it impedes upstream juvenile fish migration during low flows. During high flows, the culvert may also impede upstream fish passage for adult salmonids. Culverts on U.S. Forest Service roads in Anderson and Threemile Creeks, which have intrinsic potential steelhead habitat, limit fish movement. An unscreened ditch with a diversion dam also exists on private land on Anderson Creek, preventing fish from moving upstream and entraining fish in the unscreened ditch (USFS 2004). There are man-made physical barriers (culverts and diversion dams) within Indian Creek on both public and private lands.

Summary of Current Habitat Limiting Factors and Threats

Based on the information compiled above, NMFS concludes that the key habitat limiting factors for the North Fork Salmon River population are lack of habitat complexity, reduced streamflow, and entrainment in ditches. Development along the North Fork Salmon River corridor further threatens habitat quality and may lead to limiting factors in the near future. Impassable culverts and elevated fine sediment loads exist within the population boundaries.

Potential Habitat Limiting Factors and Threats

One potential concern has not yet risen to the level of a limiting factor, but should be managed to protect steelhead habitat in the North Fork Salmon River population area and allow any degraded habitat to recover.

1. Loss of habitat quality due to rural development. Rural development along the mainstem North Fork Salmon River poses a threat to habitat quality for steelhead. Development, and particularly bridges crossing the river to reach home sites, can lead to bank instability and loss of riparian vegetation. A study on development in Lemhi County, commissioned by Salmon Valley Stewardship, ranked almost all private land along the North Fork Salmon River as being high priority for development, based on the suitability for housing sites and relatively low agricultural potential of the land (Spatial Dynamics 2006). Housing development along the mainstem North Fork Salmon River is likely to continue, potentially leading to further bank instability and removal of riparian vegetation and an increase in riprap. These changes to the riparian zone could degrade habitat quality, such as by leading to wider stream channels with less cover for juvenile salmonids and with higher stream temperatures.

   Local efforts to reduce this threat to stream habitat are ongoing. Lemhi County is developing a Comprehensive Plan and Growth Management Plan with riparian setbacks. The Nature

Conservancy and Lemhi Regional Land Trust are working with private landowners through education and are developing conservation easement agreements. NMFS recommends education programs to encourage landowners to retain vegetation along the river and minimize the effects of bridges.

Hatchery Programs

No hatchery releases occur in the North Fork Salmon River steelhead population area. Further, strays from other hatchery programs are not known to be a problem for the population. Hatchery-related limiting factors and threats for Salmon River steelhead are discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to North Fork Salmon River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for North Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches:

Within the North Fork Salmon River population, the priority drainages for habitat actions are the population’s one major spawning area, the North Fork Salmon River, and the population’s one minor spawning area, Indian Creek. Within these drainages, priority streams are those that have been ranked by the Upper Salmon Basin Watershed Program Technical Team as Priority I and also have modeled intrinsic potential for steelhead spawning and rearing (Figure 6.3-24).

The Upper Salmon Basin Watershed Program prioritized the streams for salmonid habitat restoration in a report titled Screening and Habitat Prioritization for the Upper Salmon basin in 2005 and updated the priorities in 2012 (USBWP 2012). The SHIPUSS report prioritized stream reaches based on a scoring system that considered stream connectivity, stream size, and habitat and fisheries information on a weighted basis. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2012). The 2012 report with an updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

Because the SHIPUSS priorities encompass multiple salmonid species, priority streams for steelhead under this recovery plan are those that also provide intrinsic potential for steelhead. For example, Hughes Creek in the North Fork Salmon River drainage is a SHIPUSS Priority I stream and has high intrinsic potential.

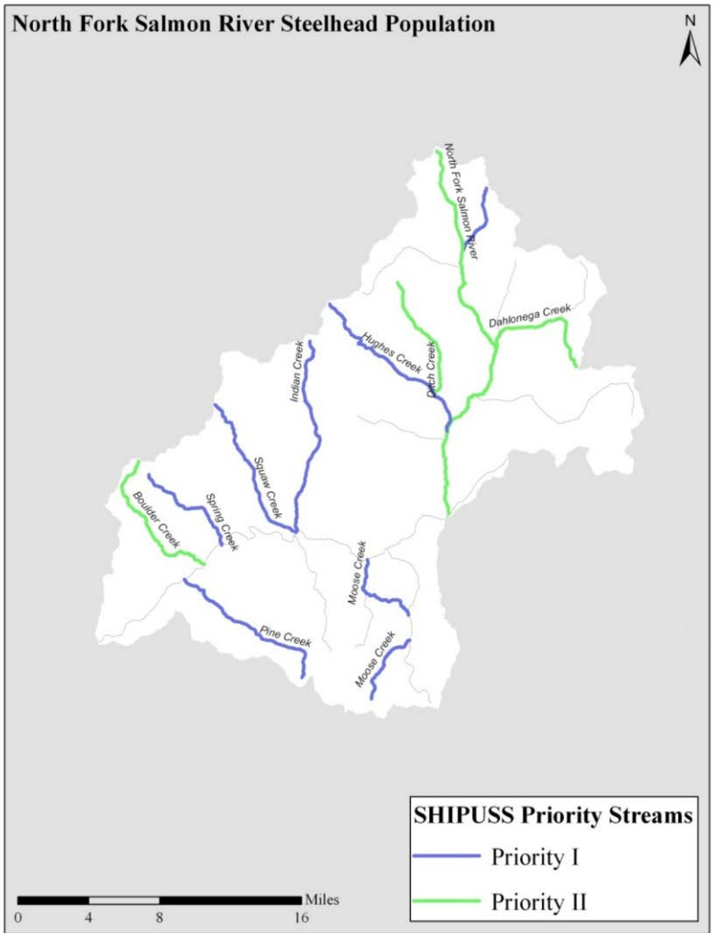


Figure 6.3-24. Priority streams for habitat actions in the North Fork Salmon River steelhead population (USBWP 2005). An updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

Habitat Actions

The following habitat actions are intended to improve productivity rates and increase the capacity for natural smolt production in the population.

1. Continue to increase habitat complexity, pool frequency, and spawning habitat by adding structures to stream channels. Salmon-Challis National Forest and Trout Unlimited have completed projects in both Indian Creek and the North Fork Salmon River in which they placed multiple log structures. But there are many more miles of stream in which habitat quality is limited by lack of complexity and pools and where placed structures could improve fish habitat by creating pools, stabilizing banks, creating scour, and retaining spawning gravels (USFS 2000). NMFS recommends new projects to increase habitat complexity and monitoring of

completed projects to track their effectiveness. Monitoring of log-drop structures placed in Indian Creek has shown that steelhead are spawning in habitat associated with the structures (USFS 2004).

2. Reestablishing riparian vegetation will also provide cover, stabilize streambanks, and reduce stream temperatures (Ecovista 2004). The lower portions of Hughes Creek and Dahlonega Creek have been channelized and altered by mining tailings. Reestablishing a natural channel would improve riparian function.
3. Reduce impacts to habitat from irrigation diversions. For the North Fork Salmon River, as for much of the upper Salmon River basin, a key habitat goal is to restore natural hydrographs in important anadromous fish streams, thus ensuring adequate base flows, channel-maintaining peak flows, and normal flow timing (Ecovista 2004). The Upper Salmon Basin Watershed Program partners, BPA, and IDWR will continue to work with private landowners to secure instream flows and improve diversion dams, conveyance systems, and irrigation efficiency. Improving diversion dams includes adding screens to unscreened diversions and thus reducing risk of fish entrainment.
4. Eliminate fish passage barriers that are blocking steelhead from accessing potential habitat.

Implementation of Habitat Actions

Implementation of habitat actions for this population will occur primarily through the efforts of the Upper Salmon Basin Watershed Program partners. On federal lands, following the existing U.S. Forest Service Land and Resource Management Plan should provide the protection needed for this population. These groups have already completed many habitat restoration projects for this population. The projects include restoring fish habitat by adding instream structures, improving fish passage, riparian fencing, road and trail work, and diversion modifications.

Additional habitat actions will build on past projects. Where active restoration is needed, implementation of this recovery plan will likely occur through the work of the Upper Salmon Basin Watershed Program. Table 6.3-37 shows habitat projects that have been identified for this population to address limiting factors. This list, however, only identifies projects for implementation through Bonneville Power Administration programs and does not represent a full list of projects. Specific projects are planned continuously based on available funding and established priorities. During Plan implementation, NMFS will work with the above groups and other partners to refine and prioritize needed habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-37. Habitat Recovery Actions Identified for the North Fork Salmon River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Channel structure and habitat diversity	Instream habitat diversity for spawning, rearing, and resting by adding structure: Create log jams and channel spanning weirs. Create pool habitat.	Boyner property restoration project. Turchan property restoration project. McClain property restoration project. Abbott property restoration project. Hutton-Murphy property restoration project. Dedmon-Kozacek property restoration project.	N/A
Floodplain connectivity	Improve floodplain connectivity.		
Riparian Area Stability and Vegetation	Reestablish riparian vegetation and improve streambank stability.		

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the North Fork Salmon River steelhead population is to continue managing the population for natural production and to collect information on the natural population. The strategy also calls to monitor the population for strays from Salmon River MPG hatchery programs and take necessary action to reduce spawning of hatchery strays with natural-origin steelhead. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The North Fork Salmon River supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Strategies and actions implemented downstream of the Salmon River MPG will contribute to increasing viability of North Fork Salmon River steelhead to achieve maintained status and the larger Salmon River steelhead MPG to reach viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by the mainstem Columbia and Snake Rivers hydropower system, estuarine habitat alterations and climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies for the Idaho steelhead MPGs and populations.

6.3.14 Pahsimeroi River Steelhead Population

The Pahsimeroi River steelhead population is tentatively rated as maintained based on a tentative moderate risk rating for abundance and productivity (NWFSC 2015). Population spatial structure and diversity are also currently rated at moderate risk. The Pahsimeroi River population is targeted to achieve this status of Maintained, which requires no more than moderate abundance/productivity and spatial structure/diversity risk.

Current Status	Proposed Status
Maintained?	Maintained

The proposed status for the Pahsimeroi River population suggests that no recovery plan actions directed specifically at this population are necessary. However, a conservative management approach should be pursued until population-specific data become available to more accurately describe the status of this population. Recovery actions in the Snake and Columbia River migration corridor, and spawning and rearing habitat actions aimed primarily at spring/summer Chinook, will further reduce the risk for this population. Recovery actions in tributaries to the main Salmon River (e.g. Iron, Cow, McKim, and Poison Creeks) could also reduce risk to the population.

While current best available information indicates that the population has tentatively achieved its proposed status, there is a high degree of uncertainty in estimating the population’s current status, as well as the nature and timing of the population’s response to various recovery strategies. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA’s 5-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If new information shows that this population has not achieved its proposed status, it is imperative to identify those actions that are most likely to yield additional improvement.

Population Status

This section of the recovery plan compares the Pahsimeroi River population’s proposed status to its current status. The population’s current status is based on the ICTRT’s population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population’s current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

This population includes the Pahsimeroi River and its tributaries, as well as all tributaries to the Salmon River from the mouth of the Lemhi upstream to the Pahsimeroi. The population is separated from steelhead spawning aggregates by a minimum of 40 km and was identified as an independent population on this basis. The current steelhead distribution in the Pahsimeroi watershed includes the lower Pahsimeroi River, Patterson Creek, and Falls Creek. In the Salmon River tributaries, steelhead are distributed in accessible areas of Iron, Hat, Poison, Cow, and McKim Creeks, and potentially in Williams Creek and the mainstem Salmon River. A NMFS model of potential habitat for the Interior Columbia Basin, based on stream characteristics such as gradient and width, suggests that the historic distribution of steelhead could have included more tributaries to the Pahsimeroi River and to the mainstem Salmon River, and could have been more expansive in some streams than current distribution (NMFS 2006)[4] (Figure 6.3-25). Access to some potential historic habitat is currently blocked by irrigation diversion structures and by the reduced streamflow associated with the seasonal water withdrawals at these structures. The Pahsimeroi River population is an A-run steelhead population.

IDFG operates a hatchery program in the Pahsimeroi River, with hatchery facilities and a permanent weir less than a mile from the confluence with the Salmon River. The hatchery is funded by Idaho Power Company as mitigation for fishery losses related to construction of hydroelectric dams on the Snake River in Hells Canyon. The hatchery's steelhead broodstock was largely sourced from Snake River/Hells Canyon A-run stock.

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[4] For a detailed description of model methods and assumptions, see http://www.nwfsc.noaa.gov/trt/trt_documents/appendix_c_viability_3_15_2007.pdf

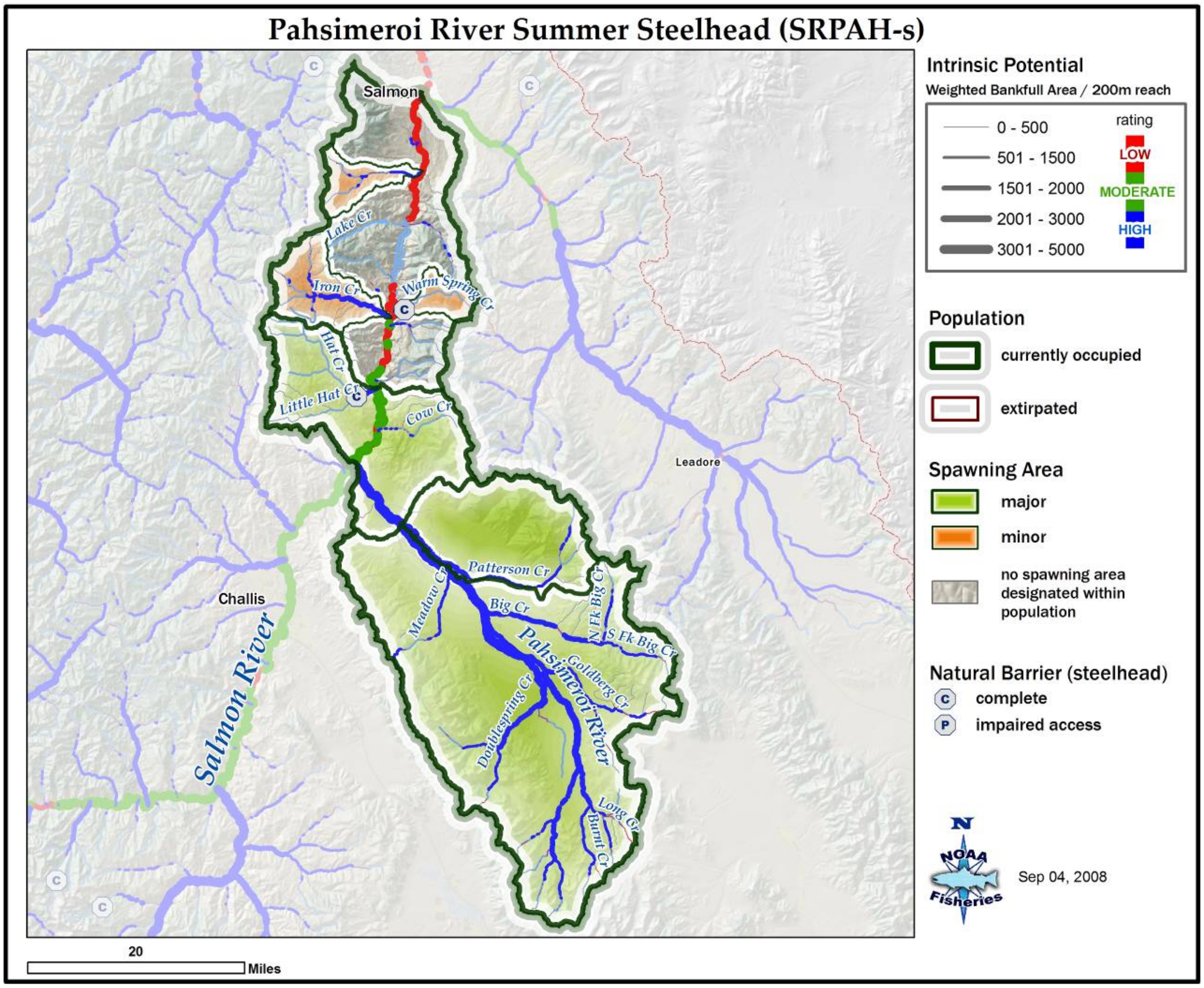


Figure 6.3-25. Pahsimeroi River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Pahsimeroi River population as “Intermediate” in size and complexity based on historical habitat potential (ICTRT 2007). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥ 1.14 recruits per spawner at the abundance threshold) to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe. For the Pahsimeroi River steelhead population to achieve a 25 percent or less risk (“moderate risk”) of extinction over 100 years, abundance and productivity targets are somewhat lower.

Abundance and Productivity

The NWFSC (2015) used results from a recent genetic stock composition study to estimate population abundance and productivity for some Snake River Basin steelhead populations. The NWFSC did not generate spawner abundance and productivity estimates for the Pahsimeroi population, however, because the stock group containing this population showed a high potential for misclassification. The NWFSC tentatively rated the Pahsimeroi River population at moderate risk for abundance/productivity, based on past assessments of aggregate abundance for A-run steelhead passing Lower Granite Dam (NWFSC 2015).

Natural spawners in this population include returns originating from naturally spawning parents (natural or hatchery-origin) and returns of hatchery steelhead. Large numbers of hatchery steelhead (adipose-clipped smolts) are released below the Pahsimeroi River weir and in the mainstem section of the Salmon River between the Pahsimeroi River and the Lemhi River for harvest augmentation under dam mitigation programs. Not all of the returning adults are intercepted in fisheries or captured at hatchery weirs. As a result there are not current estimates of either the number or proportion of hatchery-origin steelhead that spawn naturally in mainstem and tributary reaches in the Pahsimeroi River steelhead population area (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for populations where new data is available. NMFS will update this section for this population when new information is available.

Spatial Structure

The ICTRT has identified three major spawning areas (Upper Pahsimeroi; Patterson Creek; and Lower Pahsimeroi, which includes Cow Creek) and two minor spawning areas (Iron Creek and Williams Creek) in this population. Steelhead occupy additional tributaries to the main Salmon River in this population (e.g. McKim Creek), for which the habitat patch size is too small to constitute a major or minor spawning area. Juvenile steelhead are present in the upper and lower halves of the Lower Pahsimeroi and Patterson major spawning areas, but only in the lower half of the upper Pahsimeroi major spawning area, leading to a reduction and simplification of the population’s spatial structure. Until recently, the two minor spawning areas on the Salmon River appeared to be unoccupied, increasing the gap between this population and other downstream steelhead populations. (A barrier on lower Iron Creek was removed in spring 2007, and steelhead/rainbow trout were observed in this minor spawning area in summer 2007 (Curet et al. 2009)). These factors contribute to a cumulative moderate spatial structure risk for the population, which is sufficiently low for the population to reach its proposed overall status (NWFSC 2015).

Diversity

The major life history strategies historically represented in the Pahsimeroi River population are unknown. The population is currently classified as consisting of A-run steelhead, and the NWFSC (2015) tentatively assumed that all historic major life history pathways are currently present. Irrigation practices in the basin, combined with natural subsurface flows through alluvial slopes, result in dewatering of the lower reaches of many tributaries for a significant part of the year. The disconnection of tributaries from the mainstem Pahsimeroi River affects juvenile movement patterns and habitat use during freshwater rearing, leading to a change in the population's phenotypic variation. Irrigation practices have also reduced steelhead access to the upper portion of the Pahsimeroi River basin. Historically this population may have occupied five ecoregions, including dry gneissic-schistose volcanic hills in the mid-elevations of the Pahsimeroi watershed, but current distribution has been reduced almost exclusively to dry intermountain sagebrush valleys, reducing the population's diversity of habitat types.

Hatchery fish are likely influencing the diversity of this population. The current Pahsimeroi River hatchery program, founded from both local and out-of-MPG stocks, releases marked hatchery smolts for harvest augmentation in the Pahsimeroi River. Additionally, hatchery steelhead are released into the East Fork Salmon River and Upper Mainstem Salmon River populations (for both supplementation of the natural populations and harvest augmentation). These fish must swim through the Salmon River mainstem portion of the Pahsimeroi River population as adults when returning to their release sites. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps, and are thus spawning naturally. Recent surveys by the IDFG documented the presence of significant proportions of hatchery-origin spawners in many of the main Salmon River tributaries. Only natural-origin steelhead have been released into the Pahsimeroi River upstream of the hatchery weir since at least 1985, but hatchery fish are likely spawning in the lower Pahsimeroi and in tributaries to the main Salmon River between the Pahsimeroi and Lemhi River confluences. Although the ICTRT considered the two main Salmon River minor spawning areas to be unoccupied, a low level of dispersed steelhead spawning may occur in Salmon River tributaries, and hatchery fish may be a large component of these spawners. Based on the recent low returns of natural spawners into the Pahsimeroi River itself (counted at the weir), the presence of hatchery spawners in tributaries may have a large population-level effect on spawner composition.

The factors discussed above lead to a moderate cumulative diversity risk, which is adequate for the population to reach its proposed status (NWFSC 2015).

Summary

The Pahsimeroi River steelhead population is currently at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for spatial structure/diversity. A population-specific monitoring program is necessary to reduce the uncertainty of the abundance/productivity rating, which is based on an average dataset for the DPS. Table 6.3-38 shows the population's current and proposed status (both maintained) in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-38. Pahsimeroi River population risk ratings integrated across the four viable salmonid population (VSP) metrics.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M Pahsimeroi River	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

This population is estimated to be meeting its proposed status of maintained, so no recovery plan actions directed specifically at this population are necessary at this time. However, the following sections on limiting factors and recovery strategies are included for several reasons. Considerable uncertainty is involved in achieving the proposed status for all of the populations within the Salmon River MPG, so further reducing the risk status for the Pahsimeroi River population could provide flexibility for meeting the delisting goal for the MPG. Due to lack of population-specific abundance and productivity data, there is also uncertainty associated with the conclusion that the Pahsimeroi River population is currently meeting its proposed status. Finally, further reducing the extinction risk for this population could be necessary for meeting goals beyond compliance with the Endangered Species Act, such as additional harvest by the state of Idaho or interested tribes.

Limiting Factors and Threats Specific to Population

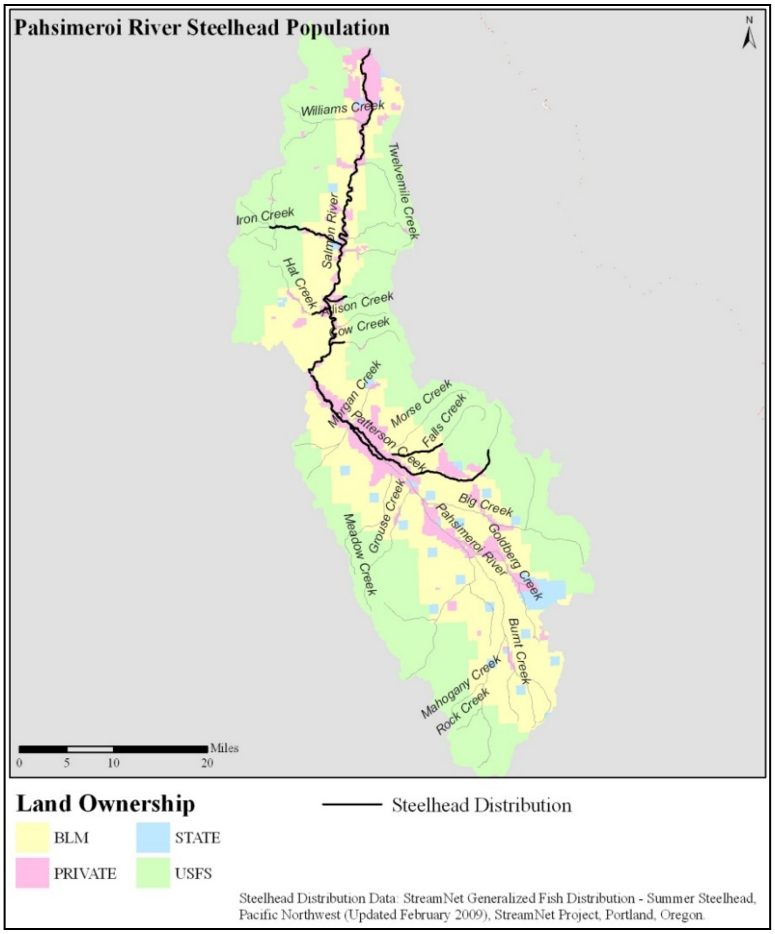
This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Pahsimeroi steelhead population includes the Pahsimeroi watershed and the Salmon River and its tributaries from its confluence with the Pahsimeroi River downstream to its confluence with the Lemhi River. The Pahsimeroi River steelhead population geographic boundary drains approximately 1,325 square miles. The drainage is semiarid, with most of the precipitation falling as snow in the higher elevations. The higher elevations may receive up to 30 inches (water content) per year, while lower elevations receive as little as 8 inches annually (Young and Harenberg 1973). Peak streamflows historically occurred during late May and early June as a result of rapid snowmelt, but streamflow in the mainstem Pahsimeroi is now low throughout the year because of irrigation withdrawals. The surface and groundwater system throughout the basin is highly connected (Meinzer 1924; Young and Harenberg 1973), such that streamflow can be affected by both surface and groundwater withdrawals.

Land ownership within the Pahsimeroi River steelhead population is mostly U.S. Forest Service (51.8%) and BLM (36.8%). Private (8.8%) and state of Idaho (2.6%) make up a smaller portion of ownership in the Pahsimeroi River steelhead population. The land-ownership pattern is private along valley bottoms of the Pahsimeroi River and along two large sections in the Big Creek and Patterson Creek drainages (Figure 6.3-26). BLM lands generally occur in the mid-elevation reaches, with U.S. Forest Service lands located in higher elevations. State-owned lands are township sections scattered mostly within BLM lands. In terms of land area, 30,000 acres of the Pahsimeroi River watershed are in irrigated agriculture (hay, pasture, or crop); 263,430 acres are rangelands; and the remaining 244,970 acres are primarily U.S. Forest Service lands (timber and range) (ISCC 1995).



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-26. Land-ownership pattern displayed in the Pahsimeroi River Steelhead Population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

The Pahsimeroi River basin has been degraded from its historic condition. Over a century of livestock grazing and instream flow alterations have substantially altered the vegetation, structure, and connectivity of the riparian zones in the Pahsimeroi watershed. Altered riparian communities exist in the lower portions of the watershed, overlapping much of current occupied steelhead and Chinook salmon habitat (NPCC 2004, p. 3-16). Water diversions occur throughout the population boundaries and have a profound impact on stream habitat. The predominant land use is ranching and cattle grazing, although historic mining also occurred (ISSC 1995). Patterson Creek (the lower reach of which is also known locally as Big Springs Creek) may have degraded water quality from zinc leaking downstream from an abandoned tungsten mine (NPCC 2004, p. 3-16). There are no significant timber resources in the Pahsimeroi watershed although there are occasionally a few post and pole timber sales (ISSC 1995). In tributary streams draining directly into the Salmon River, subwatershed descriptions provided by the IDEQ (2001a) for Hat, Iron, Williams, Rattlesnake, and Warmsprings Creeks indicate similar land uses to the Pahsimeroi River, although timber harvest appears to have been more prevalent.

Current spawning and rearing for steelhead occurs in the Pahsimeroi River from its mouth upstream to Hooper Lane, and in Falls Creek and Patterson-Big Springs Creek. Steelhead have recently been observed in the Iron Creek minor spawning area (Curet et al. 2009), but the Williams Creek minor spawning area is believed to be unoccupied. Most tributaries are disconnected from the mainstem Pahsimeroi River by irrigation diversions, combined with deep alluvial slopes that cause streamflow to move subsurface, and the flow is often intermittent in a “sink” reach of the upper Pahsimeroi River. Diverted water returns to the river via large springs near the center of the valley, so the lower Pahsimeroi River has flow year-round and high connectivity to the Salmon River. Within this lower reach, the river is a low-gradient stream dominated by groundwater flow, which moderates temperature. The channel is sinuous and well-developed and has a large proportion of pool habitat. During the summer, submergent plants grow in the main channel, indicating a relatively high level of aquatic productivity, which sets the Pahsimeroi River apart from other tributaries in the Salmon River basin (Copland and Venditti 2009).

The IDEQ’s Integrated (303(d)/305(b)) Report for the Clean Water Act identifies stream segments in this population that are not fully supporting their assessed beneficial uses. Table 6.3-39 shows the impaired stream segments listed in IDEQ’s Integrated Report under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters that have an EPA-approved TMDL) (IDEQ 2009, 2014).

Table 6.3-39. Stream segments in the Pahsimeroi River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2009, IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d) - Impaired Waters Needing a TMDL		
Pahsimeroi River - Meadow Creek to Patterson Creek	Cause Unknown	10.2
Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek	Cause Unknown	1.6
Pahsimeroi River - Goldburg Creek to Big Creek	Cause Unknown	5.3
Pahsimeroi River - Goldburg Creek to Big Creek	Cause Unknown	6.6
Pahsimeroi River - Goldburg Creek to Big Creek	Cause Unknown	0.1
Pahsimeroi River	Cause Unknown	2.5
Pahsimeroi River	Cause Unknown	10.4
Big Creek - confluence of North and South Fork Big Creeks	Cause Unknown	13.6
Salmon River - Williams Creek to Pollard Creek	Cause Unknown	8.8
Salmon River - Twelvemile Creek to Williams Creek	Cause Unknown	6.4
Salmon River - Iron Creek to Twelvemile Creek	Cause Unknown	12.6
Salmon River - Pahsimeroi River to Iron Creek	Cause Unknown	9.1
Pahsimeroi River - Meadow Creek to Patterson Creek	Combined Biota/Habitat Bioassessments	50.7
Lawson Creek-confluence of North and South Fork Lawson Creek	Combined Biota/Habitat Bioassessments	1.8
North Fork Lawson Creek - source to mouth	Combined Biota/Habitat Bioassessments	11.8
South Fork Lawson Creek - source to mouth	Combined Biota/Habitat Bioassessments	11.9
Meadow Creek - source to mouth	Combined Biota/Habitat Bioassessments	28.5
Grouse Creek - source to mouth	Combined Biota/Habitat Bioassessments	35.9
Burnt Creek - Long Creek to mouth	Combined Biota/Habitat Bioassessments	5.1
Short Creek - source to mouth	Combined Biota/Habitat Bioassessments	5.8
Donkey Creek -source to mouth	Combined Biota/Habitat Bioassessments	13.6
Salmon River - Williams Creek to Pollard Creek	Combined Biota/Habitat Bioassessments	48.9
Cow Creek - source to mouth	Combined Biota/Habitat Bioassessments	27.2
Pahsimeroi River - Meadow Creek to Patterson Creek	Particle distribution (Embeddedness)	2.5
Pahsimeroi River - Meadow Creek to Patterson Creek	Sedimentation/Siltation	50.7
Big Creek - confluence of North and South Fork Big Creeks	Sedimentation/Siltation	13.6
Pahsimeroi River - Meadow Creek to Patterson Creek	Temperature, water	50.7
Pahsimeroi River - Meadow Creek to Patterson Creek	Temperature, water	10.2
Section 4c-Waters Impaired by Non-pollutants		
Meadow Creek - source to mouth	Low flow alterations	28.51
Grouse Creek - source to mouth	Low flow alterations	35.96
Pahsimeroi River - Goldburg Creek to Big Creek	Low flow alterations	6.64

Waterbody	Impairment/Cause	Stream Miles
Pahsimeroi River - Burnt Creek to Unnamed Tributary	Low flow alterations	10.34
Patterson Creek - Inyo Creek to mouth	Other flow regime alterations	14.97
Morgan Creek - source to mouth	Low flow alterations	14.07
Section 4a- Impaired Waters with EPA-Approved TMDLs		
East Fork Pahsimeroi River - source to mouth	Sedimentation/Siltation	1.4
East Fork Pahsimeroi River - source to mouth	Temperature, water	1.4
Pahsimeroi River	Sedimentation/Siltation	12.9
Pahsimeroi River - Big Creek to Furey Lane (T15S, R22E)	Sedimentation/Siltation	3.2
Pahsimeroi River - Furey Lane (T15S, R22E) to Meadow Creek	Sedimentation/Siltation	1.6
Pahsimeroi River - Goldburg Creek to Big Creek	Sedimentation/Siltation	12.0
Pahsimeroi River - Mahogany Creek to Burnt Creek	Sedimentation/Siltation	6.2
Pahsimeroi River - Mahogany Creek to Burnt Creek	Temperature, water	6.2
Pahsimeroi River - Meadow Creek to Patterson Creek	Sedimentation/Siltation	12.7
Pahsimeroi River - Patterson Creek to mouth	Sedimentation/Siltation	10.3
Pahsimeroi River - Patterson Creek to mouth	Temperature, water	10.3
Salmon River - Iron Creek to Twelvemile Creek	Phosphorus (Total)	67.6

*The “Combined Biota/Habitat Bioassessments” cause is assigned to a waterbody when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.
**“Cause Unknown” as an impairment is used by IDEQ when instream monitoring protocols indicate the stream segment does not support the beneficial uses but the cause of the problem is not clear and may not be identifiable until a full water body assessment or TMDL is completed. For example, a review of the benthic organisms present in a water body may indicate a water quality problem.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS concluded that the habitat limiting factors for the Pahsimeroi steelhead population are reduced streamflow, passage barriers, sedimentation, elevated stream temperatures, degraded riparian conditions, and juvenile fish entrainment. Table 6.3-40 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. The following section discusses the limiting factors using information from IDEQ reports, the Salmon Subbasin Assessment and Management Plan, and Idaho Model Watershed Plan (IDEQ 2001b; IDEQ 2009, 2014; ISSC 1995; NPCC 2004; Ecovista 2004).

Table 6.3-40. Primary limiting factors identified for the Pahsimeroi River steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Stream Flow	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels).	Increase instream flow and stream connectivity.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed, ultimately reducing potential spawning and rearing habitat.	Correct or remove fish passage barriers.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration actions to stabilize streambanks and reduce sedimentation to the stream.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature.
Riparian Conditions	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and LWD recruitment (habitat complexity and pool formation).	Riparian restoration actions to increase habitat complexity and LWD recruitment.
Entrainment	Juvenile fish entrainment occurs through unscreened irrigation diversions. Young salmon are at risk when they are diverted into canals or diversion ditches.	Screen irrigation diversion structures.

1. *Reduced Flow during Critical Periods*

Reduced stream flow is the most important habitat factor limiting abundance and productivity for this population. Stream flow conditions are also affecting spatial structure within the population by eliminating access to the upper Pahsimeroi River and to tributary habitat, and are affecting diversity by limiting juvenile movement patterns and habitat use.

The NPCC’s subbasin assessment identified dewatering and reduced flows as one of the primary impacts on aquatic habitat quality in the Pahsimeroi River basin (NPCC 2004). There are approximately 38,000 acres of irrigated agriculture in the Pahsimeroi River basin, which results in the consumptive use of approximately 57,000 acre feet of water per year. This means that approximately 25 percent of the annual flow of the Pahsimeroi River is removed from the system each year. An estimated 84 percent of the farmland is irrigated with surface water diversions that directly reduce streamflow, and the remaining 16 percent of farmland is irrigated with groundwater. Groundwater pumping may lower groundwater levels and thus indirectly impact streamflow. Irrigation in the Pahsimeroi River valley started in 1870 and the amount of land irrigated has increased over time (Table 6.3-41). Between 1971 and 2003, groundwater levels dropped by as much as 39 feet, possibly due to an increase in groundwater pumping. Surface water and groundwater in the Pahsimeroi River drainage appear to be closely linked (Meinzer 1924; Young and Harenberg 1973), so the Pahsimeroi River and its tributaries might be experiencing a long-term decline in streamflow due to dropping groundwater levels.

Table 6.3-41. Amount of land irrigated from surface water and ground water sources in the Pahsimeroi River drainage.

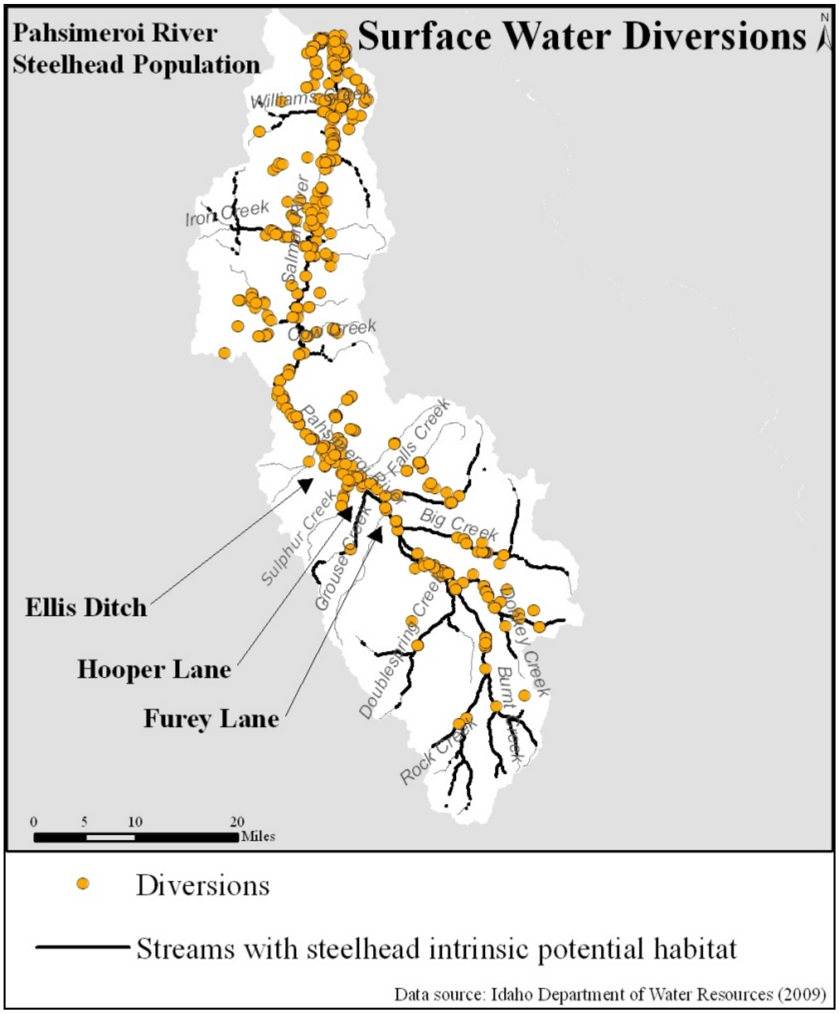
Decade	Total land (acres) irrigated from surface water sources at the end of the decade	Total land (acres) irrigated from ground water sources at the end of the decade
1870-1879	851	0
1880-1889	4,561	0
1890-1899	7,554	0
1900-1909	15,634	0
1910-1919	22,944	0
1920-1929	27,540	0
1930-1939	27,741	0
1940-1949	28,163	4
1950-1959	30,579	832
1960-1969	31,442	3,615
1970-1979	32,357	5,196
1980-1989	32,513	5,239
1990-1999	32,514	5,680

Although the lower Pahsimeroi River never completely dries, its flows are severely altered by water use. Streams in central Idaho that are not impacted by irrigation experience high flow from mid-April through mid-July and baseflow conditions for the rest of the year. Streams that are moderately impacted by irrigation experience high flow from mid-April through mid-July, very low flow in August and September, and normal baseflow conditions from October through March (Arthaud et al. 2010). In contrast, the lower Pahsimeroi River experiences lower than normal base flow from May through September and normal base flow for the rest of the year, indicating a highly modified hydrograph (Arthaud et al. 2010). Water use has essentially eliminated high spring flows. Additionally, extensive development of water resources has reduced access to tributary and mainstem habitat, and has reduced the amount of currently accessible mainstem habitat.

2. Migration Barriers

Currently much of the Pahsimeroi River watershed is inaccessible to steelhead due to barriers related to irrigation withdrawals. Most tributaries are disconnected from the mainstem Pahsimeroi River by irrigation diversions, and streamflow is often intermittent in the upper parts of the basin. Figure 6.3-27 shows surface water diversions in the watershed, along with local landmarks. Migration barriers are caused by water diversion structures and by low stream flow or dry channels. These barriers preclude steelhead from using habitat in the middle and upper Pahsimeroi River, Goldberg Creek, and many smaller tributaries. The reduction in accessible habitat caused by migration barriers has reduced the productivity and abundance of the Pahsimeroi River steelhead population. Migration barriers have also reduced the population’s spatial structure.

There is some uncertainty in the Pahsimeroi River watershed over where surface flow could feasibly be restored to allow fish access to more habitat. Currently, the mainstem Pahsimeroi River dries below Furey Lane (river mile 17.8) in summer due to surface water diversions and flows going subsurface. This reach below Furey Lane, where flow goes subsurface, has been described as a “natural” sink. However, as late as the mid-1920s the Pahsimeroi River had perennial flow through this reach and up to Goldberg Creek (RM 26.4), in spite of approximately 25,000 acres being irrigated at that time (Meinzer 1924). Reconnection of the mainstem Pahsimeroi River through this reach may therefore be possible.



Data source: Idaho Department of Water Resources (2009)

Figure 6.3-27. Surface water diversions in the Pahsimeroi River steelhead population.

Most tributaries upstream from Goldberg Creek are connected to the mainstem Pahsimeroi River and have surface flow year round (although steelhead are blocked from accessing these tributaries due to the dry reach in the mainstem Pahsimeroi River). Most tributaries downstream from Goldberg Creek are dry in their lower reaches for most of the irrigation season, and many have been completely disconnected from the mainstem Pahsimeroi River for many years. In the mid-1920s, almost no surface water from tributaries reached the lower stretches of the Pahsimeroi River after spring flooding (Meinzer 1924). Colvin and Moffit (2008) used an analysis of ditch locations to suggest that, at the time of ditch construction, some tributaries were likely already disconnected from the mainstem Pahsimeroi during summer low flows, due to natural sinks in the water table. Due to the geology of the Pahsimeroi valley, many of the smaller tributaries were likely intermittent historically. However, steelhead likely had access to tributary habitat during higher flows of spring and early summer. Tributaries with potential for reconnection include the upper Pahsimeroi River mainstem (and its tributaries), Big Creek, Patterson Creek, Falls Creek, Morse Creek, and Morgan Creek. Most of the streams on the west side of the valley quickly infiltrate into the substrates and do not even reach the valley floor. Sulphur Creek has been reconnected to the Pahsimeroi River. The tributary is now accessible to steelhead but the fish have not been documented there.

As shown in Figure 6.3-27, many irrigation diversions also remove surface water from tributaries to the main Salmon River within the population boundaries. Iron Creek is a tributary to the Salmon River that enters from the west and drains an area of 15,540 hectares. Historically, during summer base flow, the lower most diversion on Iron Creek received all the water from the stream, disconnecting the Iron Creek from the main Salmon River. Iron Creek was reconnected in the spring of 2007 by consolidating the four lowest diversions on the stream into one point of diversion that was moved to a pumping station on the mainstem Salmon River (Curet et al. 2009). The lower reach of Williams Creek, in the population’s other minor spawning area, may go dry some years due to irrigation withdrawals (IDEQ 2001a). There is a natural migration barrier (waterfall) in Hat Creek, approximately 2.2 miles upstream from its mouth (USFS 2010b).

3. *Excess Sediment*

Conditions reported for the Pahsimeroi River suggest that sediment is reducing the population’s abundance and productivity. IDEQ (2009) has listed segments of the Pahsimeroi River, East Fork Pahsimeroi River, and Big Creek as impaired by high levels of fine sediment (Table 6.3-39). The Idaho Model Watershed Plan (ISCC 1995) also lists sediment as a limiting factor for salmonids in the Pahsimeroi, primarily high sediment levels in spawning gravels. Cobble embeddedness in the Pahsimeroi River is approximately 50 percent, with similar levels in Patterson Creek and Big Creek (ISCC 1995). McNeil core sediment sampling showed subsurface fines (particles < 6 mm) in excess of 50 percent in Patterson Creek and at one sample site in the middle section of the Pahsimeroi River. Morse Creek and upper Pahsimeroi River had 32 and 34 percent subsurface fines, respectively (IDEQ 2001b). Surface fine sediments assessed during IDEQ BURP and BLM R1/R4 monitoring also indicate high levels of sediment (IDEQ 2001b). The Salmon-Challis National Forest has an objective of 20 percent or less fine sediment < 6.35 mm (0.25 in.) to 6 inches depth for streams supporting anadromous fish. Many samples sites within this population have fine sediment levels above this target.

The majority of sediment delivered to the Pahsimeroi River is from streambank erosion (IDEQ 2001b). IDEQ (2001b) states that increased streambank erosion from overgrazing within the riparian vegetation zone remains the single largest source of sediment into the Pahsimeroi River. The intensity of livestock grazing and location of irrigation diversion systems throughout the watershed contribute to high sediment levels. The Idaho Model Watershed Plan (ISCC 1995) indicates that high sediment levels are caused by poor streambank stability and diversion-related activities. IDEQ (2001b) indicates that the primary sources of sediment from streambank erosion are above Hooper Lane, affecting the reaches downstream from this point, which are occupied by salmon and steelhead. About 95 percent of the existing total erosion (tons/year) occurs from this area.

The sediments and riparian areas of upper Patterson Creek may be contaminated with lead, zinc, and other heavy metals from the abandoned Ima Mill and Mine sites. The Ima Mill on Patterson Creek processed tungsten ore from area mines from the early 1900s until 1957. The waste materials from this refining process include concentrated metals, such as lead and zinc, which could pose a threat to humans and wildlife, but are relatively minor in extent (BLM 2004). Through its Abandoned Mine Lands program, the BLM has taken steps to stabilize tailings and minimize the transport of sand-sized tailings to Patterson Creek (BLM 2004). In 2012, BLM conducted core sampling of tailings to determine if heavy metals were migrating through the tailings and therefore might pose a threat to water quality (BLM 2012). BLM completed additional surface and groundwater sampling efforts in 2013. It found that although groundwater discharges coming from the mine workings had anomalously high metals concentrations, water quality in Patterson Creek downstream from where those groundwater sources discharge to the stream did not exceed Idaho Surface Water Quality Standards for aquatic life.

The Patterson Creek drainage is one of the estimated three historic major spawning areas for the population. However, a combination of irrigation withdrawals and natural infiltration across the alluvial fan has disconnected upper Patterson Creek from its lower reaches. The mill site is just upstream from the alluvial fan, such that steelhead cannot currently access this area. High levels of dissolved metals in the surface water could limit steelhead spawning and rearing in the historic Patterson Creek major spawning area. Projects to restore habitat quality and access to upstream habitat in Patterson Creek are ongoing. The potential for heavy metal contamination of surface waters should be clarified prior to attempting to resolve other limiting factors in this tributary.

Other sources of sediment in the Pahsimeroi River basin are from roads, legacy mining, and legacy forestry. TMDLs have been approved by the U.S. Environmental Protection Agency for sediment/siltation for the Pahsimeroi and East Fork Pahsimeroi Rivers (IDEQ 2009). The recommended load allocation described in IDEQ’s Pahsimeroi TMDL is for an overall reduction of 74 percent (2,094 tons) in sediment from streambank erosion. Targets described in the TMDL for sediment reduction include attaining streambank stability of 80 percent and subsurface fine sediment levels of 28 percent or less fine sediment (< 6.35 mm) in areas suitable for salmonid spawning.

Elevated sediment levels may also be limiting habitat potential in tributaries to the main Salmon River. Past grazing activities on U.S. Forest Service lands in the upper portions of Cow Creek have contributed to sediment ratings of functioning at risk (USFS 2010b).

4. Elevated Water Temperature

Conditions reported for the Pahsimeroi River population suggest that temperature is reducing the population's abundance and productivity. Water temperatures for some stream reaches in the Pahsimeroi River exceed state criteria for salmonid spawning (IDEQ 2001b, IDEQ 2013). Idaho salmonid spawning temperature criteria require water temperatures to not exceed a maximum instantaneous temperature of 13 ºC (55.4 ºF) or a maximum daily average temperature of 9 ºC (48.2 ºF) during the spawning season (April and May for steelhead in the Pahsimeroi population). In May of 1999, temperatures measured at the Pahsimeroi hatchery intake exceeded the criteria. During this period, the highest maximum instantaneous temperature was 19.1 ºC (66.4 ºF) and the maximum temperature criterion was exceeded a total of 17 days. The maximum daily average criterion was also exceeded for 19 days, with the highest daily average at 14.9 ºC (58.9 ºF). IDEQ (2009) has listed water temperature impairments in the Pahsimeroi River from the mouth upstream to Meadow Creek, in the Pahsimeroi headwaters from Mahogany Creek to Burnt Creek, and in Trail Creek and Sulphur Creek.

Elevated temperatures in the Pahsimeroi are likely caused by lack of riparian vegetation and reduced stream flows from irrigation withdrawals. Reduced stream flow was identified by IDEQ (2009) as a stream impairment in the Pahsimeroi River and several tributaries (Table 6.3-39). Improvement of riparian vegetation density, vigor, and structure would help reduce stream widths and provide shade to the stream, which would reduce stream heat loading (IDEQ 2001b). Diverting water for irrigation may also play a substantial role in warming stream temperatures. Irrigation diversions cause increased temperatures in two ways: by reducing streamflow volume and thus reducing the temperature buffering capacity of the streams, and by delivery of heat loading from irrigation return water (Poole and Berman 2001).

5. Degraded Riparian Conditions

Poor riparian conditions can threaten salmonids by impacting sediment, stream temperature, and habitat quality. IDEQ's TMDL for sediment in the Pahsimeroi River prescribes a reduction in streambank erosion and anticipates that this reduction will result from an improvement in riparian vegetation density and structure. An increase in riparian vegetation should help stabilize streambanks, reduce lateral recession, trap sediment, and reduce the erosive energy of the stream, which should, in turn, reduce sediment loading. It is also expected that improvement of riparian vegetation density and structure would help reduce stream temperatures in the future.

Approximately 61 percent of the drainages within the Pahsimeroi River basin have less than satisfactory riparian vegetation conditions, based on stream functionality and/or plant community assessments. Most of these altered riparian communities are in the lower portions of the watershed (NPCC 2004, p. 3-18). Riparian inventories conducted by the BLM (1999) suggest that there are many riparian areas in the Pahsimeroi watershed that are either functioning at risk or not properly functioning, likely due to livestock grazing. Similarly, the riparian habitat in the upper portion of Cow Creek has been impacted by past grazing practices on U.S. Forest Service lands (USFS 2010b). For Williams Creek, a road parallels the stream for much of its length, adversely affecting the riparian vegetation (Kuzis and Bauer 2007).

6. *Entrainment*

Loss of juvenile steelhead in unscreened diversion structures can affect abundance and productivity. The exact number of unscreened diversions and loss of steelhead in this population is unknown. The large number of irrigation withdrawals in the population area indicates that the risk of entrainment is present throughout much of the population. The Idaho Fish Screen Program builds and maintains screens through a cooperative program funded by NMFS and BPA. The IDFG constructs and maintains the screens in cooperation with local water users.

Summary of Current Habitat Limiting Factors and Threats

Freshwater habitat in the Pahsimeroi River basin has been degraded from its historical condition. Stream dewatering, alterations to riparian areas, and increased fine sediments have affected freshwater habitat quality (NPCC 2004, p. 3-18). Over a century of livestock grazing and instream flow alteration has altered stream habitat and reduced the connectivity of habitat in the Pahsimeroi basin (NPCC 2004) and in tributaries to the main Salmon River. These alterations include reduction in available habitat due to low flows, sedimentation of spawning gravels, high stream temperatures from reduced shading, and bank instability. Each of these factors may act cumulatively or independently to adversely affect the Pahsimeroi River steelhead population (Ecovista 2004, NPCC 2004).

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of a limiting factor, but should be managed to protect steelhead habitat in the Pahsimeroi River population area and allow any degraded habitat to recover.

1. Reduced instream flow due to new water diversions and wells. Instream flows are already low due to irrigation withdrawals and new surface or groundwater development could further threaten steelhead habitat.
2. Loss of floodplain and riparian function from residential development. Residential development in floodplains and riparian zones can lead to bank instability, loss of riparian vegetation, and loss of floodplain function.

3. Habitat degradation from noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density. Annual grasses have the ability to alter the fire regime allowing for larger, more frequent fires.
4. Reduction or removal of American Beaver (*Castor Canadensis*). Beaver dams can substantially alter river ecosystems and provide the following possible stream habitat benefits: higher water tables, reconnected and expanded floodplains, more hyporheic exchange, higher summer base flows, expanded wetlands, improved water quality, and greater habitat complexity. Programs should be developed to encourage beaver activity in areas with low potential for beaver/human conflict and to implement beaver mimicry structures in areas with high potential for beaver/human conflict.

Hatchery Programs

The hatchery run of steelhead in the Pahsimeroi River was initiated from wild steelhead collected and transplanted from the middle Snake River beginning in 1966. These fish were collected at Hells Canyon Dam and originally inhabited waters of the upper Snake Basin, such as the Weiser and Powder Rivers. In 1974, managers released Clearwater River B-run steelhead smolts from Dworshak National Fish Hatchery into the Pahsimeroi River. Stocking of B-run progeny into the Pahsimeroi River was discontinued in 1983. More recently, steelhead adults have been released or outplanted above the weir for natural production in most years since 1969. A policy of releasing at least one-third of the steelhead run above the weir was implemented in the early 1980’s. Since 1988, all steelhead released above the weir for natural production have been of natural-origin.

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, possible demographic and life history changes, and increased competition for food and space. Hatchery-related limiting factors and threats for the Pahsimeroi River population and other Salmon River steelhead are further discussed at the MPG level in Section 6.3.3.2.

Fisheries Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Pahsimeroi River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for Pahsimeroi River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

Currently accessible reaches of the lower Pahsimeroi River and lower Patterson Creek are the first priority for habitat restoration actions. The second priority for habitat actions is reconnecting tributaries and the middle and upper sections of the Pahsimeroi River.

Habitat Actions

The following habitat actions, ranked by priority, are intended to improve productivity, abundance, and spatial structure for the Pahsimeroi River steelhead population.

1. Increase stream flows in the mainstem Pahsimeroi River below Hooper Lane. Currently, this area supports steelhead spawning and rearing, and increasing flow will result in increased productivity in this section of the river. Increasing stream flows above Hooper Lane could create access to historic spawning areas in the upper Pahsimeroi mainstem and its tributaries. An ongoing Idaho Department of Water Resources study should be completed to help identify the best locations and feasibility for additional flow augmentation and reconnection activities in the upper sections of the river. Also increase streamflows in tributaries to the mainstem Salmon River that are part of this population.
2. Modify existing barriers caused by either culverts or irrigation diversion structures. Barrier removal should be scheduled to make the best use of additional water added to the system to reconnect mainstem Pahsimeroi River reaches and tributaries.
3. Improve riparian habitat conditions, thus improving instream conditions. This work could be done as implementation of the Pahsimeroi River TMDL, which is designed to improve riparian conditions, reduce temperature, reduce nutrients and reduce sediment (IDEQ 2001b). IDEQ prepared a TMDL for this basin in 2001 that concluded that poor riparian habitat conditions and water quality issues are directly linked and that improving riparian conditions will likely reduce sediment, nutrients, and stream temperatures (IDEQ 2001b, p. 41). NMFS recommends this work start in the lower reaches of the mainstem Pahsimeroi River, or in additional stream reaches occupied by Chinook salmon or steelhead. Riparian vegetation should be restored to the historical range of natural variability.
4. Appropriately screen diversions so as not to entrain fish in ditches. This work should be scheduled in conjunction with the higher priority actions described above and in the context of the priorities set in the Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin report (USBWP 2005) for the upper Salmon Basin.

Implementation of Habitat Actions

This population is estimated to be meeting its proposed status, so no recovery plan actions directed specifically at this population are necessary at this time. However, habitat actions identified for the

Pahsimeroi River and Lower Salmon Mainstem spring/summer Chinook salmon populations should also benefit the Pahsimeroi River steelhead population. These actions are listed in Table 6.3-42.

Implementation of this habitat recovery plan will occur primarily through the work of the Upper Salmon Basin Watershed Program partners. The partners have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish conservation on the ground. These groups have a strong record of implementing water quality and salmon conservation projects. Recent projects have included reconnecting tributaries, removing barriers, and fencing riparian areas. During Plan implementation, NMFS will work with the above groups and other partners to refine and prioritize habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-42. Habitat Recovery Actions Identified for the Pahsimeroi River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Streamflow	Protect 14 cfs flow	BPA Contract # 1994-015-00: Idaho Fish Screening Project Restoration-Lemhi BPA Contract # 2002-013-01: Water Entity-Water Transaction Program BPA Contract # 2007-268-00: Idaho Watershed Habitat Restoration-Custer District BPA Contract # 2007-399-00: Upper Salmon Screen Tributary Passage BPA Contract # 2008-603-00: Pahsimeroi River Habitat BPA Contract # 2008-608-00: Idaho MOA/Fish Accord Water Transactions	N/A
Entrainment	5 fish screens		
Barriers	Address 17 barriers (diversions)		
Riparian Conditions	Improve 17.8 instream miles Improve 7 riparian miles Protect 2 riparian miles		

Habitat Cost Estimate for Recovery

The Pahsimeroi River steelhead population is estimated to be meeting its proposed status, so no recovery plan actions directed specifically at this population are necessary at this time. However, habitat actions identified for the Pahsimeroi River and Lower Salmon Mainstem Chinook salmon populations should also benefit the Pahsimeroi River steelhead population. These actions are listed in Table 6.3-42. Costs associated with these actions have been accounted for in the recovery plan subsections on Pahsimeroi River Chinook salmon and Lower Salmon Mainstem Chinook salmon. The habitat cost estimate for the Pahsimeroi River steelhead population is therefore zero. Specific projects are planned continuously based on available funding and established priorities.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Pahsimeroi River steelhead population is to minimize the potential for straying and to monitor for natural production and straying within the population. Ecological and genetic risks will be minimized by using a mix, as appropriate, of acclimated release, local broodstock, and selection of release sites. The strategies will be developed through the HGMP process. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Pahsimeroi River supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Actions taken outside the population area will provide insurance that the Pahsimeroi River steelhead population retains its status of maintained and assist in moving it toward viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.15 East Fork Salmon River Steelhead Population

The East Fork Salmon River steelhead population is rated as maintained with a tentative moderate risk rating for abundance and productivity and also for diversity (NWFSC 2015). The population is targeted to achieve the proposed status of Maintained, which requires no more than moderate abundance/productivity risk and moderate spatial structure/diversity risk.

Current Status	Proposed Status
Maintained?	Maintained

The proposed status for the East Fork Salmon River population suggests that no recovery plan actions directed specifically at this population are necessary. However, a conservative management approach should be pursued until population-specific data become available to more accurately describe the status of this population. Recovery actions in the Snake and Columbia River migration corridor, and spawning and rearing habitat actions aimed primarily at spring/summer Chinook, will further reduce the risk for this population.

While current best available information indicates that this population has achieved its proposed status, there is a high degree of uncertainty in estimating the population’s current status, as well as the nature and timing of the population’s response to various recovery strategies. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA’s 5-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If new information shows that this population has not achieved its proposed status, it is imperative to identify those actions that are most likely to yield additional improvement.

Population Status

This section of the recovery plan compares the East Fork Salmon River population’s proposed status to its current status. The population’s current status is based on the ICTRT’s population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population’s current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The East Fork Salmon River population is located upstream from the Pahsimeroi River steelhead population and downstream from the Upper Mainstem Salmon River steelhead population. The ICTRT (2003) distinguished the East Fork Salmon River as a single independent population based largely on distance from other spawning aggregates and genetic differentiation from other upper Salmon River samples. The current steelhead distribution in the East Fork Salmon River watershed includes portions of Herd, East Pass, Taylor, Germania, and West Pass Creeks, West Fork and South Fork of East Fork Salmon River, Little and Big Boulder Creeks, and the East Fork Salmon River mainstem. The population also includes several mainstem Salmon River tributaries, including Bayhorse, Challis, Morgan, and Garden Creeks. Steelhead spawning in the mainstem Salmon River, from the East Fork confluence to the Pahsimeroi River confluence, if it occurs at all, constitutes an extremely small proportion of spawning in the total population.

A NMFS model of potential habitat for the Interior Columbia Basin, based on stream width and gradient, suggests that the historic distribution of steelhead could have included more tributaries and could have been more expansive than current distribution (NMFS 2006) (Figure 6.3-28). However, this GIS-based model may have overestimated potential historic habitat in some lower elevation tributaries, such as Spar Canyon, which is naturally ephemeral. Access to some potential historic habitat is blocked by irrigation diversion structures and by reduced streamflow associated with seasonal water withdrawals.

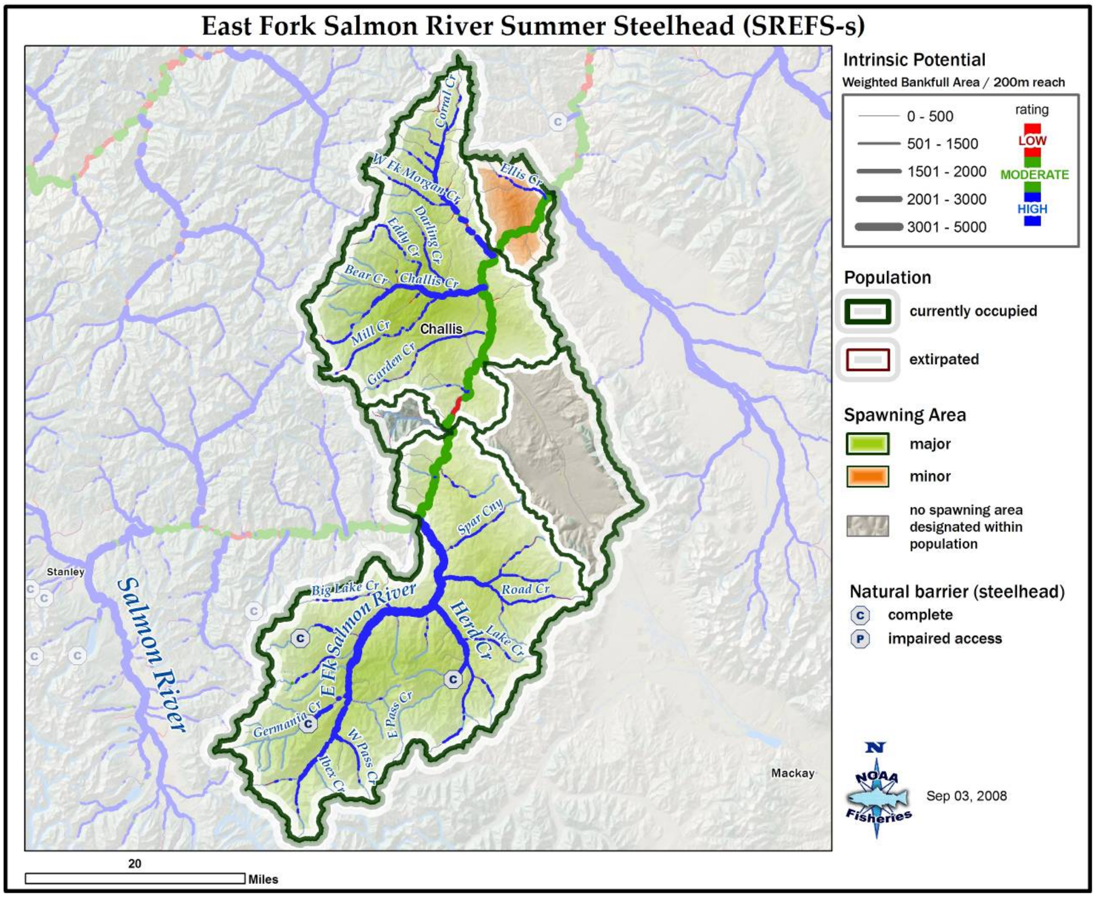


Figure 6.3-28. East Fork Salmon River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The East Fork Salmon River population is an A-run steelhead population, but B-run hatchery steelhead have been released into the population for harvest augmentation and to supplement the natural population. A satellite facility to the Sawtooth Fish Hatchery is located on the East Fork, 18 miles upstream from the river's mouth. Other tributaries in the population, such as Morgan and Challis Creeks, also have an extensive history of hatchery fish stocking, including A-run and B-run steelhead.

The ICTRT classified the East Fork Salmon River population as "Intermediate" in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥1.14 recruits per spawner at the minimum abundance threshold) to achieve a 5 percent or less risk ("low risk") of extinction over a 100-year timeframe. For the East Fork Salmon River population to achieve a 25 percent or less risk ("moderate risk") of extinction over 100 years, abundance and productivity targets are somewhat lower.

Abundance and Productivity

The NWFSC (2015) used results from a recent genetic stock composition study to estimate population abundance and productivity for several Snake River Basin steelhead populations. The NWFSC did not generate spawner abundance and productivity estimates for this population, however, because the stock group containing the population showed a high potential for misclassification.

Information from IDFG surveys provide additional information on the abundance and productivity of the East Fork Salmon River steelhead population. IDFG collects juvenile abundance data at up to three transects per year in the East Fork Salmon River drainage. Juvenile abundance peaked in the late 1980s, followed by a decline through the mid-1990s. Parr counts returned to the levels observed in the mid-1980s, then dropped off in 2004 and 2005. Outside of the East Fork drainage, recent IDFG surveys have documented spawners in the Morgan Creek and Challis Creek drainages. In 2005, 66 adult steelhead were captured at a weir in Morgan Creek, and in 2006, 72 adult steelhead were captured at a weir in Challis Creek. However, these adults were overwhelming hatchery-origin fish, with only six of the Challis Creek and two of the Morgan Creek steelhead determined to be natural-origin (IDFG 2007).

Based on past assessments of aggregate abundance for A-run steelhead passing Lower Granite Dam, the surrogate A-run population, the NWFSC gave this population a tentative abundance/productivity rating of moderate risk (NWFSC 2015). However, it is unknown whether native A-run fish are currently occupying the East Fork below the weir or tributaries to the main Salmon River. Furthermore, limited data suggest that natural-origin returns to the Challis-Morgan major spawning area are extremely low. Increased monitoring of the population is necessary to increase the certainty of this risk rating.

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for populations where new data is available. NMFS will update this information for this population when it becomes available.

Spatial Structure

The ICTRT has identified two major spawning areas (East Fork and Challis/Morgan) and one minor spawning area (Ellis Creek) within this population. The Ellis Creek minor spawning area primarily consists of habitat in the mainstem Salmon River between Morgan Creek and Ellis Creek. No systematic surveys have been conducted to delineate the distribution of spawning across the population. However, returning adults have been documented in the East Fork Salmon River, Morgan Creek, Challis Creek, and Bayhorse Creek watersheds, and spawning use of Salmon River tributaries can be inferred from juvenile steelhead presence/absence surveys and databases. Because both major spawning areas are occupied, this population has a very low spatial structure risk. A very low spatial structure risk is sufficiently low for the population to attain its overall proposed status (NWFSC 2015).

Diversity

The diversity risk for this population is largely driven by the effects of hatchery fish on the population. Current hatchery supplementation and harvest augmentation programs in the upper Salmon River basin provide substantial opportunity for hatchery-origin fish to spawn naturally in the population. These hatchery programs release marked steelhead smolts within and upstream of the East Fork population boundaries. Stocks used in these programs were founded from both local and out-of-MPG stocks. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps, and are thus assumed to be spawning naturally in the population, creating a diversity risk for the natural population.

The only within-population hatchery program is a current supplementation program targeting natural East Fork Salmon River steelhead, operated out of the East Fork satellite facility to the Sawtooth Fish Hatchery. There is a high degree of uncertainty with respect to program success and overall effects on the population’s diversity. The historic population is classified as consisting only of A-run steelhead, but recent management actions have been aimed at developing a natural B-run component originally derived from Dworshak Hatchery stock. The shift from A-run timing to B-run timing for a major portion of the population creates a diversity risk through the potential loss of a historic life-history strategy.

The presence of hatchery fish in this population leads to a moderate cumulative diversity risk, which is adequate for the population to reach its proposed status (NWFSC 2015).

Summary

The East Fork Salmon River steelhead population is currently at moderate risk due to a tentative moderate risk rating for both abundance/productivity and diversity (NWFSC 2015). A population-specific monitoring program is necessary to reduce the uncertainty of this rating. Table 6.3-43 shows the population’s current and proposed status (both maintained) in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-43. East Fork Salmon River population risk ratings integrated across the four viable salmonid population (VSP) metrics.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M East Fork Salmon River	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

This population is estimated to be currently meeting its proposed status of maintained with moderate risk, so no recovery plan actions directed specifically at this population are necessary at this time. However, the following sections on limiting factors and recovery strategies are included for several reasons. Considerable uncertainty is involved in achieving the proposed status for all of the populations within the Salmon River MPG, so further reducing the risk status for the East Fork Salmon River population could provide flexibility for meeting the delisting goal for the MPG. Due to lack of population-specific abundance and productivity data, there is also uncertainty associated with the conclusion that the East Fork Salmon River population is currently meeting its proposed status. Finally, further reducing the extinction risk for this population could be necessary for meeting goals beyond compliance with the Endangered Species Act, such as additional harvest by the state of Idaho or interested tribes.

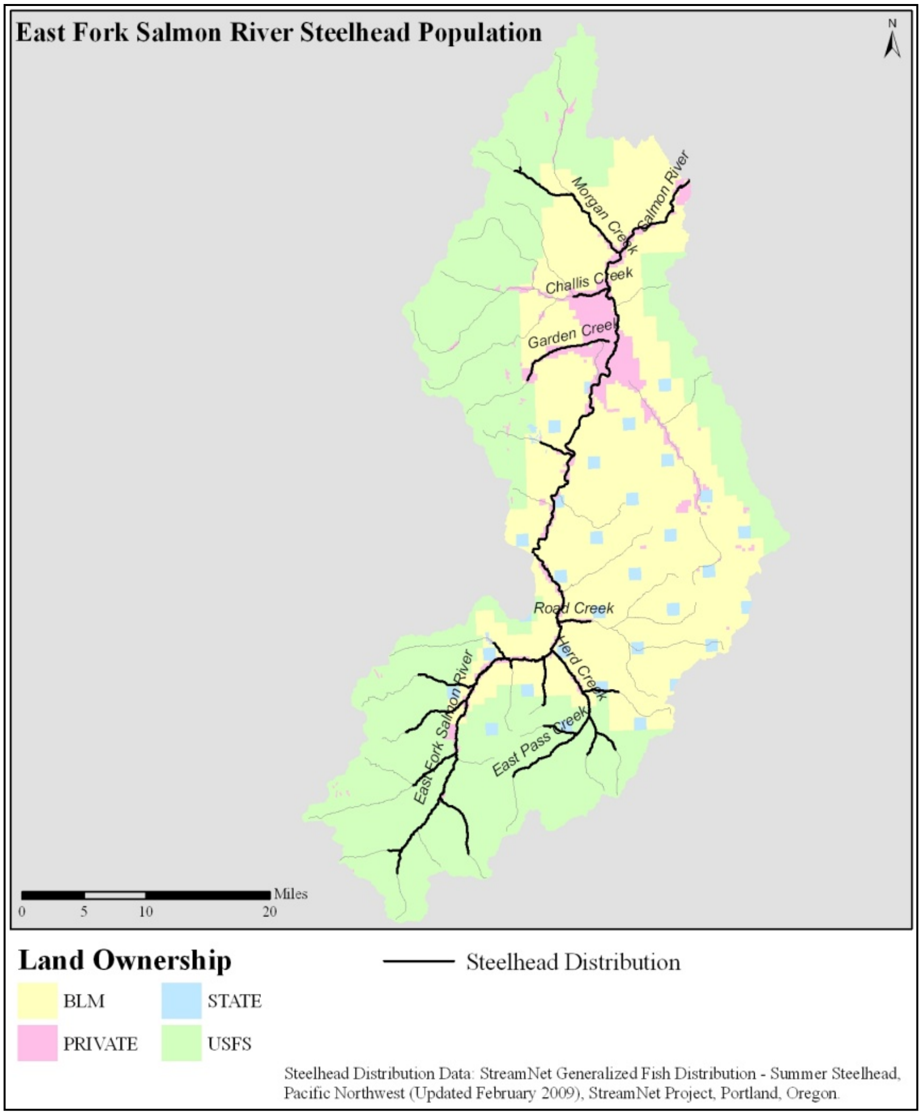
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The East Fork Salmon River steelhead population geographic boundary drains approximately 1,273 square miles. Elevations range from approximately 5,500 feet to almost 12,000 feet at the highest peaks. Precipitation is influenced by these topographic extremes with approximately 10 inches falling at the lower elevations to as much as 50 inches at higher sites. The majority of precipitation falls as winter snow, with dry summers and occasional spring and fall rains. Peak streamflows are associated with winter snowmelt and occur in late spring and early summer. Due to variability in precipitation and air temperature, mean daily streamflow values are also highly variable and flashy. Annual minimum flows usually occur in September.



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-29. Land ownership in the East Fork Salmon River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

Land ownership within the East Fork Salmon steelhead population is mostly U.S. Forest Service (50%) and BLM (43%). Private (5%) and state of Idaho (2%) make up a smaller portion of ownership in the population. U.S. Forest Service lands occupy the upper benches and higher elevation forested lands (Figure 6.3-29). BLM lands are generally the low to mid elevation lands. The valley bottom lands are a mix of private, BLM and state ownership, adjacent to much of the mainstem East Fork Salmon River and Salmon River. Public lands are used for livestock grazing, timber, recreation, and a variety of other public uses. Private land management is mostly irrigated agriculture and livestock grazing in the valley bottoms.

The East Fork Salmon River watershed has been degraded from its historic condition, although the aquatic habitat in the watershed is now improving. The predominant land use has been ranching and cattle grazing, which have led to degraded riparian conditions, sedimentation, reduced streamflow, and disconnection of tributaries from the mainstem. Habitat restoration work in the East Fork has focused on addressing flow and migrations barriers, and reducing impacts of private land activities along critical spawning and rearing habitat with fencing and grazing management (BLM 2012). Mineral exploration and mining were prevalent in most drainages following the discovery of gold in 1860. Mining activity declined at the beginning of the 20th century with a small resurgence in the 1930s. Big Boulder Creek supported the most intensive mining, and stream habitat has been influenced greatly in that drainage through channelization and sedimentation. Mine and tailing reclamation was completed in 2008 in an effort to reduce these legacy effects. There are approximately 10 public land grazing allotments in the East Fork Salmon watershed and grazing occurs on the majority of lands. Road densities are low and generally do not exceed one mile of road per square mile, although roads encroach on stream channels and riparian areas at local sites, contributing to channel instability and sedimentation.

Although much of the habitat in this population is degraded, the headwaters of the East Fork Salmon are in very good condition, falling within the Railroad Ridge roadless area and the White Cloud-Boulder wilderness area (SNF 2003, p. III-125). There are about 773 km (480 miles) of potential stream habitat for steelhead below natural barriers of the total 938 km (583 miles) of stream within the boundaries of the population (ICTRT 2008). Documented spawning and rearing for steelhead occurs in the upper East Fork Salmon River and its tributaries along with the Salmon River tributaries Bayhorse, Challis, and Morgan Creeks. About 60 percent of the intrinsic spawning habitat potential is contained within the East Fork Salmon River major spawning area (Figure 6.3-28).

IDEQ’s Integrated (303(d)/305(b)) Report identifies stream segments in this population that are not fully supporting their assessed beneficial uses under the Clean Water Act. Table 6.3-44 shows these impaired stream segments listed in the report, section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters that have an EPA-approved TMDL) (IDEQ 2009, IDEQ 2014).

Table 6.3-44. Stream segments in the East Fork Salmon River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2009, IDEQ 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5- Impaired Waters Needing a TMDL		
Salmon River Tributaries - Pennal Gulch to Pahsimeroi River	Combined Biota/Habitat Bioassessments*; Fecal Coliform	93.31
Challis Creek - Darling Creek to mouth	Water temperature	3.42
Challis Creek - Bear Creek to Darling Creek	Water temperature; Cause Unknown	1.5
Garden Creek - source to mouth	Sedimentation/Siltation; Cause Unknown	12.74
East Fork Salmon River - Germania Creek to Herd Creek	Combined Biota/Habitat Bioassessments	59.91
Big Lake Creek - source to mouth	Combined Biota/Habitat Bioassessments	2.3
Road Creek - source to Corral Basin Creek	Combined Biota/Habitat Bioassessments	2.9
Mosquito Creek - source to mouth	Combined Biota/Habitat Bioassessments	12.42
Warm Spring Creek - Hole-in-Rock Creek to mouth	Sedimentation/Siltation; Cause Unknown	4.29
Warm Spring Creek - source to Hole-in-Rock Creek	Sedimentation/Siltation; Cause Unknown	116.43
Broken Wagon Creek - source to mouth	Sedimentation/Siltation; Cause Unknown	47.96
Section 4c-Waters Impaired by Non-pollutants		
Challis Creek - Darling Creek to mouth	Low flow alterations	3.42
Challis Creek - Bear Creek to Darling Creek	High Flow Regime; Low flow alterations; Other flow regime alterations; Physical substrate habitat alterations	4.94
Road Creek - source to Corral Basin Creek	Other flow regime alterations	31.93
Section 4a- Impaired Waters with EPA-Approved TMDLs		
Challis Creek - Darling Creek to mouth	Sedimentation/Siltation	3.42
Challis Creek - Bear Creek to Darling Creek	Sedimentation/Siltation	6.44

*The combined biota/habitat bioassessment cause is assigned to a waterbody on the 303(d) list (Category 5 of the integrated report) when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS concluded that the habitat limiting factors for the East Fork Salmon steelhead population are passage barriers and juvenile fish entrainment, reduced streamflow, and poor riparian conditions. Table 6.3-45 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. The following section discusses each of the limiting factors using information from IDEQ, the Salmon Subbasin Assessment and Management Plan, and the Idaho Model Watershed Plan (IDEQ 2003, 2009; ISSC 1995; NPCC 2004; Ecovista 2004).

Table 6.3-45. Primary limiting factors identified for the East Fork Salmon steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Correction or removal of fish passage barriers.
Entrainment	Juvenile fish entrainment occurs through unscreened irrigation diversions. Young salmon are at risk when they are diverted into canals or diversion ditches.	Eliminate entrainment through actions that prevent the loss of fish in irrigation diversion systems.
Stream Flow	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels).	Water quantity restoration actions to improve instream flow and stream connectivity.
Riparian Condition Floodplain connectivity	Poor riparian conditions reduce habitat quality, streambank stability (sediment and channel condition), shade (stream temperature), and LWD recruitment (habitat complexity and pool formation). Naturally functioning floodplains remove fine sediments, reduce the energy of floods, and provide a reservoir of large woody debris. Rivers that lose their floodplains become simplified by channel incision and lose side-channel habitat.	Riparian restoration to increase habitat complexity and LWD recruitment. Remove levees that are unnecessary or not functioning; or move desired levees farther away from the stream. Restore incised channels to reestablish a functioning floodplain.
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Riparian restoration actions to improve shade and stream cover to reduce stream temperature.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Riparian restoration to stabilize streambanks and reduce sedimentation to the stream.

1. *Migration Barriers*

Most artificial migration barriers are small dams, culverts, and irrigation withdrawals. For the East Fork Salmon River population, migration barriers are reducing abundance and productivity and may have a minor effect on the population’s spatial structure.

Passage barriers were rated as having a moderate to high influence on habitat quantity and quality in the East Fork Salmon River (NPCC 2004, p. 3-16). Most barriers are associated with water diversions. The Idaho Model Watershed Plan (ISCC 1995) noted that two diversions historically hindered adult migration in Herd Creek but that those barriers have now been eliminated by local watershed groups and IDFG. The Idaho Model Watershed Plan reported numerous irrigation diversions throughout the East Fork watershed that present problems to juvenile outmigration through fish entrainment (ISCC 1995). In the East Fork Salmon River from Herd Creek to Germania Creek the majority of the irrigation ditches are screened. However, the EF-16 diversion screen is ineffective and EF-13 and EF-6a ditches are unscreened; these three diversions continue to entrain fish when in operation (Personal Communication, P. Murphy, IDFG - Fisheries Biologist, February, 2008). In West Pass Creek there are three unscreened irrigation diversions near the mouth (WP-1, WP-2, and WP-3) that could reduce juvenile steelhead outmigration. One unscreened diversion also occurs in the Upper East Fork Salmon River (EF-30). There is a diversion on Bowery Creek, in the upper East Fork drainage, which may preclude fish migration in most years (IDEQ 2003).

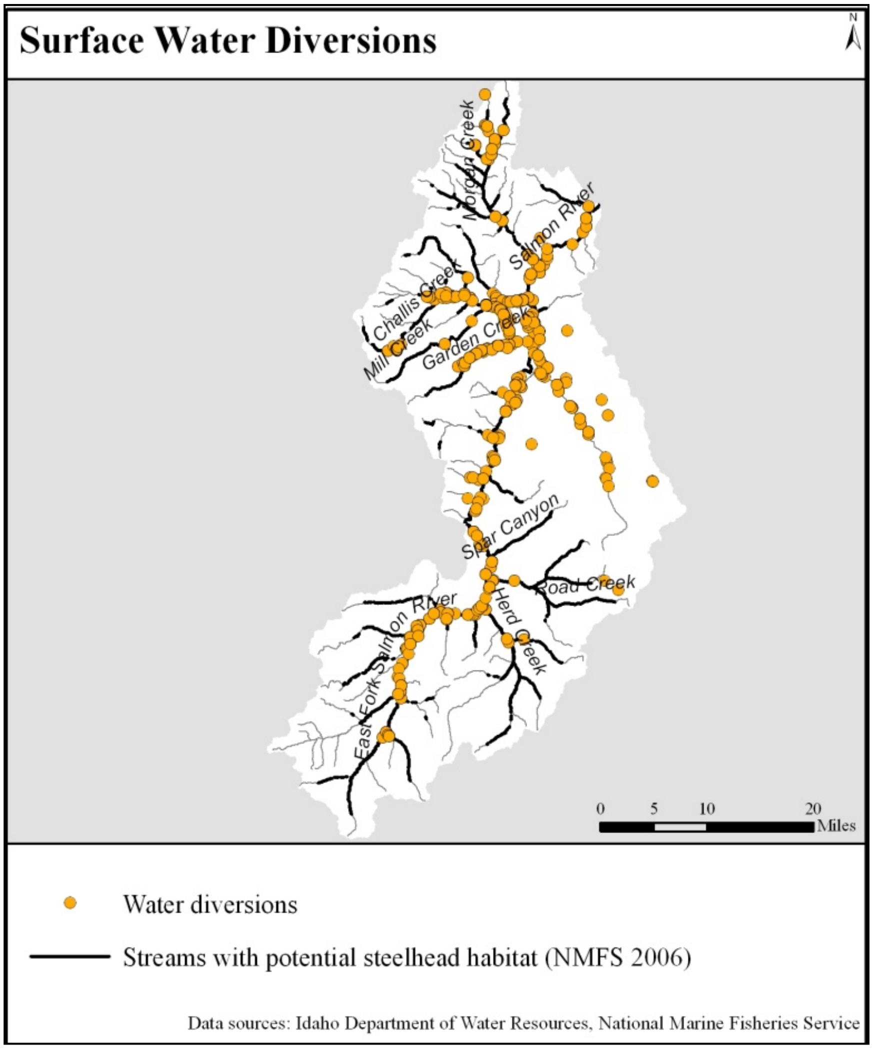


Figure 6.3-30. Surface water diversions in the East Fork Salmon River steelhead population.

In the East Fork Salmon River watershed, road culverts create several partial and complete barriers to steelhead passage on Road Creek, Corral Basin Creek, and Big Lake Creek (BLM 2012). Two culverts on the BLM-maintained portions of the Road Creek road were replaced in 2005. Steelhead access to

Big Lake Creek is blocked by a culvert at the East Fork Road crossing and an unscreened diversion and check structure one-quarter mile upstream of the East Fork Road (BLM 2012).

Passage barriers also exist in tributaries to the mainstem Salmon River within this population, including Challis Creek and Morgan Creek. As shown in Figure 6.3-30, numerous irrigation diversions take water from the small subwatersheds that drain directly into Salmon River. During the irrigation season some of these streams become dewatered, creating passage barriers and reducing habitat connectivity (IDEQ 2003).

2. *Entrainment*

Many diversions on the mainstem Salmon River and mainstem East Fork Salmon River are screened, but most diversions on tributaries remain unscreened. As depicted Figure 6.3-30, the number of irrigation withdrawals indicates that the risk of entrainment is present throughout much of the population. The Idaho Fish Screen Program builds and maintains screens through a cooperative program funded by NMFS and Bonneville Power Administration. IDFG constructs and maintains the screens in cooperation with local water users.

3. *Reduced Flow During Critical Periods*

For steelhead, reduced streamflows caused by irrigation withdrawals are most likely to reduce the quantity and quality of juvenile rearing habitat. Adult steelhead typically spawn near the peak of the hydrograph and are not as likely to be impacted by low flows, but can be impacted by diversion structures that hinder fish passage.

As shown in Figure 6.3-30, surface water is diverted throughout the East Fork Salmon River drainage and throughout many of the Salmon River tributaries in this population. Challis Creek and Road Creek (a tributary to the lower East Fork mainstem) were 303(d)-listed for flow alteration by IDEQ (Table 6.3-44), but many other streams in the population are impacted by low flows. Seasonally dewatered stream sections from irrigation diversions are known to occur in Challis, Road, and Morgan Creeks, blocking access to upstream habitat. There are numerous diversions for irrigation on Challis Creek that dry the stream channel, disconnecting Challis Creek from the main Salmon River in some years (IDEQ 2003). The lower three miles of Road Creek pass through private land, and irrigation diversions dewater Road Creek and exacerbate a flow-losing reach for the latter part of the irrigation season. On Morgan Creek, there is a large diversion in the headwaters, above Corral Creek, that dewaters a portion of Morgan Creek (IDEQ 2003). These three streams all have high intrinsic habitat potential for steelhead spawning and rearing.

4. *Degraded Riparian Conditions*

Conditions reported for the East Fork Salmon River steelhead population suggest that riparian conditions are reducing the abundance and productivity of steelhead. Altered riparian habitat has been rated as having a moderate-to-high influence on salmonid habitat quality for all reaches of the East Fork Salmon River and Salmon River tributaries (NPCC 2004, p. 3-14 and 3-16). Some of the stream reaches most influenced by altered riparian habitats are the East Fork Salmon River from Herd Creek to Germania Creek and Herd Creek and its tributaries. However, monitoring data for Herd Creek summarized by BLM (2012), including vegetation seral status, percent hydric species, and bank stability, suggest an improvement in riparian habitat.

Degradation of riparian areas has been identified as the primary factor contributing to increased temperatures, sedimentation, and unstable streambanks and channel form (Ecovista 2004, p. 62). Pool habitat in the East Fork from the mouth upstream to Herd Creek may be below natural conditions because of the loss of historic cottonwood galleries. Trapani (2002) found that pool habitat represented just 6.4 percent of this reach’s length. Pool habitat was also fairly low (15%) in the East Fork Salmon River from Herd Creek to Little Boulder Creek. For both reaches, Trapani (2002) recommended a reduction of impacts to riparian areas associated with agriculture and development. Restoration of riparian areas in Challis Creek was also identified as a key feature in reduction of sediments (IDEQ 2007).

5. *Floodplain condition and connectivity*

The mainstem Salmon River floodplain in this population has been modified considerably by human land uses. Riverbanks have been altered by the construction of numerous dikes and diversions associated with agriculture, by residential development, and by State Highways 75 and 93. Channel confinement and development of riparian areas has led to a reduction in the pool to riffle ratios, a reduction in streambank stability, a reduction in shade, and has limited salmonid access to side channel habitat (Ecovista 2004, p. 60). The stretch of the Salmon River near the town of Challis, known as Round Valley, has seen the most floodplain modification. Construction of dikes and levees, and bank stabilization projects (e.g. riprapping) have been ongoing since the late 1800s and have impeded natural river habitat function (USACE 2004). Such human interference in natural geomorphic processes disrupts channel patterns, which otherwise would form and maintain important off-channel habitat. This has caused a long-term reduction in amount, quality, and access to off-channel habitats, which has reduced amount and quality of salmonid rearing habitat in this population.

The Upper Salmon Basin Watershed Program partners are coordinating a long-term project to restore salmonid habitat and floodplain function along a reach of the Salmon River, known as the Twelve-mile Reach, which extends approximately 12 miles upstream from the mouth of Morgan Creek (RM 313). The reestablishment of side channel habitat holds the most significant and cost-effective potential for enhancing salmonid habitat in the Twelve-mile Reach, and the Upper Salmon Basin Watershed Program partners are working with private landowners towards that goal (CSWCD 2008). Restoring side channels will provide high quality rearing habitat, refugia for adults and juveniles, and possibly even some suitable spawning habitat. Side channels provide high quality habitat due to their relatively constant water temperatures, fed by springs. The Upper Salmon Basin Watershed Program partners are working with landowners both to reestablish access to side channels and to enhance the habitat by establishing and protecting riparian vegetation and by eliminating grazing along the channel banks.

6. Excess Sediment

Conditions reported for the East Fork Salmon River steelhead population suggests that sediment is reducing abundance and productivity of steelhead. IDEQ has determined that some stream reaches in the Challis, Garden, Warm Spring, and Broken Wagon Creeks drainages are impaired by excess fine sediments. Sampling in Challis Creek by the Environmental Science and Research Foundation (ESRF), using McNeil Core samples, found that subsurface fines exceeded 40 percent (IDEQ 2003). Stream bank erosion rate estimates and road erosion estimates made by ESRF also indicated that Challis Creek had one slightly eroding reach, three moderately eroding reaches and one severely eroding reach. These findings were validated by IDEQ who also identified a large landslide below Mosquito Flats Reservoir as a significant sediment source (IDEQ 2003). Sediment levels in Challis Creek appear to be improving with subsurface fines decreasing from 44.1 to 21.3 percent between 1995 and 1999 (IDEQ 2003).

IDEQ developed a TMDL for sedimentation/siltation for Challis Creek, approved by the Environmental Protection Agency. Sediment sources for Challis Creek appear to be related to stream bank and road erosion. IDEQ (2003) suggested that to improve the quality of spawning substrate and rearing habitat in Challis Creek, it would be necessary to reduce the component of subsurface fine sediment less than 6.35 mm in size to less than 28 percent. IDEQ set a target of 80 percent stream bank stability in order to decrease stream bank erosion. IDEQ (2007) further recommended that existing sediment from streambank erosion be reduced by 36 percent. Reduction in source sediment from roads and streambanks is needed on both public and private lands.

Garden Creek, Warm Spring Creek, and Broken Wagon Creeks have been 303(d)-listed for sedimentation. Sediment levels for Garden Creek, however, appear to be trending downward, with subsurface fines dropping from 22.4 to 18.0 percent (IDEQ 2003).Warm Spring Creek and Broken Wagon Creek are within the Warm Spring Creek drainage. Warm Spring Creek is geothermal, and water temperatures exceed 20 °C and would not likely support cold-water biota (IDEQ 2003). Historically, flow from Warm Spring Creek infiltrated into the substrate and did not reach the Salmon River as surface water. Currently, the stream is diverted for aquaculture of warm water species and is unlikely to be a significant source of sediment to any spawning and incubation areas of steelhead.

Sediment levels were elevated in the past in the Herd Creek watershed, a major tributary drainage to the East Fork, but now appear to have improved. The Idaho Model Watershed Plan (ISCC 1995) noted elevated sediment levels in spawning and incubation areas of Herd Creek. A U.S. Forest Service watershed analysis on Herd Creek indicated excess sediment in some areas of the watershed, with percent fine sediment in spawning gravel between 20 and 35 percent (USDA FS 2001, as cited in IDEQ (2003)). The U.S. Forest Service standard for fine sediment less than 6.35 mm at depth in the Challis zone of the Salmon-Challis National Forest is 30 percent. In 2010, however, BLM reported fine sediment levels of just 9 percent and 15 percent at two sites on Herd Creek (BLM 2012). This improvement is possibly due to restrictions on cattle access to riparian areas.

Sediment levels are high in the East Fork Salmon River mainstem. The Idaho Model Watershed Plan (ISCC 1995) indicated that some improvements in sediment levels were needed in spawning and incubation areas in the East Fork between Herd Creek and Germania Creek. Trapani (2002) estimated that 34 percent of the streambank along this reach was unstable (with approximately 5% of the stable streambank consisting of riprap) and that cobble embeddedness was 26 percent. In the East Fork Salmon River downstream from Herd Creek, Trapani (2002) estimated that cobble embeddedness was 41 percent, likely due to bank instability within and upstream of this lower reach. NMFS (1996) standards consider cobble embeddedness > 30 percent to be “not properly functioning” as salmonid habitat, and embeddedness of 20 to 30 percent to be “functioning at risk.” Based on these standards, substrate in the lower section of the East Fork Salmon River is “not properly functioning,” and substrate in the East Fork from Herd Creek to Germania Creek is “functioning at risk.”

In the East Fork Salmon River drainage, the Livingston Mine on Big Boulder Creek has affected the mainstem East Fork Salmon River channel by delivering large amounts of sediment downstream (NPCC 2004). A dam built on Big Boulder Creek in the 1930s for power generation blocked fish migration for many decades until it was removed in 1991. A blow out of Big Boulder Creek, which mobilized mine tailings, was likely one of the largest sediment sources in the East Fork watershed in recent years. Currently Big Boulder Creek is limited by lack of spawning gravels, instead dominated by larger-sized substrate (Beatty 2012).

7. Elevated Water Temperatures

Conditions reported for the East Fork Salmon River steelhead population suggest that elevated temperature is reducing abundance and productivity of steelhead. In the East Fork Salmon River watershed stream temperature has been rated as having a moderate-to-high influence on habitat quality (NPCC 2004, p. 3-16). Temperature data collected by BLM from 1995 to 1999, reviewed by IDEQ (2003), suggested that high stream temperatures occur within some East Fork Salmon River tributaries. For example, in 1996 Lower Horse Basin Creek and Road Creek below Horse Basin Creek had maximum temperatures of 23.6 °C and 22.9 °C, respectively. In 1998, Big Lake Creek had a maximum water temperature of 22.9 °C. Similarly, unpublished BLM temperature data for Herd Creek, measured at Monument Gulch upstream of the irrigation diversions, showed that maximum average 7-day max temperatures averaged 18 °C for 1999-2010 observations (Beatty 2012). BLM data recorded at the mouth of the East Fork Salmon River showed an average 7-day maximum temperature of 18.5 °C from 2001 to 2010. Water temperatures exceeding 17.8 °C are considered “not properly functioning” for salmonid rearing under NMFS (1996) criteria.

Generally in this population, tributary water temperatures are much lower than the mainstem Salmon River and provide cold-water refugia for rearing steelhead during summer, although Challis Creek is identified on the 303(d) list for stream temperature impairment. The diversion of water for irrigation and subsequent return flows, combined with reductions in riparian shading, are thought to have increased temperatures in the mainstem Salmon River in the Twelve-mile Reach near Challis (Ecovista 2004). One of the primary salmonid limiting factors in this stretch of the Salmon River is high water temperature in the late summer and early fall. In July 2007, IDFG recorded temperatures in the sub-lethal range for fish (20.0 to 25.6 °C) at multiple locations along the Salmon River (IDFG 2009). In snorkel surveys in the Salmon River near the mouths of tributaries, IDFG observed that salmonids seemed to be concentrated in the cold-water plume of the tributary and would rarely be observed outside the cold-water plume (IDFG 2009). Tributary confluences thus provide important summer rearing habitat for this population. However, several tributaries in the population are dewatered before reaching the Salmon River, reducing the availability of cold-water refugia at tributary confluences.

Summary of Current Habitat Limiting Factors and Threats

Habitat limiting factors within the East Fork Salmon River steelhead population are passage barriers, entrainment, stream flow, sediment and temperature. Sediment and temperature are linked to degradation of riparian conditions and to irrigation withdrawals that degrade water quality (by increasing sediment and temperature) and reduce water quantity. The highest habitat restoration priorities for this population are removing barriers and reconnecting tributaries that are disconnected from mainstem rivers by water withdrawals, eliminating entrainment in ditches, and increasing stream flows. The second tier of priorities is to improve riparian conditions and decreasing sediment and temperature concerns. Finally, improvements to channel structure should also be considered.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of a limiting factor or threat, but should be managed to protect steelhead habitat in the East Fork Salmon River population area and allow any degraded habitat to recover.

1. Reduced water quality from new mineral exploration and development. Without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters.
2. Habitat degradation due to noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density.
3. Habitat degradation from off-highway vehicle use. Unrestricted access and increasing use of OHV’s on public land is leading to increased habitat degradation.
4. Loss of floodplain connectivity and function from development. Development in the floodplain and along riparian areas in the East Fork Salmon remains a threat, as evidenced by Idaho Department of Water Resources data identifying 20 new groundwater well applications from 1996 to 2005 within the 100-year floodplain. Custer County and private parties should work with resource specialists to ensure that future developments maintain existing floodplain and riparian processes where they are properly functioning and allow for the long-term recovery of these processes where they are currently impaired.

Hatchery Programs

Hatchery releases currently occur in the East Fork Salmon River steelhead population area and have been ongoing for a number of years. Between the late 1970s and the late 1990s, IDFG released

Dworshak-origin, B-run steelhead in the East Fork Salmon River at the satellite weir. IDFG discontinued this program in the late 1990s, but maintained the B-run steelhead program by relocating it to within a few hundred yards of the mouth of the East Fork. In 2001, the IDFG initiated an integrated steelhead conservation program in the East Fork Salmon River.

Presently, there are three hatchery programs that may affect the East Fork Salmon River steelhead population. Two are segregated harvest programs, while one uses returns to the weir on East Fork and integrates natural-origin returns into the broodstock. The first segregated program is the East Fork Salmon B-run program, which uses Dworshak Hatchery B-run broodstock and releases approximately 325,000 yearling steelhead close to the mouth of the East Fork. The second segregated program is the East Fork Salmon Summer Steelhead hatchery program, which uses Pahsimeroi Hatchery A-run broodstock and releases 60,000 yearling steelhead to the mainstem Salmon River at Tunnel Rock and 120,000 yearlings at McNabb Point. The third program, an integrated conservation program, is the East Fork natural steelhead program. This program utilizes fish that return to the East Fork satellite facility which are spawned on-site.

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin and out-of-MPG broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, demographic and life history changes, and increased competition for food and space. Hatchery-related limiting factors and threats for the East Fork Salmon River population and other Salmon River steelhead are further discussed at the MPG level in Section 6.3.3.2.

Fisheries Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to East Fork Salmon River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for East Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The Upper Salmon Basin Watershed Program Technical Team created a list of priority stream segments for salmonid habitat improvement projects in 2005 and updated the list in 2012 (USBWP 2012). This prioritization report, Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin, considered multiple species, including spring/summer Chinook, steelhead, and bull trout. Despite including other species, the SHIPUSS prioritization overlaps considerably with habitat that has intrinsic potential for steelhead and is therefore transferable to this recovery plan. The SHIPUSS priority stream reaches from 2005 are shown in Figure 6.3-31. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2012). The 2012 report with an updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

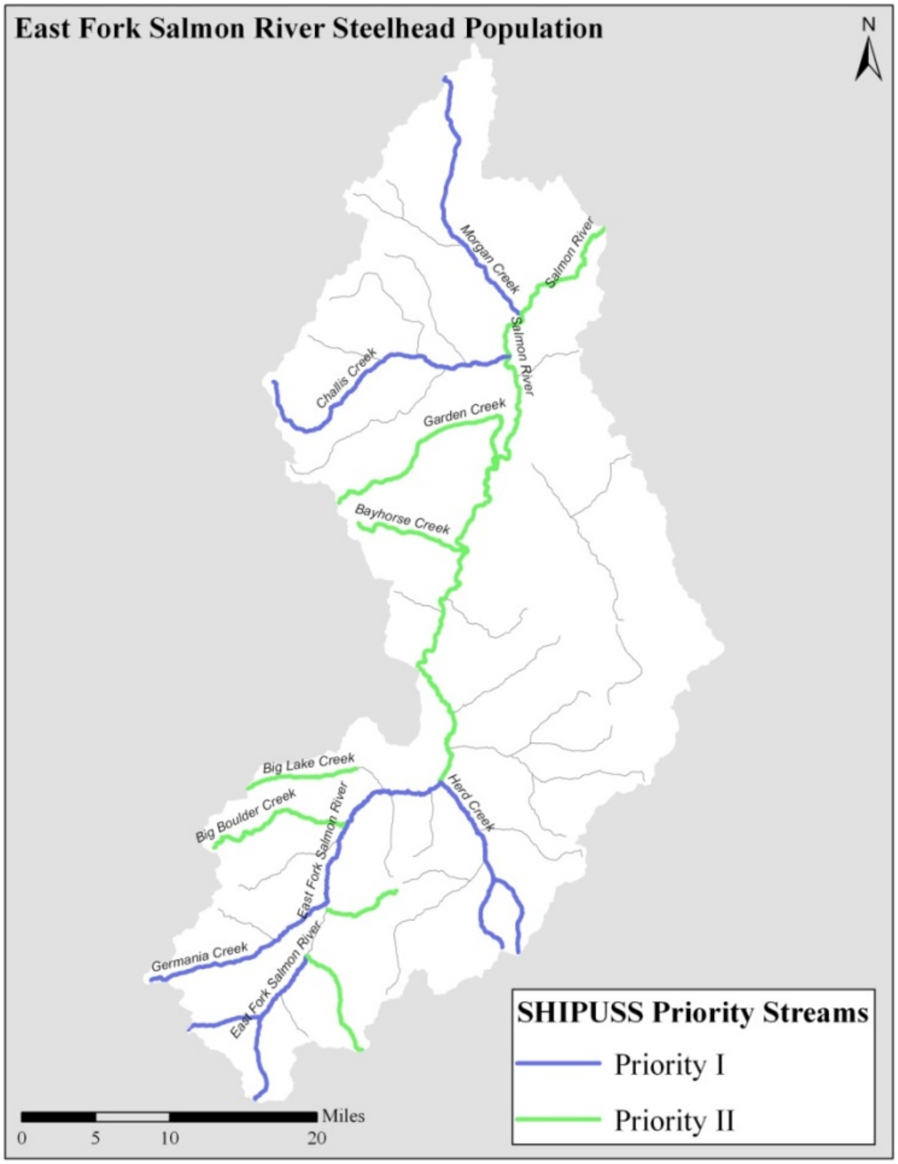


Figure 6.3-31. Priority streams for the East Fork Salmon River Steelhead Population (USBWP 2005). An updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

Habitat Actions

The following habitat action within the East Fork Salmon population, ranked in priority order, are intended to improve productivity rates and increase the effective capacity for natural smolt production in the watershed.

1. Screen irrigation diversions and provide passage at artificial barriers. One of the highest priorities is to appropriately screen all irrigation diversions so that fish do not become entrained in ditches and to eliminate passage barriers associated with diversions. Existing entrainment issues should be addressed first, followed by passage barriers blocking access to stream reaches with the greatest potential for steelhead recolonization. Projects should be scheduled within the context of the priorities set by the IDFG Screen Shop for the entire upper Salmon River basin.

   Although steelhead are currently distributed across much of the historical range of the population, partial and complete passage barriers block access to some habitat. Increased spatial distribution could increase the population’s abundance. Therefore, we recommend an assessment of potential passage blockages in the population and subsequent replacement or elimination of identified barriers to steelhead. Both structural barriers and irrigation-related dewatering barriers are thought to be present. The mainstem East Fork Salmon River should be the primary focus for this effort. West Pass Creek, Big Boulder Creek, and Big Lake Creek in the East Fork drainage, and Challis Creek and Morgan Creek on the mainstem Salmon, are the second priority. These tributaries have intrinsic potential habitat that may be inaccessible to steelhead due to migration barriers. Streams with steep gradients that naturally block steelhead should not be targeted under this recovery plan for removal of man-made fish passage barriers.

2. Restore instream flows. Another high priority is to increase flows in the mainstem East Fork Salmon River, Herd Creek, and other tributaries in this population. Instream flow improvements through irrigation diversion lease agreements, diversion consolidation, and modification of water conveyance or application could all be used to increase streamflows, with immediate benefits to this population. Projects should focus first on locations currently supporting spawning and rearing steelhead, with emphasis on areas supporting both salmon and steelhead. The mainstem East Fork Salmon River from Herd Creek to Germania Creek, Herd Creek, and West Pass Creek currently meet these criteria. Efforts to improve streamflows in currently unoccupied historic habitat should receive secondary attention except where immediate opportunities can be capitalized on or where improvements would substantially benefit occupied habitat downstream.

3. Improve riparian conditions. A second priority is to improve riparian conditions, particularly in the mainstem East Fork Salmon River upstream of Herd Creek. Other focus areas include: Salmon River tributaries, West Pass Creek, Lake Creek, Road Creek, Horse Basin Creek, and Corral Basin Creek. Increasing streambank stability will lead to improved riparian conditions, which will in turn help reduce elevated water temperatures that may currently reduce rearing success in this reach. Secondary treatment areas include the lower reach of the East Fork Salmon River (below the Herd Creek confluence) and Challis and Morgan Creeks on the Salmon River. Tertiary areas include East Fork tributaries (e.g. Big Lake Creek, Big Boulder

Creek). IDEQ concluded in the neighboring Pahsimeroi basin that poor riparian habitat conditions and water quality issues are directly linked, such that an improvement in riparian conditions will likely lead to a reduction in stream temperatures and sediment levels (IDEQ 2001b, p. 41). This logic applies equally well to the East Fork Salmon River and tributaries to the Salmon River.

Historic land use in the East Fork has disrupted the processes that form and sustain fish habitats, including sediment supply, woody debris recruitment, shading, and water delivery and storage. Thus, the improvement of fish habitat will require restoration of the watershed processes that have been disrupted. In the East Fork Salmon River this will require both active and passive restoration to recover riparian areas and thus stabilize banks and increase shade. Passive restoration opportunities may include modifying grazing strategies (e.g., adjusting the duration, intensity, and/or location of grazing) in order to facilitate recovery of riparian vegetation and associated channel forming processes. Passive restoration may also include riparian fencing and securing conservation easements to protect currently undeveloped riparian habitats and allow natural riparian processes to persist or recover as appropriate. Active restoration of riparian processes may include riparian vegetation planting; constructing bank stabilization structures where natural revegetation is not feasible; construction of riparian fences; and removal or relocation of roads, dikes, or other structures that currently impair stream and riparian function.

In addition to improving sediment and temperature conditions, restored riparian areas (including stable banks) would lead to reduced channel widths and corresponding increases in water depth and improved habitat complexity. These improvements are likely to increase productivity within the East Fork Salmon River steelhead population and contribute to increased abundance over time.

4. Increase habitat complexity and bank stability. Another additional priority action is the artificial placement of instream habitat structures. This approach is a last resort for stream reaches where the natural improvement of riparian and hydrologic processes is not feasible due to land use constraints. Where mechanical treatments are pursued, these projects should focus on improving streambank stability, increasing pool habitat and complexity, and providing for efficient sediment routing through the system. The East Fork Salmon River between Herd Creek and Little Boulder Campground is especially deficient in pool habitat and large woody debris. Increasing pools and mechanically adding stable LWD to this reach could improve the East Fork population’s productivity. However, careful evaluation of proposed projects is necessary to assure that watershed processes causing lack of pools or unstable banks are treated first, where feasible.

This population is estimated to be meeting its proposed status, so no recovery plan actions directed specifically at this population are necessary at this time. However, habitat actions identified for the East Fork Salmon River spring/summer Chinook salmon population and the Lower Mainstem Salmon spring/summer Chinook salmon population should also benefit the East Fork Salmon River steelhead population and are listed in Table 6.3-46.

Implementation of Habitat Actions

Implementation of this recovery plan will likely occur through the work of the Upper Salmon Basin Watershed Program partners. Between these groups there is an excellent representation of private, state, and federal entities that manage land and other resources within the watershed. These entities have created an effective process for working together, providing technical reviews of proposed projects and working with interested parties to accomplish conservation on the ground.

These groups have a strong record of implementing water quality and salmon conservation projects in the past and have made very important contributions to salmon recovery projects. Actions in the East Fork drainage have included work on Herd, Morgan, and Challis Creeks and have improved habitat and passage conditions through water diversion screening and modification, streambank and riparian area improvements, and installation of measuring devices on water diversions to improve streamflows. Future efforts will build on these accomplishments.

This population is estimated to be meeting its proposed status, so no recovery plan actions directed specifically at this population are necessary at this time. However, habitat actions identified for the East Fork Salmon spring/summer Chinook salmon population and the Lower Mainstem Salmon spring/summer Chinook salmon population should also benefit the East Fork Salmon River steelhead population and are listed in Table 6.3-46. During Plan implementation, NMFS will work with the partners to identify and prioritize needed habitat actions through the adaptive management process for each 5-year implementation period.

Table 6.3-46. Habitat Recovery Actions Identified for the East Fork Salmon River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Streamflow	Protect 15.5 cfs flow	BPA Contract # 1994-015-00: Idaho Fish Screening Project BPA Contract # 2007-268-00: Idaho Watershed Habitat Restoration-Custer District BPA Contract # 2007-399-00: Upper Salmon Screen Tributary Passage	N/A
Entrainment	3 screens		
Barriers	Address 3 barriers (diversions)		

Habitat Cost Estimate for Recovery

No recovery plan actions directed specifically at this population have been identified. However, Table 6.3-46 shows the habitat actions identified for the East Fork Salmon spring/summer Chinook salmon population and the Lower Mainstem Salmon spring/summer Chinook salmon population that should also benefit the East Fork Salmon River steelhead population. Costs for these projects have been accounted for in the recovery plan subsections on Chinook salmon. The habitat cost estimate for East

Fork Salmon steelhead is therefore zero. Specific projects are planned continuously based on available funding and established priorities.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the East Fork Salmon River steelhead population is maintain the East Fork Salmon River integrated conservation and supplementation program. The strategy also includes minimizing risk from out-of-MPG releases and the potential for straying, and monitoring for natural production and straying within the population. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The East Fork Salmon River supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Actions taken outside the population area will provide insurance that the East Fork Salmon River steelhead population retains its status of maintained and assist in moving it toward viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest and Ocean Modules to the recovery plan provide additional direction.

6.3.16 Upper Mainstem Salmon River Steelhead Population

The Upper Mainstem Salmon River population is rated as maintained with a tentative moderate risk rating for abundance and productivity (NWFSC 2015). Diversity risk is also moderate. The population is targeted to achieve the proposed status of Maintained, which requires no more than moderate abundance/productivity risk and moderate spatial structure/diversity risk.

Current Status	Proposed Status
Maintained?	Maintained

The proposed status for the Upper Mainstem Salmon River population suggests that no recovery plan actions directed specifically at this population are necessary. However, a conservative management approach should be pursued until population-specific data become available to more accurately describe the status of this population. Recovery actions in the Snake and Columbia River migration corridor, and spawning and rearing habitat actions aimed primarily at spring/summer Chinook, will further reduce the risk for this population.

While current best available information indicates that this population has achieved its proposed status, there is a high degree of uncertainty in estimating the population's current status, as well as the nature and timing of the population's response to various recovery strategies. Due to this uncertainty, it is important to use an adaptive management strategy, in conjunction with the ESA's 5-year status reviews and the information in the Research, Monitoring, and Evaluation chapter. If new information shows that this population has not achieved its proposed status, it is imperative to identify those actions that are most likely to yield additional improvement.

Population Status

This section of the recovery plan compares the Upper Mainstem Salmon River population's proposed status to its current status. The population's current status is based on the ICTRT's population status assessment (ICTRT 2008) and NWFSC status review (NWFSC 2015). This section focuses primarily on population abundance and productivity, and compares the population's current status to the proposed status in terms of both abundance and productivity. It also summarizes spatial structure and diversity concerns. Diversity concerns are discussed again in the hatchery section. More details on the population status are available in the full status assessment (ICTRT 2008) and status review (NWFSC 2015).

Population Description

The Upper Mainstem Salmon steelhead population includes the Salmon River and its tributaries upstream from the confluence from the East Fork Salmon River. The ICTRT (2003) distinguished the Upper Mainstem Salmon steelhead population as a single independent population based largely on distance from other spawning aggregates. This population is separated from all other steelhead spawning aggregates by a minimum of 75 km.

The current steelhead distribution in the Upper Mainstem Salmon includes the watersheds of Valley Creek, Warm Spring Creek, Slate Creek, Thompson Creek, Yankee Fork, and the upper Salmon River and tributaries. A NMFS model of potential habitat for the Interior Columbia Basin, based on geomorphological characteristics, suggests that the historic distribution of steelhead could have included additional tributaries and could have been more expansive in some streams than current distribution (NMFS 2006) (see Figure 6.3-32).

The Upper Mainstem Salmon River steelhead population is an A-run steelhead population. A steelhead hatchery program for harvest augmentation is operated out of the Sawtooth Fish Hatchery, five miles south of Stanley, and the facility includes a permanent weir across the Salmon River. The hatchery program was founded from both local and out-of-MPG stocks.

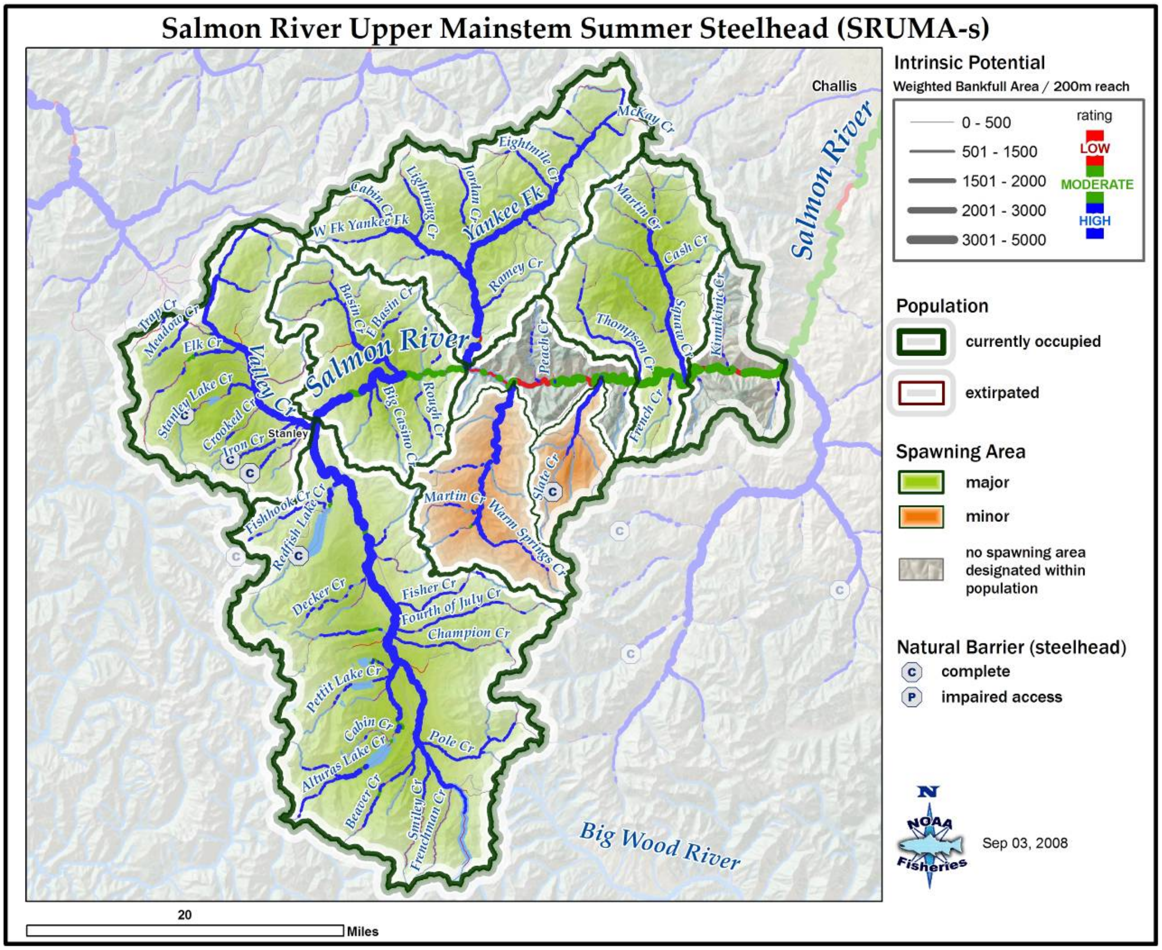


Figure 6.3-32. Upper Mainstem Salmon River steelhead population, with major and minor spawning areas. Major and minor spawning areas reflect relative suitability, or intrinsic potential, of stream reaches in this population to support spawning and rearing under historic unimpaired conditions, inferred from stream characteristics such as channel size, gradient, and valley width (Cooney and Holzer 2006).

The ICTRT classified the Upper Mainstem Salmon River population as “Intermediate” in size and complexity based on historical habitat potential (ICTRT 2007a). A steelhead population classified as Intermediate has a mean minimum abundance threshold of 1,000 natural-origin spawners with sufficient intrinsic productivity (≥1.14 recruits per spawner at the minimum abundance threshold) to achieve a 5 percent or less risk (“low risk”) of extinction over a 100-year timeframe. For the Upper Mainstem Salmon River population to achieve a 25 percent or less risk (“moderate risk”) of extinction over 100 years, abundance and productivity targets are somewhat lower.

Abundance and Productivity

The NWFSC (2015) used results from a recent genetic stock composition study to estimate population abundance and productivity for several Snake River Basin steelhead populations. The NWFSC did not generate spawner abundance and productivity estimates for this population, however, because the genetic stock group containing the population showed a high potential for misclassification. Based on past assessments of aggregate abundance for A-run steelhead passing Lower Granite Dam, the NWFSC gave this population a tentative abundance/productivity rating of moderate risk (NWFSC 2015).

The NWFSC produced a memo in August 2016 (Appendix A) that describes the new Snake River Basin steelhead DPS updated viability curves and population abundance/productivity status for populations where new data is available. NMFS will update this section for this population when new information is available.

Spatial Structure

The ICTRT has identified five major spawning areas and two minor spawning areas within this population. Based on spawner surveys and juvenile distribution data, spawning is assumed to be occurring throughout the population, in the Upper Mainstem Salmon River and in many tributaries, mirroring historic distribution. This population therefore has a very low spatial structure risk, which is sufficiently low for the population to attain its overall proposed status (NWFSC 2015).

Diversity

The major life history strategies historically represented in the population are unknown. The population is currently classified as consisting only of A-run steelhead, but there is some speculation that B-run steelhead also may have historically been part of the population.

Hatchery steelhead are released into this population at multiple locations for both harvest augmentation and for supplementation of the natural population. The harvest augmentation hatchery program releases marked smolts derived from both local and out-of-MPG stocks. Some returning hatchery fish are not harvested in fisheries and do not recruit back to weirs or traps, and are thus assumed to be spawning naturally in the population. The number and proportion of natural spawners that are hatchery-origin is unknown. The prevalence of hatchery-origin spawners is assumed to be highest in the mainstem Salmon River between the Yankee Fork Salmon River and the Sawtooth Fish Hatchery weir. These hatchery spawners pose a genetic risk to the natural population.

An additional diversity concern for this population is the current management practice of releasing unmarked hatchery steelhead and planting eyed eggs to supplement natural production. Planned production releases for brood years 2008-2017 under the current *U.S. v. Oregon* TAC Interim Management Agreement for upriver Chinook and sockeye salmon and steelhead fisheries include releases into the Yankee Fork and may include other tributaries if hatchery production is adequate.

The presence of hatchery fish in this population leads to a moderate cumulative diversity risk, which is adequate for the population to reach its proposed status (NWFSC 2015).

Summary

The Upper Mainstem Salmon River steelhead population is currently rated at moderate risk due to a tentative moderate risk rating for abundance/productivity and a moderate risk rating for diversity (NWFSC 2015). A population-specific monitoring program is needed to reduce the uncertainty of this rating. Table 6.3-47 shows the population’s current and proposed status (both maintained) in terms of cumulative abundance/productivity and spatial structure/diversity risks.

Table 6.3-47. Upper Mainstem Salmon River population risk ratings integrated across the four viable salmonid population (VSP) metrics.

		Spatial Structure/Diversity Risk			
		Very Low	Low	Moderate	High
Abundance/ Productivity Risk	Very Low (<1%)	HV	HV	V	M
	Low (1-5%)	V	V	V	M
	Moderate (6 – 25%)	M	M	M Upper Mainstem Salmon River	HR
	High (>25%)	HR	HR	HR	HR

Viability Key: HV – Highly Viable, V – Viable, M – Maintained, and HR – High Risk; shaded cells – do not meet viability criteria, with darkest cells signifying the highest risk of extinction. Percentages refer to risk of extinction over 100 years.

This population may be currently meeting its proposed status of maintained with moderate risk, so no recovery plan actions directed specifically at this population are necessary at this time. However, the following sections on limiting factors and recovery strategies are included for several reasons. Considerable uncertainty is involved in achieving the proposed status for all of the populations within the Salmon River MPG, so further reducing the risk status for the Upper Mainstem Salmon River population could provide flexibility for meeting the delisting goal for the MPG. Due to lack of population-specific abundance and productivity data, there is also uncertainty associated with the conclusion that the Upper Mainstem Salmon River population is currently meeting its proposed status. Finally, further reducing the extinction risk for this population could be necessary for meeting goals beyond compliance with the Endangered Species Act, such as additional harvest by the state of Idaho or interested tribes.

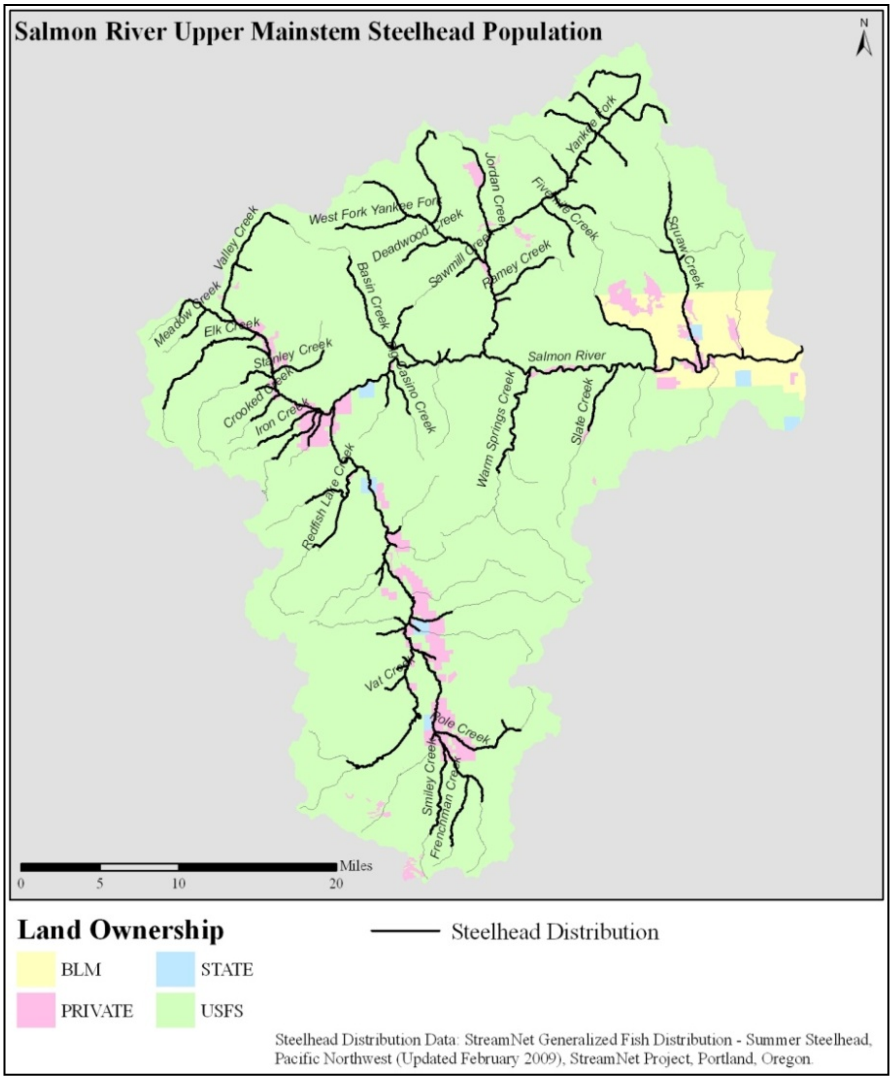
Limiting Factors and Threats Specific to Population

This section describes the limiting factors and threats that are specific for the population. The population is also affected by limiting factors and threats in the mainstem Columbia/Snake River corridor, estuary, and plume, and by climate change. Chapter 4 summarizes regional-level factors that affect all Idaho Snake River Basin steelhead populations.

Natal Habitat

Habitat Conditions

The Upper Mainstem Salmon steelhead population includes the Salmon River and its tributaries upstream from the confluence of the East Fork Salmon River. The Upper Mainstem Salmon steelhead population geographic boundary drains approximately 1,150 square miles. Climate in the Upper Salmon basin is characterized by cold winters and warm dry summers. Elevation, climate, and aspect of the area cause climate conditions to be variable throughout the basin. The average annual precipitation measured in Stanley, Idaho is about 14.54 inches with an average snowfall of about 72.4 inches. Approximately 70 percent of the precipitation falls within the spring and fall seasons (IDEQ 2003). Late spring and summer high-intensity thunderstorms may accumulate an inch of precipitation in less than a 24-hour period.



Steelhead Distribution Data: StreamNet Generalized Fish Distribution - Summer Steelhead, Pacific Northwest (Updated February 2009), StreamNet Project, Portland, Oregon.

Figure 6.3-33. Land ownership in the Upper Mainstem Salmon River steelhead population. [Note: The Streamnet website contains the latest steelhead distribution maps: www.streamnet.org.]

The Upper Mainstem Salmon River basin is primarily composed of steep, narrow drainages with V-shaped valleys. The floodplain of the upper Salmon River, in the Stanley River basin, is fairly broad compared to the floodplain in the canyon reach of the Salmon River further downstream.

Land ownership within this population is mostly federal, with the U.S. Forest Service at 91.4 percent and BLM at 4.1 percent. The remainder of the land is in private (4.0%) and state (0.5%) ownership. Private land is generally concentrated in the valley bottoms, near the towns of Stanley and Clayton and along the upper Salmon River (Figure 6.3-33). BLM-administered land is concentrated at lower elevations between Thompson Creek and the East Fork Salmon River, and state of Idaho ownership is a few township sections scattered throughout. Many upper stream reaches in this population occur in inventoried roadless areas of federal land, including the Sawtooth Wilderness and the proposed

Boulder White-Clouds and Hanson Lakes wilderness areas. The Sawtooth National Recreation Area encompasses much of the population.

Land use in the Upper Mainstem Salmon River has included mining, forestry, livestock grazing, recreation and some residential development. With such diverse land uses the degree of habitat alteration in the Upper Mainstem Salmon has varied. Impacts to habitat have ranged from extensive historic dredge mining operations in the lower Yankee Fork, which substantially altered the river channel, riparian conditions, and floodplain, to small livestock grazing operations, which altered local patches of streambank and riparian conditions. Mineral exploration and mining were prevalent in the past but mining activity declined at the beginning of the 20th century. Livestock grazing is common in many of the subwatersheds in this population, and has led to sedimentation, bank instability, and loss of riparian vegetation. However, grazing has declined since the 1950s, and grazing management has led to improved habitat conditions in many subwatersheds. Roads and riparian conversion to fields or residential development have caused channel alterations. Finally, irrigated pastures and hay fields are common along valley bottoms, relying on numerous water withdrawals from streams. Despite current and past land use effects, the quantity of good-to-excellent habitat for steelhead is still fairly abundant in the Upper Mainstem Salmon (NPCC 2004, p. 1-36). Current steelhead spawning and rearing occurs throughout much of the Upper Mainstem Salmon including Valley Creek, Basin Creek, Thompson Creek, Slate Creek, Yankee Fork, and the upper Salmon River and its tributaries (Figure 6.3-33).

IDEQ’s Integrated (303(d)/305(b)) Report identifies stream segments in this population that are not fully supporting their assessed beneficial uses under the Clean Water Act. Table 6.3-48 shows the impaired stream segments listed in IDEQ’s report under section 5 (impaired waters that need a TMDL), section 4c (waters impaired by non-pollutants), and section 4a (impaired waters than have an EPA-approved TMDL) (IDEQ 2009, 2014).

Table 6.3-48. Stream segments in the Upper Mainstem Salmon River steelhead population identified as impaired in IDEQ's Integrated Report (IDEQ 2009, 2014).

Waterbody	Impairment/Cause	Stream Miles
Section 5-303(d)-Impaired Waters Needing a TMDL		
Squaw Creek - Cash Creek to mouth	Water temperature	7.79
Squaw Creek - confluence of Aspen and Cinnabar Creeks to Cash Creek	Water temperature	0.49
Aspen Creek - source to mouth	Water temperature	60.16
Bruno Creek - source to mouth	Combined Biota/Habitat Bioassessments*	8.78
Salmon River - Thompson Creek to Squaw Creek	Sedimentation/Siltation; Water temperature	4.4
Yankee Fork Creek - source to Jordan Creek	Sedimentation/Siltation	7.05
Salmon River - Valley Creek to Yankee Fork Creek	Sedimentation/Siltation; Water temperature	12.64
Basin Creek - East Basin Creek to mouth	Sedimentation/Siltation	2.36
Valley Creek - Trap Creek to mouth	Combined Biota/Habitat Bioassessments	30.01
Meadow Creek - source to mouth	Combined Biota/Habitat Bioassessments	4.4
Salmon River - Redfish Lake Creek to Valley Creek	Sedimentation/Siltation; Water temperature	5.39
Salmon River - Fisher Creek to Decker Creek	Sedimentation/Siltation	8.39
Slate Creek - source to mouth	Combined Biota/Habitat Bioassessments	37.05
Section 4c-Waters Impaired by Non-pollutants		
Yankee Fork Creek - source to Jordan Creek	Physical substrate habitat alterations	7.05
Basin Creek - East Basin Creek to mouth	Physical substrate habitat alterations	2.36

*The combined biota/habitat bioassessment cause is assigned to a waterbody on the 303(d) list (Category 5 of the integrated report) when bioassessment scores indicate poor habitat and/or aquatic community conditions and there is insufficient information to determine the cause(s) of the poor bioassessment scores.

Current Habitat Limiting Factors

NMFS determined the habitat limiting factors by reviewing multiple data sources and reports on stream conditions. Based on reports and discussions with local fisheries experts and watershed groups, NMFS concluded that the habitat limiting factors for the Upper Mainstem Salmon steelhead population are reduced streamflow, passage barriers, degraded floodplain and riparian habitat, and juvenile fish entrainment. Table 6.3-49 summarizes the mechanisms by which each limiting factor affects steelhead, and the management objectives for addressing each limiting factor. The following section discusses each of the limiting factors using information from the Sawtooth National Forest, IDEQ, and the Salmon Subbasin Assessment and Management Plan (IDEQ 2003, 2009; NPCC 2004; Ecovista 2004).

Table 6.3-49. Primary limiting factors identified for the East Fork Salmon steelhead population, mechanisms by which each limiting factor affects salmonids, and management objectives for addressing each limiting factor.

Limiting Factors	Effects on Salmonids	Management Objectives to Address Limiting Factors
Stream Flow	Low stream flows reduce available habitat, can exacerbate high stream temperature conditions, and in extreme conditions can create barriers to migrations or movement (dry stream channels).	Restore natural hydrograph to provide sufficient flow during critical periods.
Migration Barriers	Migration barriers such as dams, culverts, and dewatered stream sections can create fish passage barriers. These barriers reduce or eliminate movement of adult and juvenile salmon within a watershed ultimately reducing potential spawning and rearing habitat.	Restore passage and connectivity to habitats blocked or impaired by artificial barriers and maintain properly functioning passage and connectivity.
Entrainment	Juvenile fish entrainment occurs through unscreened irrigation diversions. Young salmon are at risk when they are diverted into canals or diversion ditches.	Restore passage and connectivity to habitats blocked or impaired by artificial barriers and maintain properly functioning passage and connectivity.
Sediment	Excess sediments can reduce juvenile habitat (rearing), aquatic insect availability (food), and spawning and incubation success (reproduction).	Improve degraded water quality and maintain unimpaired water quality
Temperature	High stream temperatures affect salmonid growth and development, alter life history patterns, induce disease, or exacerbate competitive predator-prey interactions. High stream temperature can also be lethal to both adult and juvenile salmon.	Increase summer streamflows. Restore riparian shade.
Floodplain connectivity	Naturally functioning floodplains remove fine sediments, reduce the energy of floods, and provide a reservoir of large woody debris. Streams that lose their floodplains become simplified by channel incision.	Restore incised channels to reestablish a functioning floodplain.
Riparian Condition	Healthy riparian vegetative communities provide stream shading, overhead cover, nutrient additions, and improve inchannel complexity as a source of large wood debris. Streams without healthy riparian zones are often warmer and less complex.	Restore riparian vegetative communities.

1. *Low Flow during Critical Periods*

The NPCC’s subbasin plan identified reduced streamflow in the Salmon River mainstem from the confluence of the East Fork to the headwaters as having a high influence on habitat quality (NPCC 2004, p. 3-14). Numerous irrigation withdrawals for pastures alter the natural hydrologic regime in the Upper Mainstem Salmon River. Water diversions may affect fish by reducing instream flow and thereby reducing habitat availability, by blocking fish passage to upstream or downstream habitat, by entraining fish in irrigation ditches if the diversion structures do not have adequate screens in place, or by increasing stream temperatures through reductions in stream flow. Conditions reported for the Upper Mainstem Salmon River suggest that reduced stream flow is limiting population abundance and productivity.

Valley Creek. Irrigation diversions are affecting salmonid habitat throughout the watershed, as reported by the SNF (2010). In upper Valley Creek there are diversions on several tributaries and on the Valley Creek mainstem. In many of the smaller tributaries, such as McGown Creek, Thompson Creek, and Park Creek, historic channels have been abandoned as all the flow is incorporated into the irrigation systems. Diversions on these tributaries reduce baseflows in upper Valley Creek during the irrigation season from June through September. Within Elk Creek two surface water diversions have substantially reduced baseflows near the mouth during some years, as well as created an upstream migration barrier. The uppermost diversion was removed and the ditch plugged in 2009 but the lower diversion remains. A small diversion takes water from lower Stanley Lake Creek, but this diversion is estimated to remove less than 10 percent of streamflow from June through September.

Upper Valley Creek itself has several large diversions. In 1999, two diversions on upper Valley Creek (VC5 and VC6) were consolidated at a new point of diversion that improved long-standing passage concerns (SNF 2010). Nonetheless, these diversions reduce instream flow, thereby reducing and degrading salmonid habitat in Valley Creek. In lower Valley Creek, irrigation diversions exist on most major tributaries. These diversions create numerous seasonal barriers to fish migration. The diversions reduce instream flows substantially such that base flows are insufficient to maintain habitat or passage for salmonids during most years in Meadow Creek, Goat Creek, and Iron Creek. Two irrigation diversions formerly diverting water from Crooked Creek were removed from U.S. Forest Service land in 1999 and the ditchlines rehabilitated. Not all existing tributary diversions are adequately screened.

Upper Salmon River above Stanley. Water diversions exist on most tributaries to the upper Salmon River in the Stanley River basin, reducing streamflows and creating passage barriers. Diversions on Smiley, Champion, Fourth of July, Fisher, Gold, Williams, Cleveland, and Boundary Creeks result in very low baseflows and likely create seasonal barriers to fish passage. In addition, irrigation diversions on Fisher Creek dewater the last mile of stream during the summer irrigation season in most years (SNF 2009).

2. Migration Barriers and Fish Entrainment

Passage barriers in the population area are primarily caused by irrigation diversions and road culverts. Migration barriers and fish entrainment from irrigation diversions were identified as limiting factors in the Upper Mainstem Salmon steelhead population by the Salmon River Subbasin Assessment (NPCC 2004). Fish passage was identified as having a moderate influence on Valley Creek and upper mainstem Salmon River habitat conditions (NPCC 2004, p. 3-13, 3-14). As noted in the previous section, dewatered stream sections caused by irrigation withdrawals reduce potential rearing habitat and potential thermal refuge offered in colder tributary streams.

Information on how the diversions impact fish passage is incomplete at this time, although the Sawtooth National Forest has begun a process to identify passage barriers at irrigation diversions across the upper Salmon River basin and Valley Creek. Table 6.3-50 displays results from the Sawtooth National Forest survey of many of the diversion structures. This survey did not include as many as 31 additional diversions on private property along the mainstem Salmon River and on Smiley, Beaver, Champion, Fisher, Williams, and Cleveland Creeks or seven additional diversions on federal land on Cabin, Vat, Hell Roaring, Cleveland, and Niece Creeks (SNF 2009). Considering the information presented in Table 6.3-50, there are very few diversion structures where fish distribution ends, based on current knowledge. In most situations adults or juveniles have been found above each diversion implying at least seasonal passage. Diversions on Smiley, Champion, Fourth of July, Fisher, Gold, Williams, Cleveland, and Boundary Creeks result in very low baseflows and likely create seasonal barriers to fish passage. In addition, irrigation diversions on Fisher Creek dewater the last mile of stream during the summer irrigation season in most years (SNF 2009).

Barriers exist on most major tributaries in lower Valley Creek, including Meadow (lower), Goat, Iron, Crooked, Job, and Stanley creeks. Numerous seasonal barriers (private irrigation diversions) also exist on nearly every tributary, on both public and private land. Instream base flows are insufficient to maintain habitat and passage for salmonids in Meadow, Goat, and Iron creeks in most years.

Table 6.3-50. Fish passage at diversion structures within the Upper Mainstem Salmon River (SNF 2009).

A. Valley Creek

Stream	# Diversions/ # w/ Barrier Evaluation	Adult Passage at Low Flow	Adult Passage at Mod. Flow	Adult Passage at High Flow	Juvenile Passage at Low Flow	Juvenile Passage at Mod. Flow	Juvenile Passage at High Flow
Meadow Creek (lower) [b]	5/0						
Goat Creek [a, b]	14/2	1-B, 1-P	2-F	2-F	1-B, 1-P	1-P, 1-F	2-F
Iron Creek [b]	9/5	2-B, 2-P, 1-F	1-P, 4-G	1-P, 4-G	2-B, 2-F, 1-P	2-B, 2-G, 1-F	3-G, 2-F
Job Creek	1/0						
Tennell Creek [b]	2/0						
Valley Creek (lower mainstem) [b]	3/2	1-P, 1-VG	1-P, 1-VG	1-G, 1-VG	1-F, 1-VG	1-G, 1-VG	1-G, 1-VG
Stanley Lake Creek	1/1	VG	VG	VG	VG	VG	VG
Elk Creek	2/2	2-P	2-F	1-F, 1-G	1-B, 1-F	1-B, 1-P	1-B, 1-G
McGown Creek [b]	2/0						
Park Creek	1/0						
Valley Creek (upper mainstem)	1/1	G	VG	VG	G	VG	VG
Totals:	41	13					

B. Salmon River and Tributaries above Valley Creek

Stream	# Diversions/ # w/ Barrier Evaluation	Adult Passage at Low Flow	Adult Passage at Mod. Flow	Adult Passage at High Flow	Juvenile Passage at Low Flow	Juvenile Passage at Mod. Flow	Juvenile Passage at High Flow
Salmon River (Pole Creek upstream) [a/b]	5/1	VG	VG	VG	VG	VG	VG
Smiley Creek [a/b]	2/0						
Beaver Creek [a/b]	4/2	1-G, 1-B	1-F, 1-B	1-B, 1-P	2-G	2-F	1-B, 1-F
Pole Creek	1/1	P	P	P	G	F	F
Cabin Creek	1/0						
Vat Creek	1/0						
Warm Creek	1/1	VG	VG	VG	VG	VG	VG
Lost Creek [b]	2/0						
Salmon River (Alturas Lake Ck. to Pole Ck.) [a/b]	1/0	No Diversion Structure (Pump)					
Champion Creek [b]	5/3	1-VG, 2-B	1-G, 2-B	1-G, 2-B	1-VG, 1-P, 1-B	1-G, 1-P, 1-B	1-G, 2-B
Fourth July Creek [b]	3/3	2-G, 1-F	1-G, 2-F	1G, 2-B	1-VG, 2-G	1-VG, 1-G, 1-F	1-VG, 1-G, 1-B
Hell Roaring Creek	1/0						
Salmon River (Fourth July to Alturas Lake Ck.) [a/b]	1/1	1-VG	1-G	1-F	1-VG	1-G	1-F
Fisher Creek [a/b]	10/0						
Gold Creek	4/3	1-B, 1-G, 1-F	1-VG, 1-F, 1-G	1-VG, 1-B, 1-G	1-VG, 1-F, 1-G	1-VG, 2-F	1-B, 1-P, 1-F
Club Canyon Creek	2/0						
Williams Creek	3/2	1-F, 1-VG	1-G, 1-VG	1-F, 1-G	1-G, 1-VG	1-F, 1-G	1-P, 1-G
Salmon River (Redfish Lake to Fourth July Ck.) [a/b]	5/3	2-VG, 1-B	1-VG, 1-B, 1-G	1-VG, 1-B, 1-G	2-VG, 1-B	2-VG, 1-B	2-VG, 1-B
Redfish Lake Ck. [a]	3/0	No Diversion Structure (Pump)					
Fishhook Creek	2/0	No Diversion Structure (Pump)					
Boundary Creek	1/1	P	B	B	B	B	B
Cleveland Creek	2/0						
Niece Creek	2/0						
Totals:	61/21						

Year-round or seasonal barriers also exist at many culvert road crossings. Culvert inventories conducted by the Sawtooth National Forest in 2003 and 2007 revealed that passage is impeded in many important tributaries within the basin at certain flow conditions (Table 6.3-51). Most barriers occur in tributary headwaters (i.e., Smiley Creek, Little Beaver Creek, Twin Creek, Vat Creek, etc.), affecting minor amounts of habitat. However, culverts on Fisher, Cabin, and Mays Creek block habitat to fish moving from the Salmon River and adjacent tributaries. One culvert in Fisher Creek, and one in Williams Creek are considered partial barriers to fish passage. Passage is impeded in many important tributaries within Valley Creek at certain flow conditions. Farther downstream on the Salmon River, at the mouth of Kinnikinic Creek, a culvert under Highway 75 currently creates a complete barrier to steelhead migration into the Kinnikinic Creek watershed, blocking access to 6 miles of potential steelhead habitat.

Table 6.3-51. Miles of habitat blocked or partially blocked by culverts in the Upper Mainstem Salmon River (SNF 2009).

Stream	Miles Completely Blocked	Miles Partially Blocked
Upper Salmon and Tributaries		
Frenchman & Headwaters Salmon River	0.32[a]	-
Smiley Creek	1.43[b]	1.77[a]
Beaver Creek	1.94[c]	-
Pole Creek	0.25[b] (Twin Creek)	5.87[b] (Pole Creek)
Cabin Creek	2.55[b]	-
Vat Creek	0.78[a]	-
Mays Creek	1.75[b]	-
Fisher Creek	0.64	4.05[b]
Williams Creek	-	2.63[b]
Boundary Creek	1.36[a]	-
Totals:	11.02	14.32
Valley Creek Drainage		
Meadow Creek (lower)	-	3.3
Goat Creek	-	6.5
Iron Creek	-	5.7
Job Creek	2.75	-
Stanley Creek	2.60	2.5
Stanley Lake Creek	3.39	-
Elk Creek	-	11.0
Trap Creek	-	5.5
Hanna Creek	1.66	-
Totals:	10.40	34.5

Key: a – Stream segment not delineated above culvert; b - Miles not taken to the end of the stream; c – Historic habitat for Chinook salmon and steelhead not delineated in Little Beaver Creek.

3. Excess Sediment

Conditions reported for the Upper Mainstem Salmon steelhead population suggest that sediment may be reducing the population’s abundance and productivity. The Salmon Subbasin Assessment rated the influence of increased fine sediments on habitat quality as moderate in Yankee Fork and Valley Creek (NPCC 2004, p. 3-13). In the Salmon River mainstem upstream from the East Fork, the influence of fine sediment on habitat quality was considered high (NPCC 2004, p. 3-14). As indicated by IDEQ’s integrated report, some stream reaches in the Salmon River and Basin Creek are impaired by excess fine sediments.

IDEQ (2003) reports a range of sediment conditions throughout this population. In Basin Creek, fine sediment levels from a single monitoring station varied greatly from 13.5 to 33.3 percent, well above a NMFS standard of less than 12 percent fines in gravel for properly functioning sediment conditions (NMFS 1996). Sediment monitoring on the upper Salmon River showed elevated subsurface fine sediment at one site below the confluence of Hell Roaring Creek (42% fine sediment) and at another site below the confluence of Redfish Lake Creek (51% fine sediment) (IDEQ 2003). The primary overall source of fine sediment for these reaches of the Salmon River is stream bank erosion associated with winter ice damming and natural stream channel migration across the low gradient reach that extends across Decker Flat, from the confluence of Alturus Lake Creek downstream to the confluence of Williams Creek (IDEQ 2003). Historic land management in this area was predominantly livestock grazing. Improved grazing management, including riparian fencing, has now eliminated or greatly reduced the impacts to stream banks from grazing, but sediment levels remain elevated. Current sediment sources in the population include mining, existing roads, and pastures.

4. Elevated Water Temperature

Although the upper Salmon River is at high elevation with a relatively cool climate, summer stream temperatures can nonetheless be suboptimal for salmonids. The Salmon Subbasin Assessment rated the influence of elevated water temperature on habitat quality as moderate in Valley Creek and high in the Salmon River mainstem upstream from the East Fork (NPCC 2004, p. 3-14). In tributaries to the main Salmon River above Redfish Lake, Rothwell and Moulton (2001) found that reductions in streamflow caused by irrigation diversions led to dramatic increases in stream temperature of greater than 10 ^{o}C. In the main Salmon River, noticeable increases in summer stream temperatures occurred around the inputs of tributaries affected by diversions (Rothwell and Moulton 2001). Summer temperatures in Valley Creek are also high, with August daily maximum temperatures rising above 21^{o}C in the Valley Creek mainstem (RMRS 2013). In Elk Creek (tributary to Valley Creek), Rothwell and Moulton (2001) found that temperatures were only slightly elevated downstream from irrigation diversions, and USGS (2004) found no diversion-related stream temperature increases in Elk Creek. However, the lower tributaries Goat Creek, Iron Creek, and Meadow Creek are heavily diverted and may be contributing warmer water to Valley Creek.

Water temperature has been identified as impaired on the 303(d) list for the Squaw Creek watershed and for three sections of the Salmon River between Redfish Lake Creek and Squaw Creek. In these streams or stream segments cold-water aquatic life standards were exceeded. The temperature criteria (values not to be exceeded) for cold-water use are 22 °C as a daily maximum and 19 °C as a daily average. In Squaw Creek, the primary land use activities are mining, followed by livestock grazing, irrigated pasture and recreation. IDEQ (2003) noted that there is some potential that the lower portion of Squaw Creek is influenced by geothermal activity. Elevated stream temperature in the Squaw Creek subwatershed may be from the combined effect of flow alteration and geothermal inflow. Squaw Creek was not recommended for a TMDL because of the natural geothermal influence. No temperature TMDL has been recommended for segments of the Salmon River because information suggests that beneficial uses are fully supported (IDEQ 2003, p. 62).

5. Loss of floodplain connectivity and riparian function

Floodplain connectivity and riparian function are reduced in many parts of this population, particularly in the Yankee Fork. In the 1940s and early 1950s, a large floating dredge mined the Yankee Fork stream channel beginning about one mile from the confluence with the Salmon River and continuing upstream to Jordan Creek, covering approximately seven miles. The dredge dug 10-35 feet into the streambed to recover gold by washing and separating rock from dirt. This floating dredge moved massive amounts of channel substrate (mostly gravel to large cobble) into large tailings piles along the east side of the stream bank. A total of 626 acres of land is now covered in tailings with gravel piles that reach heights of 20 feet. These gravel piles disconnected seven miles of the Yankee Fork Salmon River from much of its floodplain by constricting the stream channel. The tailings piles blocked access for fish to off-channel habitat and covered up riparian vegetation. Further, since the tailings do not contain sufficient soil, riparian vegetation has not regrown. Consequently, the current riparian zone does not provide either large wood recruitment or shade to the Yankee Fork stream channel. Tributaries have eroded downward as they adjust to the lowered elevation of the mainstem Yankee Fork, and two perennial tributaries (Jerry’s Creek and Silver Creek) are disconnected from the Yankee Fork where flow goes subsurface through dredge tailings. These tributaries likely provided steelhead rearing habitat prior to dredging. The difference between the pre-dredge channel and the present channel is the degree of channel confinement. By increasing channel confinement between dredge piles, the channel has a narrower width which must convey the same peak flows, resulting in increases to water depth, flow velocity, and sediment transport capacity. Both wood and sediment are transported downstream, such that wood frequency is extremely low at less than 1 piece of wood per mile and spawning gravel availability is reduced (BOR 2012). Habitat projects implemented every year since 2012 have substantially increased the quantity of wood and spawning gravel in the dredged reach and timber-harvested areas in the Yankee Fork watershed.

Loss of floodplain connectivity has also impacted salmonid habitat on the mainstem Salmon River. Ecovista (2004, p. 58) suggests that modifying stream flow withdrawals to increase instream flows alone will not restore adequate base flows. Restoration of adequate summer base flows will also require the restoration of water storage mechanisms (e.g. wetlands, functional riparian areas, side channels, groundwater recharge, etc.). This will require improvements in riparian and wetland function as well as floodplain connectivity. Channel confinement and development of riparian areas all along the Salmon River has caused a reduction in the pool-to-riffle ratio, a reduction in streambank stability, a reduction in shade, and has limited salmonid access to side channel habitat.

In Valley Creek, various human land-uses have degraded riparian and floodplain habitat. Livestock grazing, dispersed recreation and irrigation practices have led to soil instability, soil compaction, accelerated sediment delivery to streams, and stream channel and structure modification (SNF 2003, p. III-103). Riparian areas have been degraded in localized areas due to loss of riparian vegetation. Floodplains have been altered by roads, developed and dispersed recreation, water withdrawals, and grazing. Large woody debris levels are low in some riparian areas due to firewood gathering, and native sedge and willow species are being replaced by grass species due to livestock grazing. Fire exclusion and irrigation diversions have had the cumulative effect of reducing wet meadows, reducing willows, and reducing overall amount of riparian habitat (SNF 2003, p. III-103). Considerable floodplain modification has occurred in the lower section of the Valley Creek watershed. Near the city of Stanley, numerous floodplain fills, levees, and other similar modifications have occurred. Past mining and grazing have significantly altered and entrenched some reaches of Stanley Creek, Job Creek, and Little Job Creek.

Potential Habitat Limiting Factors and Threats

Several potential concerns have not yet risen to the level of a limiting factor or threat, but should be managed to protect steelhead habitat in the Upper Mainstem Salmon River population area and allow any degraded habitat to recover.

1. Habitat degradation from dispersed recreation. Recreation can damage vegetation, compact soils, channelize overland water flow, and increase erosion. Monitoring sites where recreation use is concentrated, and modifying or discontinuing use of these sites if riparian habitat deteriorates, will likely minimize impacts.
2. Habitat degradation from off-highway vehicle use. Assuring that OHV use is restricted to existing U.S. Forest Service roads and trails will likely minimize impacts.
3. Reduced water quality due to new mineral exploration and development. Without sufficient water quality conservation measures, new mining operations could release sediment and toxic chemicals into surface waters.
4. Reduced water quality due to heavy metals. Risk of heavy metal contamination of ground and surface waters from legacy mining waste.
5. Habitat degradation from noxious weeds. The spread of noxious weeds can increase soil erosion and decrease native plant density. Annual grasses have the ability to alter the fire regime allowing for larger, more frequent fires.
6. Reduction or removal of American Beaver (*Castor Canadensis*). Beaver dams can substantially alter river ecosystems and provide the following possible stream habitat benefits: higher water tables, reconnected and expanded floodplains, more hyporheic exchange, higher summer base flows, expanded wetlands, improved water quality, and greater habitat complexity. Programs

should be developed to encourage beaver activity in areas with low potential for beaver/human conflict and to implement beaver mimicry structures in areas with high potential for beaver/human conflict.

Hatchery Programs

Hatchery releases currently occur in the Upper Mainstem Salmon River steelhead population area and have been ongoing for a number of years. The Sawtooth Fish Hatchery steelhead broodstock was originally derived from a mixture of indigenous wild steelhead and returns from Pahsimeroi Hatchery A-run steelhead. The Pahsimeroi Hatchery steelhead broodstock was originally transplanted from the Snake River. Currently, naturally produced steelhead are not included in the hatchery broodstock. Upper Salmon A-run steelhead from Sawtooth and Pahsimeroi hatcheries are released in four areas of the upper Salmon River. Broodstock are collected at both Sawtooth and Pahsimeroi hatcheries and no natural-origin returns are used for broodstock in these programs.

Hatchery-related threats to the population include incidental catch of natural-origin fish in mark-selective fisheries for hatchery-origin fish, the continued use of out-of-basin and out-of-MPG broodstock, weir operation, and the high proportion of hatchery-origin spawners and low proportion of natural-origin broodstock. Limiting factors include reduced genetic adaptiveness, demographic and life history changes, and increased competition for food and space. Hatchery-related limiting factors and threats for the Upper Mainstem Salmon River population and other Salmon River steelhead are further discussed at the MPG level in Section 6.3.3.2.

Fishery Management

Fisheries in the Columbia River estuary, mainstem Columbia, Snake River, Salmon River and tributaries continue to pose a threat to Upper Mainstem Salmon River steelhead, an A-run population, and to other Salmon River populations. Harvest-related mortality has the potential to affect migration timing, maturation timing and size of the steelhead population; however, managers currently control harvest-related impacts through an abundance-based approach and existing fishery management programs to support the recovery of natural-origin populations. Fishery-related limiting factors and threats for East Fork Salmon River steelhead and other populations in the MPG are discussed in Section 6.3.3.3.

Recovery Strategies and Actions

Natal Habitat Recovery Strategy and Actions

Priority Stream Reaches

The Upper Salmon Basin Watershed Program Technical Team created a list of priority stream segments for salmonid habitat improvement projects in 2005 and updated the list in 2012 (USBWP 2012). This prioritization report, Screening and Habitat Improvement Prioritization for the Upper Salmon Subbasin, considered multiple species, including spring/summer Chinook, steelhead, and bull trout. Despite including other species, the SHIPUSS prioritization overlaps considerably with habitat that has intrinsic potential for steelhead and is therefore transferable to this recovery plan. The SHIPUSS priority stream reaches identified in 2005 are shown in Figure 6.3-34. Under SHIPUSS, Priority I streams are those streams that have the potential to realize immediate, tangible benefits to fish if recovery efforts are directed toward them. Priority II streams are those streams that will also see tangible benefits to fish as a consequence of recovery projects, but where the benefits may be less substantial or may be delayed for quite some time (USBWP 2012). The 2012 report with an updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

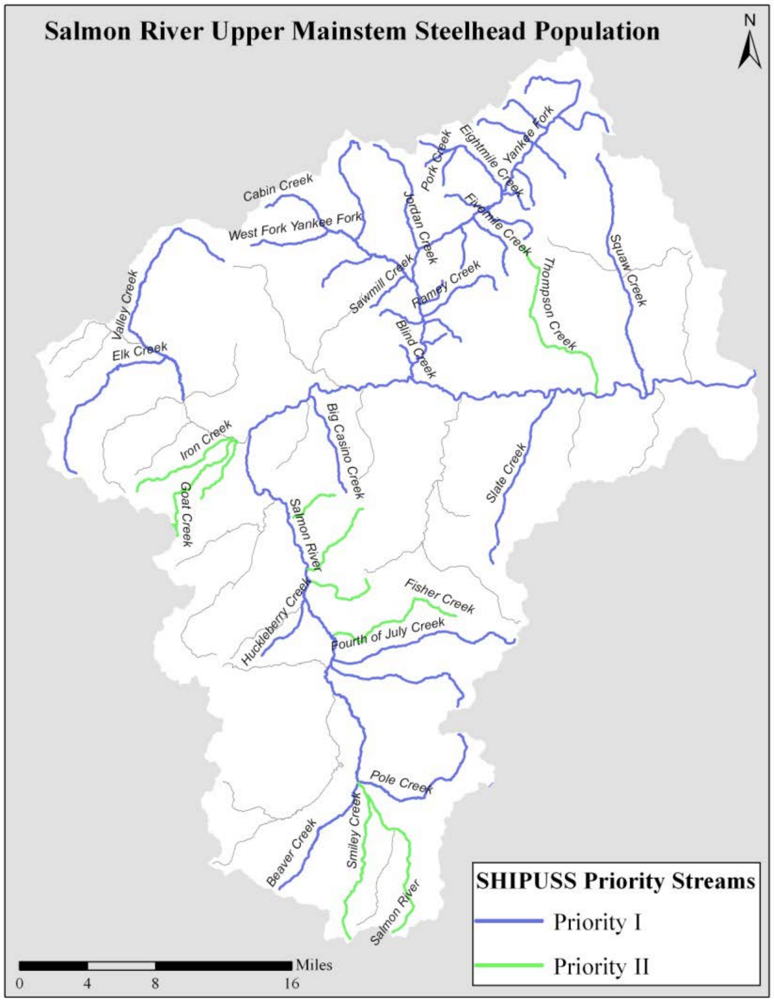


Figure 6.3-34. Priority streams for the Upper Mainstem Salmon River Steelhead Population (USBWP 2005). An updated list of priority streams is available at: http://modelwatershed.org/resources/library/.

Habitat Actions

The following habitat actions, ranked by priority, are intended to improve abundance and productivity for the Upper Mainstem Salmon River steelhead population. Because this population covers a diverse landscape, habitat actions are listed separately for the upper Salmon River, Valley Creek, and Yankee Fork Salmon River. Habitat actions in steelhead Salmon River tributaries below the Yankee Fork may also benefit the population, although not specific actions are listed here.

Upper Salmon River above Valley Creek

1. Increase streamflow and provide screening and passage. For all surface water diversions, assure that diversions bypass adequate flows, provide for fish passage, and have adequate screening in place, particularly in eastern tributaries of the Salmon River. Improve stream flows in the mainstem Salmon River and improve stream flow and connectivity of tributaries that are currently disconnected from the mainstem Salmon River due to water diversions.
2. Reduce sediment delivery to streams. Reduce road-related sediment delivery within southern and eastern drainages of the population, including Fisher Creek, upper Salmon River, Fourth of July Creek, Pole Creek, Frenchmen Creek, Smiley Creek, and Beaver Creek; Fisher Creek and the upper Salmon River headwaters are the priorities. Also reduce sediment delivery associated with livestock grazing, dispersed recreation, and irrigation use.
3. Restore degraded riparian and floodplain habitat through the following actions:
    a. Reduce grazing impacts to streams and riparian habitat. Control livestock access to encourage establishment of mature riparian vegetation.
    b. Plant or provide for regrowth of natural riparian woody and hydric vegetation composition, age classes, structure, and pattern in order to restore and maintain streambank stability. Regrowth of natural riparian vegetation will also lead to lower width-to-depth channel ratios.
    c. Conduct land acquisitions and riparian conservation easements where possible and where some measurable benefit to habitat will occur.
    d. Improve floodplain connectivity and access to side channel rearing habitat.
4. Remove human-caused migration barriers at stream road crossings that are blocking access to potential steelhead habitat.

Valley Creek

1. Increase streamflow and provide screening and passage. Evaluate existing irrigation diversions to assure that diversions bypass adequate instream flow, provide for fish passage, and are adequately screened. Priority streams for increasing instream flow and removing migration barriers caused by irrigation ditches include Elk Creek, Iron Creek, Goat Creek, and lower Meadow Creek.
2. Remove human-caused migration barriers caused by diversion structures and stream-road crossings. Priority streams for barrier removals are Elk Creek, Iron Creek, Goat Creek, Stanley Creek, lower Meadow Creek, and Trap Creek.
3. Restore degraded riparian and floodplain habitat through the following actions:
    a. Discourage additional development in streamside areas on private lands to avoid degrading fish habitat and floodplain function, particularly on lower Valley Creek

within the communities of Stanley and Lower Stanley, and also on Nip and Tuck Creek, Sunny Creek, Iron Creek, and Goat Creek.

b. Reduce grazing impacts to streams and riparian habitat.

c. Plant or provide for regrowth of natural riparian woody and hydric vegetation composition, age classes, structure, and pattern in order to restore and maintain streambank stability. Regrowth of natural riparian vegetation will also lead to lower width-to-depth channel ratios.

d. Modify localized portions of roads and trails along Nip and Tuck Creek and Iron Creek to reduce accelerated contributions to instream sediment, eliminate impairments to proper floodplain function, and restore water quality and geomorphic integrity.

Yankee Fork Salmon River

1. Reconnect floodplain. The highest priority in the watershed is to reconnect the lower Yankee Fork Salmon River to its floodplain. By restoring natural processes to this portion of the river, this river segment could again return to its historical high value as salmonid spawning and rearing habitat. BPA is working with the Shoshone-Bannock Tribes and Simplot, the principle private landowner along the lower Yankee Fork, to begin this long-term project.

   As part of the Yankee Fork Floodplain Restoration Project, the Shoshone-Bannock Tribes have identified two primary categories of actions that could substantially improve fish habitat within the lower Yankee Fork Salmon River: floodplain reconnections and tributary reconnections. These actions are described in Chapter 5, Table 5.4-29, Recovery actions identified for Yankee Fork spring/summer Chinook salmon population, and in more detail in the Yankee Fork Tributary Assessment: Upper Salmon Subbasin (BOR 2012) and the Yankee Fork Fluvial Habitat Rehabilitation Plan, 2013 Working Version (Gregory and Wood 2012). Floodplain reconnections could reduce main channel velocity, shear stress, and sediment transport and increase the magnitude and duration of flows dispersed across the floodplain. Reductions in shear stress in the main channel could result in deposition of sediment, establishment of riparian vegetation, increases in channel roughness, and narrowing of the main channel width. Tributary reconnections could provide steelhead access to additional rearing habitat. Increased access to floodplains could allow juvenile steelhead to use off-channel rearing habitat. Increased streamflow could create more off-channel habitat, flush fine sediment and maintain better fish access during low flow conditions (BOR 2012; Gregory and Wood 2012).

2. Maintain a riparian corridor. Maintain the riparian corridor (i.e., about 100-foot buffer zone) along the Yankee Fork Salmon River in the Middle Yankee subwatershed to allow for riparian vegetation regrowth and progress through successional stages towards mature timber.

Since this population is currently estimated to be meeting its proposed status, no recovery plan actions are directed specifically at the population. However, habitat actions identified for the Valley Creek, Upper Salmon River Lower Mainstem, Upper Salmon River Upper Mainstem, and Yankee Fork spring/summer Chinook salmon populations should also benefit Upper Mainstem Salmon River steelhead. These actions are shown in Table 6.3-52. During Plan implementation, NMFS will work with the various partners through the adaptive management process to refine and prioritize habitat actions for each 5-year implementation period.

Table 6.3-52. Habitat Recovery Actions Identified for the Upper Mainstem Salmon River Steelhead Population.

Limiting Factor	Habitat Actions	Project Name	Cost Estimate
Streamflow	Protect 22 cfs flow	BPA Contract # 1994-015-00: Idaho Fish Screening Project Restoration-Lemhi BPA Contract # 2002-013-01: Water Entity-Water Transaction Program BPA Contract # 2007-268-00: Idaho Watershed Habitat Restoration-Custer District Yankee Fork Floodplain Restoration - SBT BPA Contract # 2007-399-00: Upper Salmon Screen Tributary Passage BPA Contract # 2008-602-00: Upper Lemhi River-Restoration BPA Contract # 2008-608-00: Idaho MOA/Fish Accord Water Transactions	N/A $10,452,000
Barriers	Address 6 barriers		
Riparian and Floodplain Condition	Improve 20 wetland acres		
Instream Structural Complexity	Improve 7.92 instream miles		
Lack of functioning floodplain	Reconnect main river channel to floodplain through two types of actions: a) In those areas where a low area occurs between the river channel and the gravel piles, create a side channel with dimensions comparable to others within the watershed. b) In those locations where gravel piles are continuous from the Yankee Fork road to the banks of the river, create a floodplain bench by regrading the existing gravel piles to create a floodplain accessible to bankfull and greater flows		
Sediment	Improve 2 road miles		

Implementation of Habitat Actions

Implementation for the habitat actions for this population will occur primarily through the efforts of the Upper Salmon Basin Watershed Program partners. Between these groups there is an excellent representation of private, state, and federal entities that manage land and other resources within the watershed. These entities have created an effective process for working together, providing technical reviews of proposed projects, and working with interested parties to accomplish these conservation projects.

Many habitat restoration projects have already been completed in this population. Recent habitat restoration efforts have included riparian fencing, fish screens, water diversion modifications, water conservation, and fish passage. Future efforts will build on these accomplishments.

Habitat Cost Estimate for Recovery

This population is currently estimated to be meeting its proposed status so no recovery plan actions are directed specifically at this population. However, habitat actions identified for the Valley Creek, Upper Salmon River Lower Mainstem, Upper Salmon River Upper Mainstem, and Yankee Fork Chinook salmon population should also benefit Upper Mainstem Salmon River steelhead (Table 6.3-52). The habitat cost estimate for the Upper Mainstem Salmon River steelhead population is zero. Specific projects are planned continuously based on available funding and established priorities.

Hatchery Recovery Strategy and Actions

The intent of the hatchery recovery strategy for the Salmon River steelhead MPG is to promote recovery by reducing the fitness and diversity risks the hatchery programs may present. As part of this MPG-level strategy, the hatchery strategy for the Upper Mainstem Salmon River steelhead population is to reduce ecological and genetic risk associated with the hatchery program by releasing acclimated fish from locally adapted broodstock at sites where these risks can be minimized or managed, and by monitoring for straying within natural production areas. The strategy will use a mix, as appropriate, of acclimated release, local broodstock, and selection of release sites to minimize risk. The program will be developed through the HGMP process. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address concerns related to hatchery programs.

Fishery Management Recovery Strategy and Actions

The Upper Mainstem Salmon River supports an A-run steelhead population. As part of the recovery strategy, harvest impacts will continue to be controlled through the abundance-based approach for managing mainstem and tributary fisheries to limit ESA impacts on natural-origin Snake River Basin steelhead and support DPS recovery. State and tribal tributary fisheries will continue to be managed to support natural production and survival, and recovery of the DPS. The fisheries strategy also calls to refine monitoring and research efforts to manage population-specific impacts on natural-origin returning steelhead, including remaining uncertainty regarding natural-origin spawning escapement and catch and release impacts in recreational fisheries. Section 6.3.4.2 provides more information on the MPG-level recovery strategies and actions to address fishery-related concerns.

Other Recovery Strategies and Actions

Actions taken outside the population area will provide insurance that the Upper Mainstem Salmon River steelhead population retains its status of maintained and assist in moving it toward viability. Chapter 4 discusses regional-level strategies and actions to address concerns across all Idaho Snake River spring/summer Chinook salmon and steelhead MPGs and populations, including those posed by threats in the mainstem Columbia and Snake River migration corridor, Columbia River estuary and ocean, and by climate change. Section 6.1 summarizes limiting factors and threats, and related recovery strategies and actions for all Idaho Snake River Basin steelhead MPGs and populations. The Estuary, Hydro, Harvest, and Ocean Modules to the recovery plan provide additional direction.

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