35. Salmon River Population

Interior Klamath Stratum

Non-Core 1, Potentially Independent Population

High Extinction Risk

Population likely below depensation threshold

450 spawners needed for ESU Viability

751 mi^2 watershed (99% Federal ownership)

115 IP-km (71 IP-mi) (2% High)

Dominant Land Uses are Wilderness, Conservation, and Vegetation Management via Commercial Thinning and Fuels Treatment

Key Limiting Stresses are 'Lack of Floodplain and Channel' and 'Structure'Degraded Riparian Conditions'

Key Limiting Threats are 'Climate Change' and 'High Severity Fire'

Highest Priority Recovery Actions

• Increase large woody debris (LWD), boulders, and other instream structure • Construct off-channel habitats, alcoves, backwater habitat, and old stream oxbows • Re-establish a natural fire regime	• Remove, setback, or reconfigure historic mine tailings • Protect existing or potential cold water refugia • Increase instream flows guided by NCRWQCB TMDL Implementation Plan

35.1 History of Habitat and Land Use

Karuk, Shasta, and Konomihu Indians first inhabited the Salmon River. As in the past, the Karuk and Shasta still emphasize the importance of Salmon River aquatic resources in their ceremonial and daily use activities (Elder et al. 2002). Starting in the 1850s, land use changes in the Salmon River watershed, such as large scale hydraulic mining and timber harvest, began to alter river channels, tributaries, and riparian areas. Between 1870 and 1950, an estimated 15 million cubic yards of sediment was discharged into the Salmon River as a result of gold mining activities (Elder et al. 2002).

Major channel and landscape modifications ensued, especially in the upper South Fork of the Salmon River. Mining activities impacted the landscape, vegetation, soil, water quality, and channel structure in many fish-bearing streams (United States Forest Service [USFS] 1995c). Many of these impacts are still apparent on the many bare slopes and large tailing piles seen throughout the watershed. Remnant mine tailings and riparian disturbance continue to affect coho salmon habitat in the Salmon River and mined-over floodplains and terraces have remained poorly vegetated many decades after large-scale mining ended. The removal of soil down to bedrock in the Petersburg and Summerville areas has severely hampered vegetation growth (USFS 1994a).

When mining activities peaked in the watershed, the Salmon River and many of its tributary streams were dammed, diverted, or drained, which blocked fish migration (Taft and Shapovalov 1935, Handley and Coots 1953). A dam near Sawyers Bar on the North Fork of the Salmon River prevented fish from passing until the 1950s. Another dam located four to five miles above the Forks of Salmon on the South Fork of the Salmon River blocked migration for at least 50 years (Elder et al. 2002).

Over the years, major flood events have led to large scale disturbance and landscape modification. Historical accounts indicate major floods in 1861 to 1862 and again in 1889 to 1890 (McGlashan and Briggs 1939). Major floods in the Salmon River also occurred in 1953, 1955, 1964, 1970, 1971, 1972, 1974, and 1997 (Elder et al. 2002). The floods of 1955, 1964, and 1970 to 1974 created large scale landslide episodes and the 1964 flood resulted in major stream channel widening and modification (Elder et al. 2002). Floods caused channel migration, aggradation, scour, and widespread loss of riparian vegetation, with most low gradient floodplains stripped of riparian vegetation and covered with fresh sediment.

Timber harvest historically occurred in much of the watershed. Early timber harvest in the Salmon River basin was associated with mining and homesteading activities, with commercial harvest on public land beginning in earnest in the 1950s. Federally-managed land comprises nearly 99 percent of the Salmon River basin. By 1974, there were approximately 7,500 acres of harvested public land in the watershed, and by 1989, there were about 30,000 acres (Elder et al. 2002). To date, timber has been harvested from 47,995 acres (NCRWQCB 2005b), or 10 percent of the watershed. Prior to implementation of the Northwest Forest Plan, timber harvest extended into the riparian zone in many areas of the watershed (USFS 1994a). Two of the most significant outcomes of these timber harvest activities have been the associated changes in the natural fire regime and the substantial building of road networks throughout the basin.

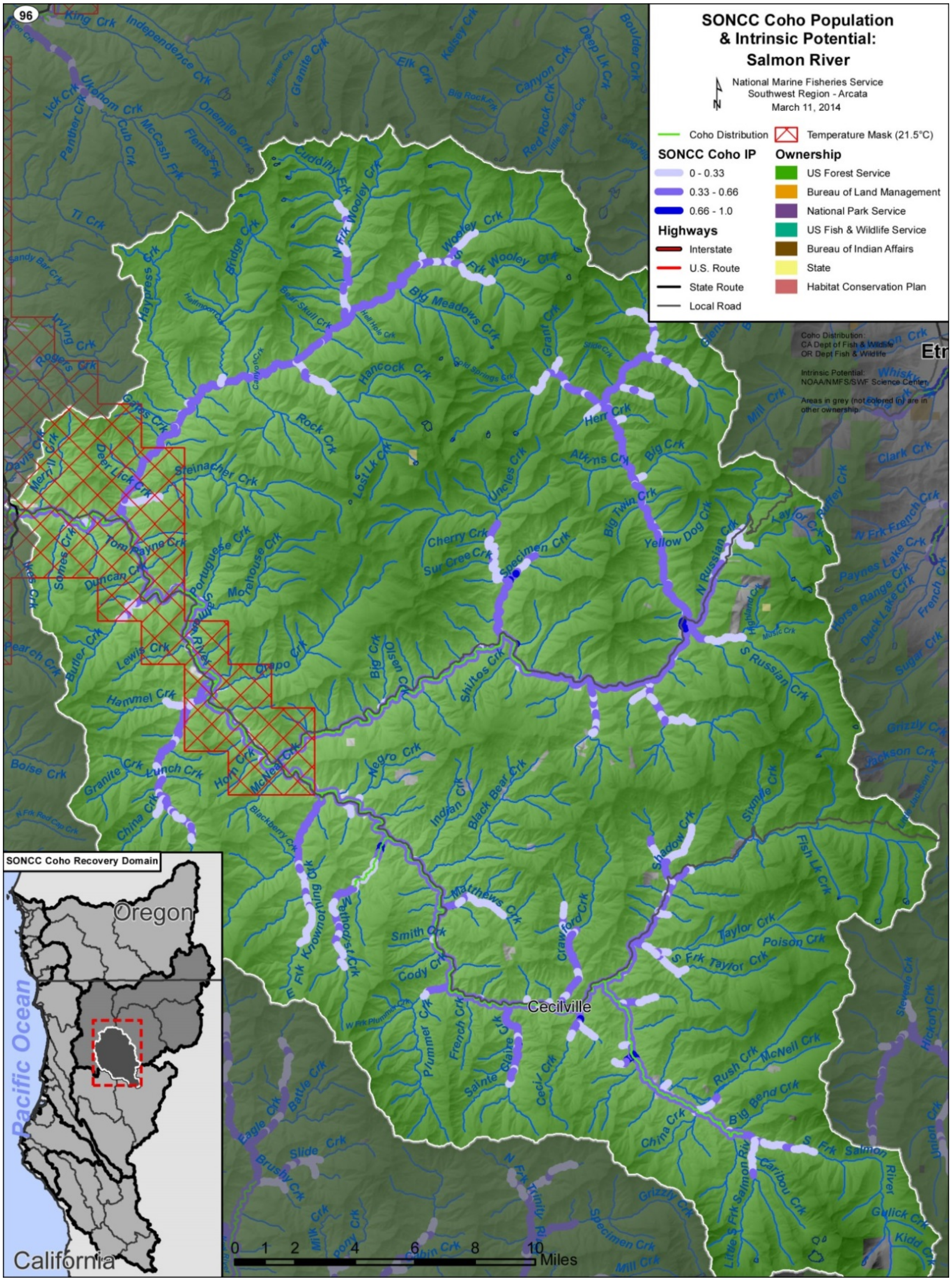

Figure 35-1. The geographic boundaries of the Salmon River coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), a temperature mask (indicating areas that are inherently too warm for rearing coho salmon). land ownership, coho salmon distribution (CDFG 2012a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Interior Klamath River diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

Much of the damage to riparian areas in the Little North Fork is the result of landslides associated with road construction and timber harvest that occurred in the early 1970s, in conjunction with major flood events (USFS 1995c). Over the past 50 years, roads have been an on-going source of sediment to streams through surface erosion and landslides. By 1944, there were about 188 miles of roads in the Salmon River watershed, most built in association with timber harvest. By 1989, the amount of road on federal lands had increased to 766 miles (USFS 2011a). Currently, there are over 900 miles of federal and private roads in the watershed, mostly located in the Klamath National Forest. As of 2011, an active Klamath National Forest road decommissioning and storm-proofing program has inventoried the Salmon River Basin's 766 miles of federally-maintained roads, completed decommissioning of 84.4 miles of roads with high sediment source potential, and storm-proofed 76.2 miles of priority roads (USFS 2011a).

35.2 Historical Fish Distribution and Abundance

The 480,619 acre Salmon River watershed hosts spring and fall runs of Chinook salmon, coho salmon, and steelhead; although many of these runs exist as remnant populations. Little is known about historic run sizes of coho salmon in the Salmon River sub-basin. The IP model suggests the Salmon River has a moderate carrying capacity for coho salmon, with less than 5 kilometers having a high IP value (>0.66; Figure 35-1). The majority of the 115 IP-km of potential habitat has a medium IP value (0.33 to 0.66) and portions of many small tributaries have low IP value (<0.33). Historic coho salmon habitat in the Salmon River includes 105 miles found along the mainstem and several tributaries, and run sizes were on the order of 2,000 adults per year (California Department of Water Resources [CDWR] 1965). Data collected from the early 1960s show coho salmon runs in the Salmon River were already on the decline, with California Department of Fish and Wildlife (CDFW; formerly California Department of Fish and Game [CDFG]) estimating an annual coho salmon spawning escapement for that year of only 800 (CDFG 1965). This decline continued between 1985 and 1991, based on data from a weir operated by CDFW near the mouth of the Salmon River in conjunction with spawning ground surveys, when adult abundance estimates fluctuated between a record low of only two coho salmon in 1985 and a high of 75 in 1987 (CDFG 1992).

Juvenile presence/absence and abundance data from a variety of surveys in the late 1970s to late 1990s indicate that many of the tributaries throughout the watershed were being used for rearing (Brownell et al. 1999). Juvenile coho salmon were found in 11 tributaries in the watershed including tributaries to the lower Salmon, Wooley Creek, and the North and South Fork Salmon (Brownell et al. 1999).

35.3 Status of Salmon River Coho Salmon

Spatial Structure and Diversity

Twelve percent of the 1,414 miles of stream within the Salmon River watershed are able to support anadromous salmonids, due to the mountainous topography and associated hydrology of the landscape (Elder et al. 2002). Coho salmon habitat includes the mainstem Salmon River, Wooley Creek, the North Fork and South Fork Salmon Rivers, and the lower reaches of a few smaller tributaries. For this reason, coho salmon in the Salmon River population are naturally restricted in their distribution.

Known coho salmon spawning has been observed in the Nordheimer Creek, Logan Gulch, Brazil Flat, and Forks of Salmon areas along the mainstem Salmon River, in the Knownothing and Methodist Creek reaches of the South Fork Salmon River, and in the lower North Fork Salmon River (Salmon River Restoration Council [SRRC] 2007, SRRC 2010a). The total linear stream distance used by spawning coho salmon from 2004 to 2010 is at least 8 km of surveyed stream habitat. Surveys suggest that specific spawning areas are re-visited each year and that fish in certain spawning areas may have specific life history traits, such as different run timing (Pennington, N., pers. comm., 2009). Based on the low hatchery influence and small population size, the genetic structure of the population likely retains much of its wild character, but overall the level of natural genetic diversity has likely declined.

Juvenile coho salmon have been found rearing in most of the available tributary habitat with moderate or high IP values. These streams are tributaries to the South Fork Salmon (Knownothing and Methodist Creek), at least nine tributaries to the North Fork Salmon, and in mainstem Salmon River tributaries of Nordheimer and Butler Creeks (SRRC 2008a). The lower reaches of these tributaries provide substantially cooler summer habitat than mainstem river habitat. Current data only includes presence/absence information; however, there is some indication that juvenile coho salmon move up from the mainstem Klamath River into the cooler Salmon River tributaries during summer months when stressed by mainstem water temperatures (USFS 2009b). Juveniles found in surveys are thought to be of both natal and non-natal origin.

The more restricted and fragmented the distribution of individuals within a population, and the more spatial distribution and habitat access diverge from historical conditions, the greater the extinction risk. Williams et al. (2008) determined that at least 35 coho salmon per IP-km of habitat are needed (4,000 low-risk spawner threshold) to approximate the historical distribution of Salmon River coho salmon and habitat. Based on current spawning densities and locations, the Salmon River population's spatial structure and diversity appear limited compared to historic conditions.

Population Size and Productivity

Survey data indicates that there are low numbers of coho salmon, and that the population is below depensation levels. In most years, only a handful of adults and/or redds are found during the spawning season. Annual returns of adults are likely less than 50 per year (SRRC 2008b). Since stream flow level and visibility in the Salmon River watershed often make coho salmon surveys difficult or impossible, these estimates could be the result of the inability to count all individuals present as well as the low abundance of the population.

Spawning surveys in the late 1980s (USFS 1991) and early 1990s failed to document the existence of coho salmon (Olson and Dix 1992). Since 2002, the SRRC along with CDFW, the Karuk Tribe, the USFS and the USFWS have conducted spawning and juvenile surveys throughout the watershed. Annual adult coho salmon abundance in the Salmon River varied between 0 and 14 spawning adults from 2002 to 2005 (SRRC 2006). As mentioned above, coho salmon spawning has been observed in the Nordheimer Creek; Logan Gulch, Brazil Flat, and Forks of Salmon areas of the mainstem Salmon River; in the Knownothing and Methodist Creek reaches of the South Fork Salmon River; and in the Lower North Fork Salmon River (SRRC 2010a). In spawning/redd surveys in 2003 and 2004, which covered a large extent of suspected coho salmon distribution within the watershed, only 3 and 14 coho salmon were observed respectively (SRRC 2006). Surveys in 2006 resulted in observations of one adult coho salmon and five redds in Knownothing and Nordheimer Creeks (SRRC 2007). Between 2002 and 2007, a total of 18 adults (average of 3 spawners per year) and 12 redds were found in approximately 25 km of surveyed habitat. In 2009, surveys limited to Knownothing and Nordheimer Creeks resulted in the observation of 7 redds in Nordheimer Creek (SRRC 2010a).

Young of the year (YOY) and yearling abundance is also low in the Salmon River, indicating that production is low. Between 2002 and 2004, only 112 YOY and 2 yearlings were captured during outmigrant trapping in the lower Salmon River at RKM 1.5 (Sartori 2006). Juveniles have been found utilizing the lower reaches of many of the tributary streams during both the winter and summer; however, abundance data is unavailable (SRRC 2010a). Some juveniles likely originate from outside the Salmon River and rear in the Salmon River (USFS 2009b).

Extinction Risk

The Salmon River population is at high risk of extinction because NMFS estimates the ratio of the three consecutive years of lowest abundance within the last twelve years to the amount of IP-km in a watershed is less than one, the criterion described by Williams et al. (2008). NMFS' determination of population extinction risk is based on the viability criteria provided by Williams et al. 2008 (Table 3, pg. 17). These viability criteria reflect population size and rate of decline. As Williams et al. (2008) provided no viability criteria for assessing moderate and high risk based on spatial structure and diversity, spatial structure and diversity were not considered in NMFS' determination of population extinction risk.

Role in SONCC Coho Salmon ESU Viability

The Salmon River population is a non-core, Potentially Independent population within the Interior Klamath River diversity stratum; historically having had a high likelihood of persisting in isolation over 100-year time scales, but strongly influenced by immigration from other populations such that they did not exhibit independent dynamics (Williams et al. 2006). The Salmon River population is strongly influenced by upstream populations. Adult strays from these populations spawn and interact with coho salmon in the Salmon River. To contribute to stratum and ESU viability, the Salmon River non-core population should have at least 450 spawners. Sufficient spawner densities are needed to maintain connectivity and diversity within the stratum and continue to represent critical components of the evolutionary legacy of the ESU. Furthermore, the Salmon River population will contribute toward stratum and ESU viability by providing rearing, migratory, and refugia habitat to other Interior Klamath River populations.

35.4 Plans and Assessments

State of California

Salmon River Total Maximum Daily Load for Temperature and Implementation Plan
http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/salmon_river/

The North Coast Regional Water Quality Control Board (NCRWQCB) identified the Salmon River as an impaired water body under the Clean Water Act Section 303(d) as a result of excessive stream temperatures and nutrients. Because the U.S. Forest Service controls 98.7% of the Salmon River watershed, and has designated this watershed as a high priority in a restoration strategy, the TMDL relies on a Memorandum of Understanding (MOU), the terms of which link the existing USFS analysis and commitments to TMDL objectives and load allocations. The load allocation, when achieved, is expected to result in the attainment of the applicable water quality standard for temperature for the Salmon River and its tributaries. This TMDL focuses on stream temperature conditions in the watershed, for which the Salmon River is listed under Section 303(d). Because of a recommendation to the State Water Resources Control Board to delist the Salmon River for nutrients, there is currently only a TMDL for temperature.

Recovery Strategy for California Coho Salmon
http://www.dfg.ca.gov/fish/Resources/Coho/SAL_CohoRecoveryRpt.asp

The Recovery Strategy for California Coho Salmon was adopted by the California Fish and Game Commission in February 2004. The recommendations developed by the Coho Recovery Team and CDFW for the Salmon River basin have been considered and incorporated into the table of population-specific recovery actions at the end of this document.

The Salmon River Restoration Council (SSRC)

SRRC Salmon River Sub-basin Restoration Strategy
http://www.srrc.org/publications/general/SRRC%20Salmon%20River%20Sub-basin%20Restoration%20Strategy.pdf

The 2002 Salmon River restoration strategy, jointly developed by the Klamath National Forest and SRRC, was built upon watershed analyses, transportation planning documents and other administrative investigations. The focus of the strategy is on restoring the biological, geologic, and hydrologic processes that shape aquatic habitat and the resulting plan focuses on reduction of upslope risks and hazards in watersheds with high quality habitat and native fish populations. Restoration objectives and recommendations on target watershed conditions are included in the strategy.

Salmon River Road Sediment Source Assessment (2001)

Private Roads Sediment Reduction Project, Final Report (2011)
http://www.srrc.org/publications/programs/roads/Salmon%20River%20Private%20Roads%20Sediment%20Reduction%20Project%20Final%20Report.pdf

Salmon River Riparian Assessment, 2006 to present

Salmon River Cooperative Noxious Weed Program Strategy for Restoring Native Plant Communities (2003)

Limiting Factors for Salmon River Spring Chinook Life Stages (draft)

U.S. Forest Service – Klamath National Forest (KNF)

Evaluation of Fish Habitat Condition and Utilization in Salmon, Scott, Shasta, and Mid Klamath Sub-basins 1988/89.

Forest-Wide Late Successional Reserve Assessment (1999)

Salmon Sub-Basin Sediment Analysis (1994)

Upper South Fork of the Salmon River Ecosystem Analysis (1994)

South Fork of the Salmon River Ecosystem Analysis (1994)

Main Salmon Ecosystem Analysis (1995)

North Fork Watershed Analysis (1995)

Lower South Fork of the Salmon River Ecosystem Analysis (1997)

North Fork Salmon River Watershed Access and Travel Management Plan (1998)

Upper South Fork Salmon River Watershed Access Analysis (1997)

Ukonom Travel and Access Management Plan (1996)

Klamath National Forest Forestwide Roads Analysis (2002)

Roads Analysis Process (RAP) for North (2003) and South Forks of Salmon River (2005)

Klamath Motorized Travel Management Plan, Siskiyou County, California (2010)

Sufficiency Assessment: Forest Service and Bureau of Land Management Programs in Support of SONCC Coho Salmon Recovery (USFS and BLM 2011).

Klamath Motorized Travel Management Plan, Siskiyou County, California (2010)

The KNF, with partner Northern California Resource Center, completed a Forest-wide assessment of fish passage at road stream crossings during 2002-2004. Since then, the KNF has upgraded 7 crossings in the Salmon River Watershed to allow for free passage of all aquatic organisms. Four of these crossings are just upstream of coho salmon critical habitat and three are within critical habitat on Methodist, Cecil, and Taylor creeks. Currently the KNF, along with partner Salmon River Restoration Council, are planning the Hotelling Gulch aquatic habitat restoration project that would provide aquatic organism passage at a county road crossing and access to approximately 1.4 miles of potential habitat in this SF Salmon River tributary. The KNF will continue to pursue this and other fish passage restoration projects where barriers to fish passage are identified.

The USFS has adopted a Watershed Condition Framework assessment and planning approach (USFS and BLM 2011). The Watershed Condition Framework (WCF) is a comprehensive approach for proactively implementing integrated restoration on priority watersheds on national forests and grasslands. The WCF provides the Forest Service with an outcome-based performance measure for documenting improvement to watershed condition at forest, regional, and national scales. As part of the WCF, the South Fork of the Salmon River was identified as a high priority 6th field sub-watershed in the Klamath National Forest (USFS and BLM 2011).

Salmon River Fire Safe Council

Recent Salmon River Community Wildfire Protection Plans
http://www.srrc.org/publications/index.php

The Salmon River Fire Safe Council formed in 2000 in order to gain more involvement from agencies and the community on fire issues. The mission of the Salmon River Fire Safe Council is to help plan, implement and monitor the reinstatement of natural fire regimes in the Salmon River ecosystem in a manner that protects life and property, improves forest health, and enhances the resources valued by its stakeholders. The Fire Safe Council has been working on two levels of fire planning. They have completed a draft Community Wildfire Protection Plan for the entire watershed and are working to develop more detailed Community Wildfire Protection Plans for the towns and neighborhoods in the watershed. The SRRC and the Forest Service work together to develop partnership agreements and memorandums of understanding for various resource protection, enhancement, and awareness projects in the Salmon River watershed. Through the Fire Safe Council, there is coordination of fire planning and fuel reduction activities with community members, the Karuk Tribe, CalFire, US Fish & Wildlife Service, National Marine Fisheries Service, Salmon River Volunteer Fire and Rescue, the Salmon River and Orleans Ranger Districts, and others.

35.5 Stresses

Table 35-1. Severity of stresses affecting each life stage of coho salmon in the Salmon River. Stress rank categories, assessment methods, and data used to assess stresses are described in Appendix B.

	Stresses	Egg	Fry	Juvenile[1]	Smolt	Adult	Overall Stress Rank
1	Lack of Floodplain and Channel Structure[1]	High	High	High[1]	Medium	Medium	High
2	Degraded Riparian Forest Conditions[1]	-	High	High[1]	Medium	Medium	High
3	Impaired Water Quality	Low	Medium	High	Medium	Medium	Medium
4	Adverse Hatchery-Related Effects	Medium	Medium	Medium	Medium	Medium	Medium
5	Altered Sediment Supply	Medium	Medium	Medium	Low	Low	Medium
6	Impaired Estuary/Mainstem Function	-	Low	High	High	Low	High
7	Increased Disease/Predation/Competition	Low	Low	Medium	Medium	Medium	Medium
8	Altered Hydrologic Function	Low	Low	Medium	Low	Low	Low
9	Adverse Fishery- and Collection-Related Effects	-	-	Low	Low	Medium	Low
10	Barriers	-	Low	Low	Low	Low	Low

[1] Key limiting stresses and limited life stage.

Key Limiting Stresses, Life Stages and Habitat

Lack of floodplain and channel structure and degraded riparian forest conditions are the key limiting stresses for the Salmon River population of coho salmon, with the juvenile life stage being the most limited. Water quality and riparian conditions are both degraded in the watershed and off-channel habitat is minimal due to the bedrock geology and steep terrain. The SRRC analyzed what limiting factors were important for Spring Chinook salmon in the watershed and found that temperature (in the mainstem Klamath and Salmon River), pool size and quantity, thermal barriers, flow, disease, and sediment embeddedness were all important factors limiting productivity of that population and likely the Salmon River coho salmon population as well (SRRC 2008b).

The juvenile life stage is likely the most limited and quality summer and winter rearing habitat is likely lacking as vital habitat for the population. Juvenile summer rearing habitat is impaired by high temperatures with few thermal refugia areas accessible. Winter off-channel rearing habitat is naturally lacking and may force juveniles downstream where they may rear in the estuary or in off-channel habitat in the mainstem (NMFS 2007b).

Lack of Floodplain and Channel Structure

Floodplain and channel structure are generally based on physical characteristics that create complex habitat (e.g., pool depths, substrate size, and large woody debris quantity). Floodplain and channel structure in the Salmon River generally do not support many of the life history requirements of coho salmon due to the natural confinement of the watershed and the high frequency of disturbance. The IP model supports this presumption based on the low amount of high IP habitat in the Salmon River (Figure 35-1). Human-related activities have further limited floodplain, channel form, and function by altering floodplain habitat through mining activities (e.g., South Fork Salmon), changes in the natural fire regime, and erosion related to road-building and timber harvest. Natural disturbance regimes have been impacted by human activities and the consequences for floodplain and channel structure are that some disturbances such as fire and slope failure are more common and intense. Large wood is often flushed from the system by flooding and the associated stream power of the Salmon River. Because large wood typically influences the deposition and sorting of sediment, the loss of wood has led to excessive mobilization and input of sediment to streams. Floodplain habitat is often naturally disconnected due to steep canyon walls, but in some cases floodplains have been disconnected by large scale landslides, road building, and mine tailings. Sediment loading in some areas has filled pool habitat and simplified stream reaches.

Because off-channel and low-velocity habitat is already limited in the basin, any loss or alteration of existing habitat can have a disproportionate negative impact. Effects of floodplain and channel structure on the egg stage occur from channel confinement, substrate size, and the amount of bedrock in some reaches. Effects on fry and juveniles occur from the loss and degradation of off-channel and low-velocity rearing and refugia habitat, and to a lesser extent on smolts. Lack of floodplain and channel structure is a medium stress to adults due to a lack of suitable spawning habitat and altered channel form and function.

Degraded Riparian Forest Conditions

The recovery of riparian vegetation height and extent from past disturbances is expected to be the most important factor at a landscape scale in lowering stream temperatures toward natural levels (NCRWQCB 2005b). Riparian forests in the Salmon River have been primarily impacted by disturbances such as flooding and fire. Although these disturbances are natural to the Salmon River, their increased frequency and severity have caused large scale impacts to ecosystem processes. Based on the altered composition (decreased diversity and age class distribution) and decreased size of vegetation, the poor condition of riparian forests within the Salmon River watershed is a high stress to the fry and juvenile coho salmon life stages and medium stress for other life stages. Available data (USFS 2000c) indicate that lack of riparian cover is of particular concern in the North Fork and South Fork Salmon Rivers where there has been more than 25 percent (of which more than 10 percent was somewhat recent) disturbance. By comparison, the riparian corridors along the lower mainstem Salmon River and Wooley Creek are considered “very good” (fully functioning), and contain less than 10 percent disturbance (5 percent fairly recent) (USFS 2000c). Many riparian areas have been altered by large mass wasting events, high severity fires, and anthropogenic activities. Almost 25 percent of riparian areas have been scoured by debris torrents or degraded by fire (USFS 1994a) and only 27 percent of riparian areas have forest cover greater than 70 percent crown closure (USFS 1995d). Disturbance has resulted in fewer large trees in the riparian area, especially conifers, and a much greater extent of bare areas. Most of these changes are attributed to the 1964 flood, while others are attributed to disturbance by human activity or a combination of floods, fires, and human activity (USFS 1995d).

Currently riparian vegetation consists of fewer stands of large, dense conifers than were present before Euro-American settlement. The lack of functional riparian forest throughout the basin also limits the amount of large wood entering streams, leads to increased erosion and bank instability, and can lead to high stream temperatures. In areas where riparian forest conditions are impaired, rearing habitat for fry and juveniles is likely limited and/or impaired and holding habitat for adults is often lacking. Water quality is also impaired in many of these areas and can affect growth and survival of juveniles during the summer.

Impaired Water Quality

Although data indicate that water quality is good for many parameters, the Salmon River experiences impaired temperatures (>17^{o} C) (NCRWQCB 2005b), fair dissolved oxygen (DO) (8.5 to 8.75), and elevated pH levels (8.5 to 8.75; Wilkie and Wood 1995) at times during the summer, early fall and especially during low-flow conditions. Aquatic invertebrate EPT and species richness scores were both indicative of good aquatic health in the watershed although there are potentially site-specific issues with contamination from past mining activities and fire retardant misapplication. Little information is available on the extent of contamination from these types of activities. Water temperature is the most significant issue affecting water quality in the Salmon River and exerts a stress on all life stages of coho salmon in the Salmon River population. Data from throughout the basin indicates that impaired water temperatures, sometimes exceeding sublethal levels (i.e., >17^{o}C) occur during late summer in all the major tributaries and mainstems of the North Fork, South Fork, and Lower Salmon (NCRWQCB 2005b). This results in a high stress on juveniles, a medium stress on fry, smolt and adult, and a low stress on the egg life stages. Most tributary temperatures are below lethal levels (NCRWQCB 2005b).

In areas that would be cooled by riparian shade (e.g., smaller tributaries), the reduction and compositional alteration of riparian vegetation along the river and its tributaries has led to increased water temperatures. This issue is exacerbated in dry years when stream flows are low, and in summer and early fall when water temperatures are highest. The only sources of cool water are smaller tributaries with adequate shading. The lack of available cool summer habitat is especially stressful for rearing juveniles, which can be at risk of reduced growth, disease, infection, and eventual mortality during these periods.

Adverse Hatchery Related Effects

No hatcheries are present, and no artificial propagation occurs in the Salmon River population area, but Iron Gate Hatchery is located upstream on the Klamath River. Strays from other Klamath Basin hatcheries are known to utilize the Salmon River for spawning and potentially rearing (Pennington, N., pers. comm., 2008). The proportion of spawning adults in the Salmon River that are from a hatchery is unknown. Adverse hatchery-related effects pose a medium risk to all life stages, due to the presence of Iron Gate Hatchery and Trinity River Hatchery in the Klamath basin (Appendix B).

Altered Sediment Supply

The quality and type of sediments delivered to stream channels within the Salmon River watershed do not generally present a significant stress to coho salmon. Based on measurements of fine sediments in channels (i.e., V*; Cover et al. 2008, USFS 2010a, SRRC 2011), there is little accumulation of fine sediment in channels and pools within the watershed, except in Crapo Creek and Taylor Creek. In areas where excess sediment loading has occurred, the early life stages of coho salmon are most affected since it often results in simplified rearing habitat and impaired water quality. Due to the steep slopes and localized soil instability, sediment loading in the Salmon River continues to be elevated in some reference stream reaches, resulting in an overall medium stress for the population.

Impaired Estuary/Mainstem Function

All salmon and steelhead that originate from the Salmon River migrate to and from the ocean through the mainstem Klamath River and the Klamath River estuary. Also, due to the lack of winter rearing habitat in the Salmon River, many juveniles move downstream during high flows and must find rearing and refugia habitat in the lower Klamath River and estuary. The importance of the lower basin to this population is largely unknown. However, a proportion of the coho salmon population likely spend a substantial amount of time rearing downstream of the Salmon River. For coho salmon that rear downstream of the Salmon River, the mainstem and estuary conditions play an important part in their growth and survival. Other coho salmon may pass through the mainstem and estuary on their way to and from the ocean, using these habitats primarily for migration. Although small compared to the large size of the watershed, the estuary provides rearing habitat for juvenile coho salmon. The estuary, although relatively intact, suffers from impaired water quality, elevated sedimentation, loss of habitat, and disconnection from tributary streams and the floodplain. More information about the Klamath River estuary can be found in the Lower Klamath River population profile.

Elevated water temperatures, sedimentation, disease, and degraded habitat conditions exist in mainstem reaches. Juveniles, smolts, and adults in mainstem habitats are stressed by the degraded conditions in these migratory and rearing habitats. Disease, access and availability of rearing and migratory (holding) habitat, and lack of connectivity between tributaries and the mainstem are all issues that impact the quality of rearing and migratory habitat downstream of the Salmon River. Although the prevalence of diseases is low in mainstem reaches downstream of the Salmon River, disease is still an issue when water temperatures are high and fish are stressed.

Adverse Fishery- and Collection-Related Effects

Based on estimates of the fishing exploitation rate, as well as the status of the population relative to depensation and the status of NMFS approval for any scientific collection (Appendix B), these activities pose a medium stress to adults and a low stress to juveniles and smolts.

Increased Disease/Predation/Competition

Although disease, predation, and competition are not limiting factors for coho salmon in the Salmon River, adult coho salmon migrating through the Klamath River to spawn in the Salmon River are exposed to disease as are juveniles and smolt that redistribute to find rearing habitat in the mainstem Klamath or are outmigrating through the mainstem. For this reason, disease is considered a medium stress for juveniles, smolt, and adults. Pathogens that cause diseases in juveniles and adults include *Ceratonova shasta*, Ichthyopthirius *multifilis* (Ich*), Flavobacterium columnare* (columnaris), Aeromonid bacteria, *Nanophyetus salmonicola*, and the kidney myxosporean *Parvicapsula minibicornis* (Federal Regulatory Energy Commission (FERC) 2007, National Research Council (NRC) 2004). Disease occurs when conditions for the pathogen are favorable and when fish are susceptible. Ich and columnaris were responsible for the significant die-off event in the Lower Klamath River in the summer of 2002. Infection by *P. minibicornis* may occur at a prevalence of greater than 50 percent of juvenile coho salmon. It is unknown how often they cause direct mortality (Bartholomew and Courter 2007). Juvenile mortality rates from short term and longer term exposures at various locations in the Klamath River vary by location and time of year. Between 2008 and 2010 mortality ranged from 0 to less than 10 percent at the Orleans site (Bartholomew 2012). Further discussion of disease issues occurring in the mainstem Klamath River is included in the Upper, Middle, and Lower Klamath population profiles.

Altered Hydrologic Function

Altered hydrologic function is a medium stress for juvenile coho salmon and a low stress for all other life stages. There is little impervious surface area within the watershed and no major barriers or diversions to block or reduce flow. However, there are numerous small diversions throughout the watershed that can have a cumulative impact on the amount of surface flow, particularly diminished summer flows from tributaries that provide rearing refugia for juvenile salmonids (USFS 2011b). The lower Salmon River was ranked by the U.S. Forest Service as having a “fair,” or partially functional flow regime (USFS 2000c). This was based on the timing, rate of change, and/or duration of mid-range discharges, which were considered to impair aquatic habitat availability in this drainage area. Though diversions may have localized effects, overall peak and low flows are thought to remain primarily unaltered in this area.

Barriers

Although several man-made barriers exist on small tributaries throughout the Salmon River, most of these barriers exist outside the range of coho salmon and do not impede access (CalFish 2013). Several fish passage barriers at road-stream crossings have been prioritized for fish passage in the past but the most significant barriers have been removed or remediated (Taylor et al. 2002). An example of coordinated barrier removal is the Whites Gulch Dam removal project (http://www.srrc.org/programs/riparian.php), and the subsequent upgrade of a Siskiyou County road crossing downstream on lower Whites Gulch in August 2009. One remaining large barrier associated with the road crossing over lower Hotelling Gulch, is under review for barrier removal (USFS 2010b). In addition to man-made barriers, natural seasonal low flow barriers block passage to some reaches. Because many tributaries provide thermal refuge when mainstem water temperatures rise in the summer, ensuring access to all fish bearing tributaries is important.

35.6 Threats

Table 35-2. Severity of threats affecting each life stage of coho salmon in the Salmon River. Threat rank categories, assessment methods, and data used to assess threats are described in Appendix B.

	Threats[2]	Egg	Fry	Juvenile[1]	Smolt	Adult	Overall Threat Rank
1	Climate Change[1]	Medium	Medium	Very High[1]	Very High	Medium	Very High
2	High Severity Fire[1]	Medium	Medium	Medium[1]	Medium	Medium	Medium
3	Roads	Medium	Medium	Medium	Medium	Medium	Medium
4	Hatcheries	Medium	Medium	Medium	Medium	Medium	Medium
5	Mining/Gravel Extraction	Low	Medium	Medium	Medium	Low	Medium
6	Fishing and Collecting	-	-	Low	Low	Medium	Low
7	Dams/Diversions	Low	Low	Low	Low	Low	Low
8	Invasive Non-Native/Alien Species	Low	Low	Low	Low	Low	Low
9	Agricultural Practices	Low	Low	Low	Low	Low	Low
10	Timber Harvest	Low	Low	Low	Low	Low	Low
11	Urban/Residential/Industrial Dev.	Low	Low	Low	Low	Low	Low
12	Road-Stream Crossing Barriers	-	Low	Low	Low	Low	Low

[1] Key limiting threats and limited life stage
[2] Channelization/Diking is not considered a threat to this population.

Key Limiting Threats

The two key limiting threats, those which most affect recovery of the population by influencing stresses, are climate change and high severity fire.

Climate Change

The greatest threat is likely from climate change, particularly from the predicted changes in temperature and precipitation. Climate change in this region will have the greatest impact on juveniles, smolts, and adults. The current climate is generally warm and modeled regional average temperatures show a large increase over the next 50 years (see Appendix B for modeling methods). Average ambient temperature could increase by up to 3 °C in the summer and by 1.3 °C in the winter. Recent studies have already shown that water temperatures in the mainstem Klamath River have been increasing at a rate of 0.4 to 0.6 °C/decade since the early 1960s (Bartholow 2005). The season of high temperatures that are potentially stressful to salmon has lengthened by about 1 month and the average length of mainstem river with cool summer temperatures (<15 °C) has declined by about 8.2 km/decade (Bartholow 2005). Annual precipitation in this area is already low and is predicted to trend downward over the next century, while snowpack in upper elevations of the basin is expected to decrease with changes in temperature and precipitation regime (California Natural Resources Agency 2009). Juvenile rearing and migratory habitat in the Salmon River and mainstem Klamath River is most at risk to climate change as are migratory conditions in the Klamath River for adults. Increasing ambient temperatures and changes in the amount and timing of precipitation and snowmelt will impact water quality and hydrologic function in the summer and winter. Overall, the range and degree of temperature increase and precipitation volatility are likely to continue in all populations. Eggs and fry will be impacted by larger and more frequent flooding and mass wasting events than have historically occurred, which will be especially significant in this area due to the steep terrain and unstable geology. Adults will also be negatively impacted by ocean acidification and changes in ocean conditions and prey availability (Independent Science Advisory Board 2007, Portner and Knust 2007, Feely et al. 2008).

High Severity Fire

The Salmon River watershed is naturally a fire-adapted landscape with a relatively frequent recurrence of wildfire. The fire regime historically was highly variable in terms of frequency, severity, and spatial pattern (Frost and Sweeney 2000). The predominant fire regime was relatively frequent (every 10 to 50 years) low and moderate severity, with varying-sized patches of high severity fire. However, because of land management activities over the past 150 years including clearcut timber harvest and fire suppression, high fuel loading occurs throughout the watershed and causes fires to burn much hotter and longer. In many lower and mid-elevation areas and in high elevation areas that have not burned in the last 45 years, current vegetative structure and patterns strongly favor high severity, frequent fires (SRRC 2007).

After several fires in 1917 and 1918, which burned 6,270 and 15,660 acres respectively, effective fire suppression began in the 1920s and continues to the present in some areas. Without natural fire on the landscape to reduce fuel loads, areas without fuels treatment now have a higher risk of catastrophic fire. The result is an ecosystem with more frequent, more intense fires. In the latter quarter of the 20th century, high severity fires became more common and more detrimental to watershed health. An estimated 29 percent of the Salmon River watershed has burned since the early 1970s with isolated pockets of high severity fires occurring in some sub-watersheds (Elder et al. 2002). Under natural fire regimes, a much higher percentage of the watershed likely would have been affected by fire; however, these fires would have been at a much lower intensity, thereby preventing high severity, stand replacing fires as seen recently. Recent efforts have shifted from suppression to strategic landscape level fuels reduction, prescribed fire, and controlled burns as a means to mitigate high severity fire.

The impacts to coho salmon associated with high severity fire make this an immediate threat to this population. Fires affect salmon and salmon habitat in the Salmon River in a number of ways. Catastrophic fires denude riparian areas, which in turn increase water temperatures through the loss of riparian shading. Snow pack and water retention has been reduced in denuded areas, affecting the hydrology of the basin (Vajda et al. 2006). Fire in upslope areas has also led to increased soil erosion and sediment delivery, which has resulted in stream aggradation, pool filling, and in extreme cases landslides, debris torrents, or other forms of mass wasting (Elder et al. 2002). Recent large-scale fires that resulted in lost or degraded coho salmon habitat include the Forks Complex (37,000 acres in 2013), Backbone and Red Spot (6,324 acres in 2009), Ukonom Complex (80,000 acres in 2008), and the Uncles Complex (48,085 acres in 2006; SRRC 2010b). Current efforts to reduce fuels and reintroduce low intensity fire into the landscape through fire use and under-burning aim to address this problem and should lessen this threat over time.

At present, fuel loading is a high hazard in many areas of the watershed, and the Salmon River Sub-basin Restoration Strategy (Elder et al. 2002) identifies fire as the primary long-term risk to the aquatic and terrestrial ecosystems within the Salmon River watershed, due to resulting impacts on sediment and water temperatures (Elder et al. 2002).

Roads

Sedimentation from roads will continue to detrimentally impact the population. Road-related sediment mobilizations, however, are expected to decrease over time as road decommissioning and upgrading continues by the Klamath National Forest. Existing roads are considered a medium threat to all life stages of coho salmon in the Salmon River. In 2011, there were over 900 miles of roads within the Salmon River watershed. Most of these roads are within the South Fork and North Fork Salmon River drainages and their density within specific drainages is variable. The drainages with the highest density of roads (very high; >3 mi./sq. mi.) include Negro Creek, McNeal Creek, Eddy Gulch, Cecil Creek, Indian Creek, and Crawford Creek. At least 14 other drainages have a rating of “high” road density (2.5 to 3.0 mi. /mi^2; Elder et al. 2002). At these levels, salmon habitat is considered to be “not properly functioning” or as having degraded functions (NMFS 1996) due to the impacts of increased sedimentation, riparian condition, hydrology, water quality, slope stability, habitat complexity (especially large wood transportation and delivery), and fish passage.

In the Salmon River watershed, roads account for 90 percent of the human caused sediment and 43 percent of expected surface erosion (Elder et al. 2002). Roads have a significant impact on slope stability in an area which is naturally prone to landslides and erosion. Roads are significantly correlated with the number of landslides within the watershed, with roaded areas in the Salmon River watershed being 27 times more likely to yield landslides than undisturbed sites (De la Fuente and Elder 1998). When roads are built within the riparian corridor, they impact stream habitat through the loss and/or degradation of riparian function. Within the Salmon River basin, approximately 79 miles of roads are within Riparian Reserves (USFS 1995c). Within these areas, opportunities for the establishment of riparian vegetation are limited, particularly along major road arteries that track the mainstem and forks of the Salmon River. Given the elevated summer water temperatures along these reaches of the Salmon River, it will be important to reduce the impacts of roads in order to increase riparian shading and decrease stream filling due to sedimentation. In order to address sediment source issues on 15 road-related sediment mobilization sites within the Salmon River watershed, the Salmon River Private Roads Sediment Reduction Project (PWA 2011) has upgraded and decommissioned approximately 3.1 miles of roads in the Salmon River basin. The Klamath National Forest also continues to mitigate road-related hydrologic connection on public land in the Salmon River watershed, has implemented many road decommissioning and storm proofing projects in the

South Fork Salmon River watershed, and is implementing several road improvement projects in the North Fork Salmon River and Upper South Fork Salmon River watersheds (Perrochet, J., pers. comm., 2011). These efforts should reduce the impacts of roads on watershed conditions in the future.

Hatcheries

Hatcheries pose a medium threat to all life stages in Salmon River watershed. The rationale for these ratings is described under the "Adverse Hatchery-Related Effects" stress.

Mining/Gravel Extraction

Several thousand acres of public lands are currently reserved as mining claims including more than 400 placer and lode mining claims in the Salmon River basin (Elder et al. 2002). Most mining activity is currently pursued at a part-time or hobby level by individuals. The active gold mining occurs mostly as placer mining along the South Fork Salmon and Knownothing Creek, as hard-rock mining at the Discovery Day Mine, and as recreational gold suction dredging or panning has occurred at various locations throughout the Salmon River watershed. The last commercial gold mine closed in the 1990s (Elder et al. 2002), while three hard rock mining special use permits were issued during the 2000s. Overall, mining activities in the Salmon River have decreased significantly from historic levels, though there remain significant legacy effects from remnant tailing piles associated with past placer mining. Suction dredge mining had been increasing until the cessation of suction dredging permit issuance by the state of California in 2009. In response, high banking practices (processing gravel materials along the shoreline) are becoming more common. The potential for future mining operations, and the number of claims that could be utilized, suggest that mining/gravel extraction is a medium threat to coho salmon.

Fishing and Collecting

Based on estimates of the fishing exploitation rate, as well as the status of the population relative to depensation and the status of NMFS approval for any scientific collection (Appendix B), these activities pose a medium threat to adults and a low stress to juveniles and smolts.

Dams/Diversions

Although small scale diversions and dams exist within the watershed, they are mostly confined to smaller tributaries and are not believed to significantly impact coho salmon. The diversions that exist are mostly associated with mining activities and residential use, and may have the cumulative potential to affect stream hydrology or migration and rearing of juveniles. Other dams may include small dams for recreational use (e.g., swimming holes) and are monitored opportunistically by CDFW and SRRC during surveys.

Invasive Non-Native/Alien Species

Noxious weeds in the Salmon River watershed have become an ongoing problem throughout the basin. Fire and fire suppression crews are thought to play a major role in the introduction and establishment of weed species. The SRRC manages a noxious weed program for 11 species of weeds found in the watershed and has been successful in hindering the establishment and spread of these species. The SRRC has eradicated 99 percent of the largest infestation of spotted knapweed. Invasive species are currently considered a low threat to this population because of the success of this program.

Agricultural Practices

Unlike the upper Klamath Basin, the Salmon River watershed does not lend itself to large-scale agricultural or grazing, although grazing has occurred within the watershed at some level since the mid-1800s. The Salmon River watershed is highly forested and steeply sloped, and current grazing is primarily within transitory rangeland in or adjacent to USFS wilderness areas. There are currently four grazing allotments within the boundary of the watershed: Big Flat, Carter Meadows, Garden Gulch, and South Russian Creek. The total area of these allotments is small, and the Klamath National Forest currently manages these areas for ecological benefits (USFS 1995c). In terms of grazing impacts, there is little evidence to suggest a direct linkage between existing grazing management and increased stream temperatures in the Salmon River watershed. Most grazing occurs in the headwater drainages well above anadromous fish habitat and current levels likely do not pose a significant threat to coho salmon. Therefore, agricultural practices are considered a low threat for all life stages.

Timber Harvest

Timber harvest, although once a major land use in the basin and a significant threat to coho salmon, is now restricted to just a few thousand acres of upland habitat. Much of the land that was once logged is now part of National Forest Riparian Reserves, Late Successional Reserves, or wilderness, none of which are designated for timber harvesting. Since 2000, timber harvesting and other vegetation treatments have primarily emphasized maintenance and/or improvement of resource values and objectives, such as maintenance of habitat diversity and strategic wildfire hazard reduction. Timber harvest is a low level threat for the population.

Urban/Residential/Industrial Development

Residences are dispersed throughout the watershed with concentrations located in, or near, the towns of Sawyers Bar, Cecilville, Somes Bar, and Forks of Salmon. In addition, the community is made up of several outlying small neighborhoods and isolated forest residencies. With only 250 residents within the watershed, and expected future population growth under 2 percent, urban, residential, and industrial development is very minor and is considered a low threat to coho salmon in this population.

Road-stream Crossing Barriers

Several road-stream crossing within the watershed are considered barriers to adult and juvenile coho migration. The SRRC has helped to identify the known man-made fish barriers in the Salmon River watershed and is cooperating with partners to remove these barriers. Several were ranked as priorities for removal by the Siskiyou County Culvert Inventory and Fish Passage Evaluation (Taylor et al. 2002) with four of the top six priority sites in the Salmon River watershed. Currently, all four fish passage issues have been, or are currently being, addressed by the SRRC, the county, and their partners. Several impassable culverts have already been replaced (Whites Gulch, Kelly Gulch, Merrill Creek) and the remaining significant barrier on lower Hotelling Gulch is undergoing a feasibility study for treatment. Because of the limited scope of this problem in the watershed and the ongoing efforts to address it, road-stream crossing barriers in the watershed currently constitute a low threat to coho salmon.

35.7 Recovery Strategy

Summertime temperatures and a lack of winter rearing habitat remain the greatest stresses for juvenile coho salmon and overall the small population size limits the potential for natural salmon recovery. Restoration opportunities are limited on private land because the majority of land in the watershed is public and managed by the U.S. Forest Service as a Key Watershed under the Northwest Forest Plan (USFS 1994a); however, many of the hurdles facing restoration in other watersheds are not present in the Salmon River.

Improvements of mainstem rearing and migratory habitat are expected to occur as a result of recovery actions in the three mainstem Klamath River populations. It is expected that the threat from climate change will be mitigated by addressing the key limiting stresses. By improving connection to off channel habitat and increasing riparian cover, water temperatures should cool and slow water refuge habitat will be improved to help buffer against the warming summer climate and large flow events in the winter. Specific emphasis has been placed in this recovery strategy on meeting habitat needs associated with the current TMDL for temperature (NCRWQCB 2005b) and on the recommendations outlined in the Salmon Sub-basin Restoration Strategy (Elder et al. 2002).

The highest priority should be improving the quality and extent of rearing habitat and refugia. For summer rearing, reducing water temperatures in the watershed, along with protecting and restoring thermal refugia is the top priority. For winter rearing, improving connectivity to existing off-channel habitat, and increasing the extent and quality of winter rearing areas is essential. Juvenile rearing habitat, located primarily in lower tributary reaches, should be restored or re-created wherever possible, to provide increased opportunities for winter rearing in the watershed. Efforts to improve riparian habitat condition such as planting and protecting riparian vegetation will be important to the long term recovery strategy. The effects of fishing on this population’s ability to meet its viability criteria should be evaluated.

Table 35-3 on the following page lists the recovery actions for the Salmon River population.

Table 35-3. Recovery action implementation schedule for the Salmon River population. Recovery actions for monitoring and research are listed in tables at the end of Chapter 5.

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-SalR.2.1.8	Floodplain and Channel Structure	Yes	Increase channel complexity	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	All streams where coho salmon would benefit immediately, guided by Karuk tribe data, SRRC Riparian assessment information, CDFW, or USFS data.	2a
SONCC-SalR.2.1.8.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-SalR.2.1.8.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-SalR.2.1.38	Floodplain and Channel Structure	Yes	Increase channel complexity	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Population wide	2b
SONCC-SalR.2.1.38.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-SalR.2.1.38.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-SalR.2.1.7	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	All streams where coho salmon would benefit immediately, guided by Karuk tribe data and SRRC Riparian assessment information.	2a
SONCC-SalR.2.1.7.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-SalR.2.1.7.2	*Place instream structures, guided by assessment results*					
SONCC-SalR.2.1.37	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Population wide	2b
SONCC-SalR.2.1.37.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-SalR.2.1.37.2	*Place instream structures, guided by assessment results*					
SONCC-SalR.2.2.25	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Remove, set back, or reconfigure historical mine tailings	In areas that would benefit coho immediately	2a
SONCC-SalR.2.2.25.1	*Assess feasibility of mine tailing manipulation that includes restoring the natural channel form and floodplain connectivity*					
SONCC-SalR.2.2.25.2	*Implement mine tailing restoration actions guided by feasibility assessment*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-SalR.7.1.2	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Reestablish natural fire regime	Basin-wide, guided by priorities in USFS WCF and SRCC WCPP	2b
SONCC-SalR.7.1.2.1	*Identify areas prone to high severity fire and develop a plan to reestablish a natural fire regime*					
SONCC-SalR.7.1.2.2	*Carry out fuel reduction or modification projects such as thinning, prescribed burning, and piling, guided by the plan*					
SONCC-SalR.26.1.33	Low Population Dynamics	No	Increase population abundance	Rescue and relocate stranded juveniles	Population wide	2b
SONCC-SalR.26.1.33.1	*Survey coho-bearing tributaries and relocate juveniles stranded in drying pools*					
SONCC-SalR.3.1.4	Hydrology	No	Improve flow timing or volume	Increase instream flows	All streams where coho salmon would benefit immediately, guided by NCRWQCB 2005 TMDL Implementation Plan	2c
SONCC-SalR.3.1.4.1	*Assess basin wide water diversion projects and prioritize areas in need of increased flows. Develop a plan to obtain adequate flows for riparian resources*					
SONCC-SalR.3.1.4.2	*Reduce diversions, guided by the plan*					
SONCC-SalR.3.1.4.3	*Assess potential for vegetation management projects to improve flow timing or volume*					
SONCC-SalR.3.1.39	Hydrology	No	Improve flow timing or volume	Increase instream flows	Population wide	2d
SONCC-SalR.3.1.39.1	*Assess basin wide water diversion projects and prioritize areas in need of increased flows. Develop a plan to obtain adequate flows for riparian resources*					
SONCC-SalR.3.1.39.2	*Reduce diversions, guided by the plan*					
SONCC-SalR.3.1.39.3	*Assess potential for vegetation management projects to improve flow timing or volume*					
SONCC-SalR.10.3.5	Water Quality	No	Protect cold water	Protect existing or potential cold water refugia	All streams where coho salmon would benefit immediately	2c
SONCC-SalR.10.3.5.1	*Develop resource protection measures for mining, water drafting, fire suppression, and other actions to avoid adverse effects to water temperature in coho habitat*					
SONCC-SalR.10.3.5.2	*Develop educational materials for landowners to expand stewardship program*					
SONCC-SalR.10.3.5.3	*Develop an emergency action plan and implement measures to protect thermal refugia during excessively long warm or dry periods*					
SONCC-SalR.10.3.35	Water Quality	No	Protect cold water	Protect existing or potential cold water refugia	Population wide	2d
SONCC-SalR.10.3.35.1	*Develop resource protection measures for mining, water drafting, fire suppression, and other actions to avoid adverse effects to water temperature in coho habitat*					
SONCC-SalR.10.3.35.2	*Develop educational materials for landowners to expand stewardship program*					
SONCC-SalR.10.3.35.3	*Develop an emergency action plan and implement measures to protect thermal refugia during excessively long warm or dry periods*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-SalR.10.2.6	Water Quality	No	Reduce pollutants	Reduce point- and non-point source pollution	All streams where coho salmon would benefit immediately, using WCF and road inventory data to update Salmon River SRR strategy	2c
SONCC-SalR.10.2.6.1	*Implement the Salmon River TMDL Implementation Plan for temperature*					
SONCC-SalR.10.2.6.2	*Identify, inventory and develop mitigation plan for discharge and polluted sites (e.g., nutrients, algae, metals, coliform) that are not road related*					
SONCC-SalR.10.2.6.3	*Implement mitigation plan for discharge and polluted sites*					
SONCC-SalR.10.2.34	Water Quality	No	Reduce pollutants	Reduce point- and non-point source pollution	Population wide	2d
SONCC-SalR.10.2.34.1	*Implement the Salmon River TMDL Implementation Plan for temperature*					
SONCC-SalR.10.2.34.2	*Identify, inventory and develop mitigation plan for discharge and polluted sites (e.g., nutrients, algae, metals, coliform) that are not road related*					
SONCC-SalR.10.2.34.3	*Implement mitigation plan for discharge and polluted sites*					
SONCC-SalR.5.1.10	Passage	No	Improve access	Remove barrier	Lower reaches of tributaries (e.g., Nordheimer Creek) and all streams where coho salmon would benefit immediately	3a
SONCC-SalR.5.1.10.1	*Restore and maintain habitat connectivity between the Salmon River and tributaries where low flow or sediment aggradation has been known to restrict coho salmon passage*					
SONCC-SalR.5.1.40	Passage	No	Improve access	Remove barrier	Population wide	3b
SONCC-SalR.5.1.40.1	*Restore and maintain habitat connectivity between the Salmon River and tributaries where low flow or sediment aggradation has been known to restrict coho salmon passage*					
SONCC-SalR.5.1.43	Passage	No	Improve access	Remove barrier	Nordheimer Creek	3a
SONCC-SalR.5.1.43.1	*Determine whether to maintain or decommission the Nordheimer Creek fish ladder*					
SONCC-SalR.5.1.9	Passage	No	Improve access	Restore access to overwinter areas	All streams where coho salmon would benefit immediately, guided by 5 Counties data and SRRC Riparian Assessment information; including Hotelling Gulch, Little Cronan Gulch	3a
SONCC-SalR.5.1.9.1	*Identify and prioritize removal of remaining high priority barriers that prevent access to side channels and over wintering areas, and allow passage of all coho life stages*					
SONCC-SalR.5.1.9.2	*Remove or modify high priority barriers to allow passage of coho salmon at all life stages*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-SalR.5.1.41	Passage	No	Improve access	Restore access to overwinter areas	Population wide	3b
SONCC-SalR.5.1.41.1	*Identify and prioritize removal of remaining high priority barriers that prevent access to side channels and over wintering areas, and allow passage of all coho life stages*					
SONCC-SalR.5.1.41.2	*Remove or modify high priority barriers to allow passage of coho salmon at all life stages*					
SONCC-SalR.7.1.1	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	High IP sub watersheds, guided by SRRC Riparian Assessment information	3b
SONCC-SalR.7.1.1.1	*Develop an appropriate timber harvest management plan for benefits to coho salmon habitat*					
SONCC-SalR.7.1.1.2	*Thin, or release conifers, guided by the plan*					
SONCC-SalR.7.1.1.3	*Plant conifers, guided by the plan*					
SONCC-SalR.7.1.1.4	*Control non-native/invasive species in prioritized areas*					
SONCC-SalR.8.1.26	Sediment	No	Reduce delivery of sediment to streams	Minimize mass wasting	In areas that would benefit coho immediately	3b
SONCC-SalR.8.1.26.1	*Assess and map mass wasting hazard, prioritize treatment of sites most susceptible to mass wasting, and determine appropriate actions to deter mass wasting*					
SONCC-SalR.8.1.26.2	*Implement plan to stabilize slopes and revegetate areas*					
SONCC-SalR.8.1.3	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	Areas identified in USFS WCF and SRCC WCPP, all streams where coho salmon would benefit immediately	3c
SONCC-SalR.8.1.3.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-SalR.8.1.3.2	*Decommission roads, guided by assessment*					
SONCC-SalR.8.1.3.3	*Upgrade roads, guided by assessment*					
SONCC-SalR.8.1.3.4	*Maintain roads, guided by assessment*					
SONCC-SalR.8.1.42	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	Population wide	3d
SONCC-SalR.8.1.42.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-SalR.8.1.42.2	*Decommission roads, guided by assessment*					
SONCC-SalR.8.1.42.3	*Upgrade roads, guided by assessment*					
SONCC-SalR.8.1.42.4	*Maintain roads, guided by assessment*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-SalR.10.7.32	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	All streams where coho salmon would benefit immediately	3c
SONCC-SalR.10.7.32.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-SalR.10.7.32.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-SalR.10.7.36	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	Population wide	3d
SONCC-SalR.10.7.36.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-SalR.10.7.36.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-SalR.1.2.20	Estuary	No	Improve estuarine habitat	Improve estuary condition	Klamath River Estuary	3d
SONCC-SalR.1.2.20.1	*Implement recovery actions for Lower Klamath River population that address the target "Estuary", including the creation/restoration of off-channel rearing habitat throughout the lower Klamath River*					
SONCC-SalR.16.1.11	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating salmonid fishery management plans affecting SONCC coho salmon	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-SalR.16.1.11.1	*Determine impacts of fisheries management on SONCC coho salmon in terms of VSP parameters*					
SONCC-SalR.16.1.11.2	*Identify level of fishing impacts that does not limit attainment of population-specific viability criteria*					
SONCC-SalR.16.1.30	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating salmonid fishery management plans affecting SONCC coho salmon	Tribal lands	3d
SONCC-SalR.16.1.30.1	*Determine impacts of fisheries management on SONCC coho salmon in terms of VSP parameters*					
SONCC-SalR.16.1.30.2	*Identify level of fishing impacts that does not limit attainment of population-specific viability criteria*					
SONCC-SalR.16.1.12	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Reduce fishing impacts to levels that do not limit recovery	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-SalR.16.1.12.1	*Determine actual fishing impacts*					
SONCC-SalR.16.1.12.2	*If actual fishing impacts limit attainment of population-specific viability criteria, modify management so that fishing does not limit attainment of population-specific viability criteria*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-SalR.16.1.31	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Reduce fishing impacts to levels that do not limit recovery	Tribal lands	3d
SONCC-SalR.16.1.31.1	*Determine actual fishing impacts*					
SONCC-SalR.16.1.31.2	*If actual fishing impacts limit attainment of population-specific viability criteria, modify management so that fishing does not limit attainment of population-specific viability criteria*					
SONCC-SalR.16.2.13	Fishing/Collecting	No	Manage scientific collection consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating scientific collection authorizations affecting SONCC coho salmon	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-SalR.16.2.13.1	*Determine impacts of scientific collection on SONCC coho salmon in terms of VSP parameters*					
SONCC-SalR.16.2.13.2	*Identify level of scientific collection impact that does not limit attainment of population-specific viability criteria*					
SONCC-SalR.16.2.14	Fishing/Collecting	No	Manage scientific collection consistent with recovery of SONCC coho salmon	Reduce impacts of scientific collection to levels that do not limit recovery	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-SalR.16.2.14.1	*Determine actual impacts of scientific collection*					
SONCC-SalR.16.2.14.2	*If actual scientific collection impacts limit attainment of population-specific viability criteria, modify collection so that impacts do not limit attainment of population-specific viability criteria*					