13. Chetco River Population

Northern Coastal Stratum

Core, Functionally Independent Population

High Extinction Risk

Population likely below depensation threshold

4,500 Spawners Required for ESU Viability

356 mi^2 watershed (82% Federal ownership)

135 IP-km (84 IP-mi) (8% High)

Dominant Land Uses are 'Recreation' and 'Timber Harvest'

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

Key Limiting Threats are 'Channelization/Diking' and 'Urban/Residential/Industrial Development'

Highest Priority Recovery Actions

• Increase instream flows • Improve timber harvest practices by revising Oregon Forest Practices Act • Increase large woody debris (LWD), boulders, or other instream structure	• Restore tidally-influenced habitats • Increase riparian vegetation • Construct off-channel habitats, alcoves, backwater habitat, and old stream oxbows

13.1 History of Habitat and Land Use

Historically, the mouth of the Chetco River and the surrounding low lying bottom lands were dominated by salt water and fresh water marshes. The population area was forested with a diversity of habitat types which supported abundant life (U.S. Forest Service (USFS) 1996a). The lower Chetco River was the center of coho salmon productivity in this population (Maguire 2001f), coinciding with areas that have the highest intrinsic potential (IP >0.66) coho salmon habitat. Large floating wood jams changed location on lower Chetco River gravel bars, scouring holes as they moved. Beaver were also abundant in the lower portions of the river and estuary and likely contributed to habitat complexity (Maguire 2001f).

The discovery of gold in the interior Chetco River basin in the 1850s precipitated the first major alteration to fish habitat. Miners excavated river terraces, leaving a lasting footprint on some stream channels. Although some of this activity occurred upstream of the range of coho salmon, it released fine sediment that affected downstream reaches. Near the coast, timber harvest intensity increased. In the early 1900s, a railroad was constructed and timber was exported from the lower tributary, Jack Creek.

After World War II, timber harvest and road building on public and private lands increased and resulted in widespread disturbance. The 1964 flood delivered massive amounts of fine sediment that filled in deep pools, changed channel configuration, and eliminated much of the coho salmon habitat (Maguire 2001f). This loss was likely greatest in the mainstem, South Fork, Eagle Creek, and Panther Creek. Long-time fishermen of the Chetco River recounted that formerly deep pools were filled and the river bar was so aggraded that you could drive on it after the flood (Maguire 2001f). Timber harvest on U.S. Forest Service lands and private land continued through the 1970s and 1980s. Land management practices have resulted in the replacement of large streamside conifers with hardwoods in most of the population area (USFS 1996b; Maguire 2001f).

The estuary was altered by the construction of levees at the mouth in 1962 to improve navigation to the ocean (Figure 13-1). Long-time residents remember that before the levees were constructed, a sand bar formed in late summer which created a lagoon with connections to tributaries and wetlands (Maguire 2001f). Levee construction disconnected wetlands and streams that were vital coho salmon habitat, and also changed the salinity and other water quality parameters by altering the tidal exchange. The Corps of Engineers dredges the navigation channel routinely to keep the entrance open to the boat basin.

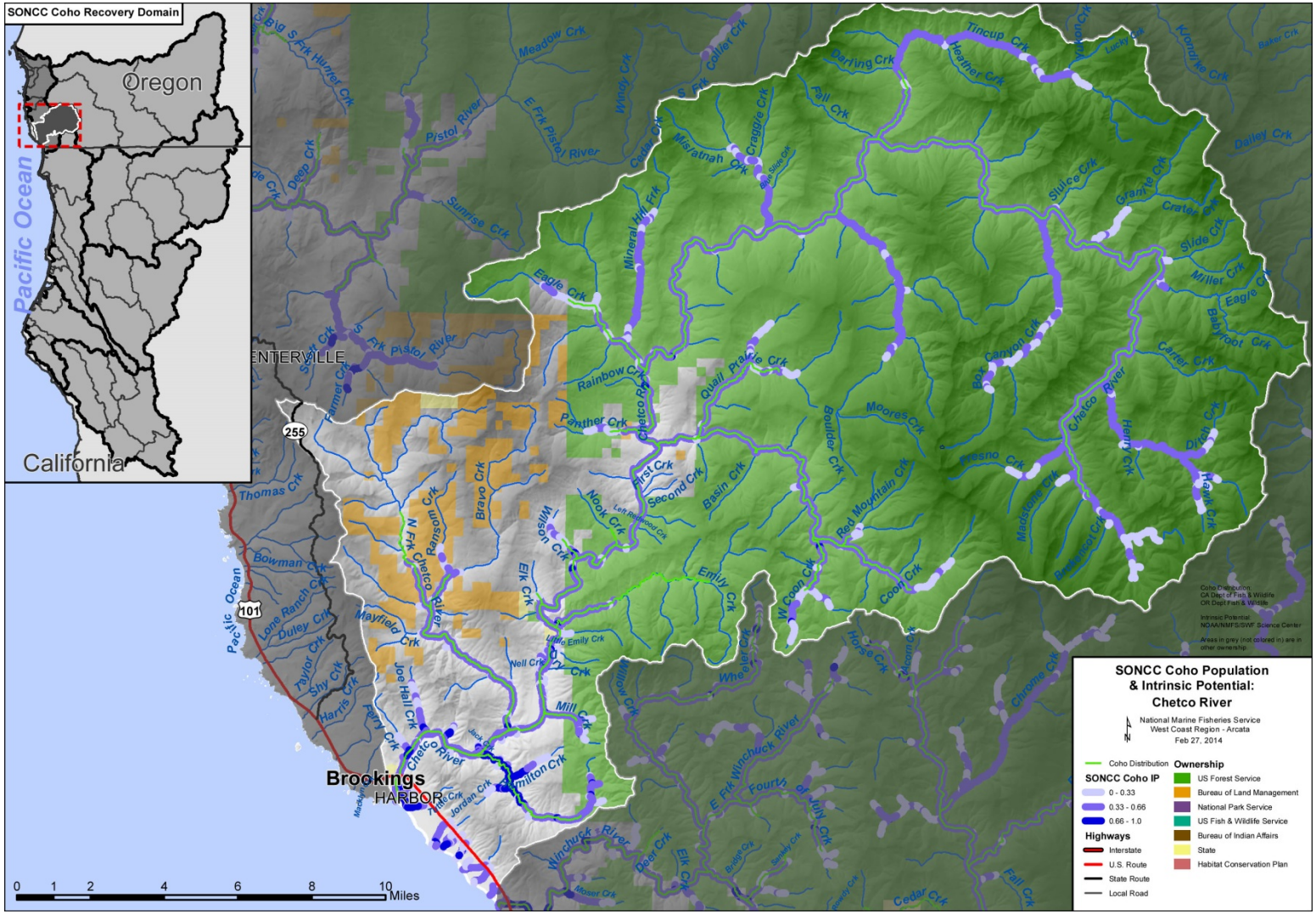

Figure 13-1. The geographic boundaries of the Chetco River coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (ODFW 2013a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Northern Coastal diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

13.2 Historic Fish Distribution and Abundance

The Chetco River coho salmon population is not well studied and there is little trend data, but local residents described coho salmon in the Chetco River estuary as formerly abundant and the target of a "net fishery" (Maguire 2001f). The lower tributaries were subject to extensive fishing pressure, with Tuttle Creek noted as having particularly large runs of coho salmon (Maguire 2001f).

The Oregon Department of Fish and Wildlife (ODFW) believe that the "abundance of coho salmon has been reduced due to modification of low gradient streams" (Maguire 2001f). The lower mainstem Chetco, North Fork Chetco, and Jack Creek are modeled as the most potentially suitable reaches for juvenile rearing (IP > 0.66) in the entire basin (Williams et al. 2006). Small patches of high IP also occur at the mouths of lower and middle Chetco River tributaries and in upstream areas of the South Fork and its tributary, Coon Creek. Moderate IP reaches occur in many upper tributaries. Table 13-1 lists tributaries with high IP (>0.66) reaches.

Table 13-1. Tributaries with high IP reaches (IP > 0.66). (Williams et al. 2006).

Stream Name	Stream Name	Stream Name
Chetco Estuary	Jack Creek	North Fork Chetco
Emily Creek	Joe Hill Creek	SF Chetco/Coon Creek
Hamilton Creek (tributary of Jack Creek)	Lower Chetco River	Tuttle Creek
Jordan Creek (tributary of Jack Creek)	Mill Creek	Wilson Creek

13.3 Status of Chetco River Coho Salmon

Spatial Structure and Diversity

Coho salmon occur in many parts of the Chetco River population area and juvenile coho salmon have been found in the upper mainstem reaches in the Kalmiopsis Wilderness (ODFW 2005a). Coho salmon are present in several tributaries throughout the population area including tributaries in the upper-most portions of the watershed (USFS 1996b). Coho salmon are present in the majority of the IP habitat identified by Williams et al. 2006.

Although the genetic structure of the population has not been studied, it is likely that diversity has been diminished as the population has declined, consistent with the known dynamics of small populations (Chapter 2). The ODFW Expert Panel expressed concern that out-of-basin hatchery-produced coho salmon may stray into the Chetco River and affect the genetic integrity of the wild population (ODFW 2008b). However, hatchery effects were not considered a stress or threat to this population given the small number of strays thought to affect the Chetco River.

Population Size and Productivity

The USFS (1996b) characterized the Chetco River coho salmon population as historically "a fair sized run," but currently relatively scarce. The population has diminished greatly from the historic levels described in Maguire (2001f). The Expert Panel stated that the Chetco River coho population has a very low abundance and is verging on extirpation (ODFW 2008b). Population estimates for 1998 to 2012 for the Chetco River are shown in Figure 13-2.

The range of estimates is from zero to 665 adults. Years with no observed returns are 1998, 1999, 2002, 2003, 2005, 2009, and 2012 (ODFW 2009a, Confer 2013). It is problematic to draw definitive conclusions from these data because the locations of sampling and water conditions at time of sampling are unknown. Some of these data come from Chinook salmon spawning surveys were coho salmon were also observed, but they did not target coho salmon. Their utility is lowered by the fact that coho salmon spawning may not occur in the same places or at the same times as Chinook salmon.

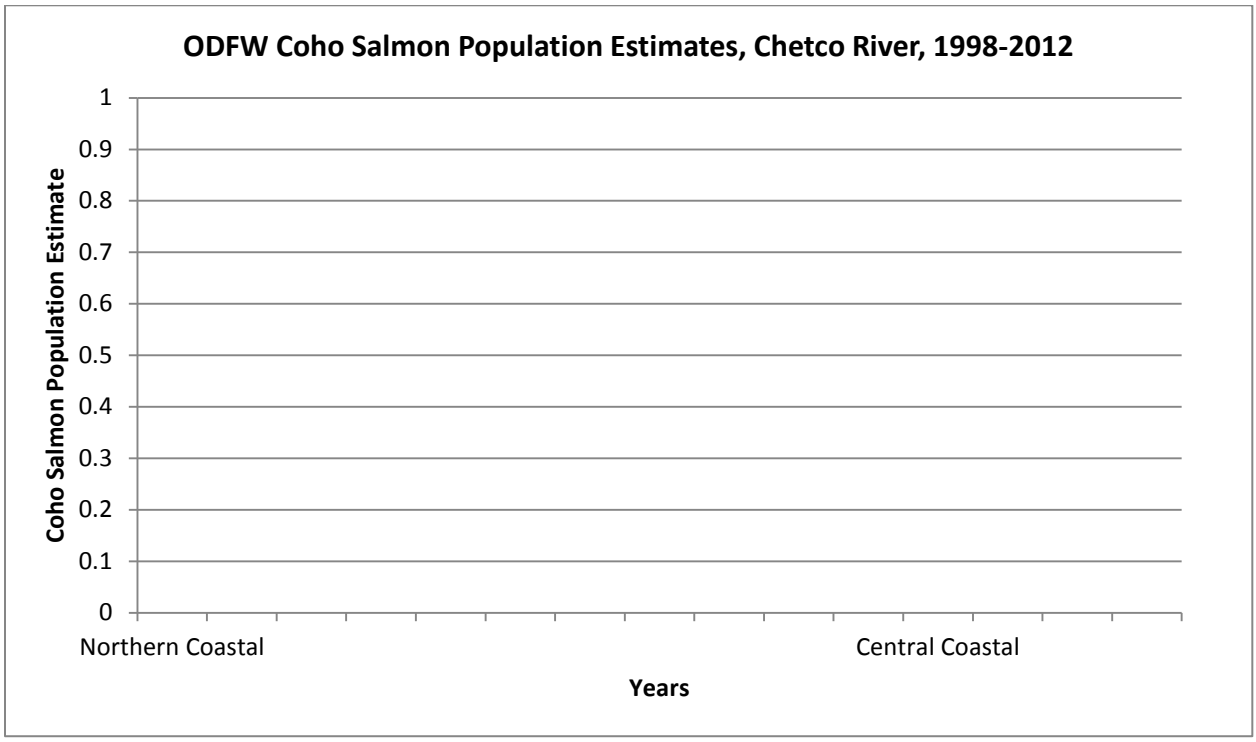

Figure 13-2. Chetco River basin-wide adult coho salmon return estimates. The data are for the years 1998 to 2012 (Confer 2013).

The more robust returns in 2001, 2004 and 2007 suggest that one year class is stronger than the other two. Unfortunately it collapsed in 2010. The lack of returns in 2003, after 307 coho spawned in the Chetco River in 2000, suggests that successful recruitment of juveniles to the adult life stage was problematic. The overall population productivity for Chetco River coho salmon appears to be very low.

Little information is available for juvenile SONCC coho salmon in the Chetco River, as well. Juveniles were found at only two locations and at very low densities within the basin during

snorkeling surveys conducted in 2003 and 2004 (Jepsen and Rodgers 2004, Jepsen 2006). In a trapping operation on Jack Creek between March 9 and May 10, 2007, ODFW captured 69 out-migrant coho salmon smolts (Confer, 2007). Operation of this trap between March 13 and May 16, 2008 caught 163 coho salmon smolts (Mazur 2010). The trap did not provide enough data for ODFW to make estimates of the total outmigration for either year, but it is likely four to five times the number caught. In addition, low water levels stopped the trap in mid-May while the coho salmon smolt outmigration likely lasts to mid-June.

Extinction Risk

The Chetco River population is at high risk of extinction because the estimated average spawner abundance has been less than the depensation threshold in the three consecutive years of lowest abundance within the last twelve years (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 are related to 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 Chetco River population is a core, Functionally Independent population within the Northern Coastal diversity stratum; historically having had a high likelihood of persisting in isolation over 100-year time scales, and with population dynamics or extinction risk over a 100—year time period that are not substantially altered by exchanges of individuals with other populations (Williams et al. 2006). To contribute to stratum and ESU viability, the Elk River core population should have at least 2,400 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. Besides its role in achieving demographic goals and objectives for recovery, as a core population the Chetco River may serve as a source of spawner strays for nearby coastal populations. At present, the capacity of the Chetco River coho salmon population to provide recruits to adjacent independent populations is limited due to its low spawner abundance. Conversely, recruits straying from nearby rivers may enhance recovery of the Chetco River population.

13.4 Plans and Assessments

State of Oregon

http://www.Oregon.gov

Expert Panel on Limiting Factors for Oregon's SONCC coho salmon populations

ODFW (2008b) convened a panel of fisheries and watershed scientists as an initial step in their development of a recovery plan for Oregon's SONCC coho salmon populations. Deliberations of the expert panel provided ODFW with initial, strategic guidance on limiting factors and threats to recovery. Based on the input of panel members, ODFW (2008b) summarized the concerns for the Chetco River population as follows:

Key concerns in the Chetco River were primarily loss of over-winter tributary and freshwater estuarine habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally very limited in this system and have been impacted by past and current urban, rural residential, and forestry development and practices. Secondary concerns were related to a loss of large wood and habitat complexity, high water temperatures in tributaries for summer parr (excluding the mainstem, where rearing is not expected), reduced estuarine habitat for smolts, and a very low spawner abundance susceptible to genetic impacts by out-of-basin hatchery fish.

Oregon Plan for Salmon and Watersheds

The State of Oregon developed a conservation and recovery strategy for coho salmon in the SONCC and Oregon Coast ESUs (State of Oregon 1997). The Oregon Plan for coho salmon is a comprehensive plan that includes voluntary actions for all of the threats currently facing coho in these ESUs and involves all relevant state agencies. Reforms to fishery harvest and hatchery programs were implemented by ODFW in the late 1990s. Many habitat restoration projects have occurred across the landscape in headwater habitat, lowlands, and the estuary. The action plans, implementation, and annual reports can be found at http://www.oregon.gov/OPSW/.

Southwest Oregon Salmon Restoration Initiative

The Southwest Oregon Salmon Restoration Initiative (Prevost et al. 1997) was created to help fulfill a memorandum of understanding between ODFW and the National Marine Fisheries Service (NMFS) to recover coho salmon. The initiative provides the framework for recovery in southwest Oregon and helped foster formation of watershed councils. Although the Chetco River has 72.8 miles of "high value" coho salmon habitat, there are no reaches or tributaries designated as "core areas" that are the highest priority for restoration in the SONCC coho salmon ESU.

Oregon Coastal Management Program (OCMP)

The OCMP has identified several areas of the Chetco River (mainstem Chetco River from Box Canyon Creek to estuary, North Fork Chetco River, and Bravo Creek) as impaired water bodies under Clean Water Act Section 303(d) as a result of excessively high river temperatures. Due to this listing, a total maximum daily load (TMDL) must be prepared for these areas, in accordance with 40 CFR 130.6. The Oregon Department of Water Quality has initiated a TMDL for the Chetco River basin. The TMDL is in the initial scoping and data collection phase.

Cumulative Effects of Southwest Oregon Coastal Land Use on Salmon Habitat

Oregon State University (OSU) Oak Creek Labs conducted a study funded by ODFW and the Oregon Department of Forestry (ODF) to determine relationships between forest harvest and Pacific salmon productivity (Frissell 1992). The study assessed basins along the Oregon coast extending from the Sixes River to the southern border during the period from 1986 to 1992 with the most extensive research conducted in Euchre Creek to the south of the Elk River.

South Coast Watersheds Council

http://oregonwatersheds.org/

Chetco River Watershed Assessment

The Chetco River Watershed Assessment (CRWA) (Maguire 2001f) identified reduced juvenile summer and over-wintering habitat as the greatest limiting factor for coho salmon, and linked degraded habitat conditions to sedimentation of channels, reduction of large wood jams, diking and draining of wetlands, and riparian removal on the lower mainstem Chetco River and its tributaries. The report offered solutions such as the potential for reducing increased peak flows, reducing estuary eutrophication, and increasing water supply.

Chetco River Action Plan

The Chetco River Action Plan was written to address issues raised in the CRWA. Its intent is to define specific priority actions for restoration. Recommendations include educating residents regarding the need for riparian and water quality protection and water conservation. Recommended actions include increasing conifers in riparian zones, reconnecting wetlands in the lower Chetco River and estuary, and decreasing erosion potential related to roads. The document concludes Jack Creek and the North Fork Chetco have the greatest coho salmon restoration potential.

13.5 Stresses

Table 13-2. Severity of stresses affecting each life stage of coho salmon in the Chetco River. Stress rank categories, assessment methods, and data used to assess stresses are described in Appendix B.

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

[1]Key limiting stresses and limited life stage.
[2]Increased Disease/Predation/Competition is not considered a threat to this population.

Key Limiting Stresses, Life Stages, and Habitat

The juvenile life stage is most limited and quality winter rearing habitat, as well as summer rearing habitat, is lacking for the population. Juvenile summer rearing habitat is impaired by high water temperatures resulting from degraded riparian conditions and water withdrawals. Winter rearing habitat is severely lacking because of channel simplification, disconnection from the floodplain, degraded riparian conditions, poor large wood availability, and an estuary which has been altered and reduced in size due to development, channelization, and diking. Large wood has been removed and is not naturally replacing at the rates required to maintain key components of habitat complexity. Overall, these findings are consistent with those of the Oregon Expert Panel (ODFW 2008b) (Section 13.4).

Degraded Riparian Forest Conditions

Degraded riparian forest condition is the most significant stress affecting coho viability in the Chetco River basin. Old growth conifers historically lined the banks of the lower mainstem Chetco River and tributaries in most of the population area. These trees helped create high quality coho salmon rearing habitat by maintaining stable banks, creating undercuts beneath roots, contributing large wood to the channel, and providing shade to maintain cool stream temperature. Canopy within the North Fork watershed is currently dominated by hardwood species. ODFW riparian surveys indicate poor riparian conditions on the North Fork Chetco with fewer than 75 conifers larger than 36 inches in diameter per thousand feet of stream length. The CRWA (USFS 1996b) used remote sensing to gauge the size of trees within 200 feet of streams and found few large conifers along reaches on USFS lands. The Oregon Department of Agriculture (2008) documented sudden oak death syndrome in the riparian zones of the North Fork Chetco River and Joe Hall Creek.

Lack of Floodplain and Channel Structure

The lower Chetco River channel has been disconnected from its estuary, floodplain, wetlands, and smaller tributaries. Tributary channels and floodplains have been simplified. Higher peak flows have increased bank erosion, caused loss of large woody structure, and scoured channels in many upper tributaries in the Chetco population area (USFS 1996b). Large wood surveys from ODFW and the USFS confirm very low levels in the North Fork, upper South Fork, Boulder Creek, and Mislatnah Creek. Historically, large floating wood jams changed location on lower Chetco River gravel bars, scouring holes as they moved (Maguire 2001f). Beaver were also abundant in the lower-river and estuary and likely contributed to habitat complexity and overwintering habitat (Maguire 2001f). Today, the Chetco River is very responsive to rain events and contributes to the displacement of juvenile coho salmon. During winter storms, discharge of the Chetco River routinely increases from less than 1,000 cfs to over 20,000 cfs within 24 hours.

Stream channels in the Chetco River tend to be wide and shallow, and pools lack both depth and complexity (Massingill 2001f). Good quality spawning gravel is present, but quantity is limited. Only large mainstem reaches have pools deeper than 3 feet. An insufficient abundance of deep pools in most lower and middle Chetco River channels limits juvenile rearing potential. For example, the South Fork Chetco River, including Coons Creek, have coho salmon present and are showing a cooling trend, but lack deep pools and large wood.

Impaired Estuary/Mainstem Function

The Chetco River estuary was historically small, and much of what once was estuarine rearing habitat no longer serves this function for coho salmon (Massingill 2001f). There is little to no remaining estuarine rearing habitat or refugia for smolts or adults. Upstream of the mouth, steep terrain adjacent to the mainstem limits the availability of tidal estuarine habitat. Formerly productive Tuttle Creek is disconnected as it now flows through several hundred feet of culverts underneath an RV Park. Reduced freshwater flows into the estuary contribute to and exacerbate stagnation and water quality problems. Lack of juvenile rearing habitat and impaired water quality in the estuary constitute an overall high stress for coho salmon.

Impaired Water Quality

Temperature is the most widespread water quality impairment in Chetco River. The river temperature exceeds ODEQ (2002a) standards coming out of the Kalmiopsis Wilderness because of sparse vegetation and riparian conditions resulting from granitic soil (Maguire 2001f). Historically, it was cooled by tributaries flowing from forested watersheds in the middle and lower basin. Most tributaries and the lower mainstem Chetco River have warmed considerably in modern times and do not meet the ODEQ (2002a) temperature criterion of MWMT 64 °F. Tributaries no longer provide a significant buffer to mainstem temperatures and their function as cold water refugia for downstream migrating coho salmon juveniles and other salmonids is now impaired. Although tributaries still provide cool water refugia, the quantity and quality of the cold water refugia has decreased over time while temperatures gradually warm. Temperature data confirm that reaches of the mainstem are acutely stressful or lethal to salmonids (Figure 13-3), indicating that cooler water inputs from tributaries has become even more important over time. The water temperature in stream channels on U.S. Forest Service (USFS) lands has been improving. Emily Creek and the South Fork Chetco River have been gradually approaching suitable water temperatures for coho salmon (USFS 1996b). The middle North Fork Chetco River and its tributary Bosley Creek, on BLM lands, are currently suitable for coho salmon, but Bravo Creek and the lower North Fork reaches on private timberlands are too warm. There are also problems with high total phosphates, and occasional high pH, in the lower Chetco River (Maguire 2001f). Water quality in the estuary is poor due to low dissolved oxygen in the summer (Maguire 2001f).

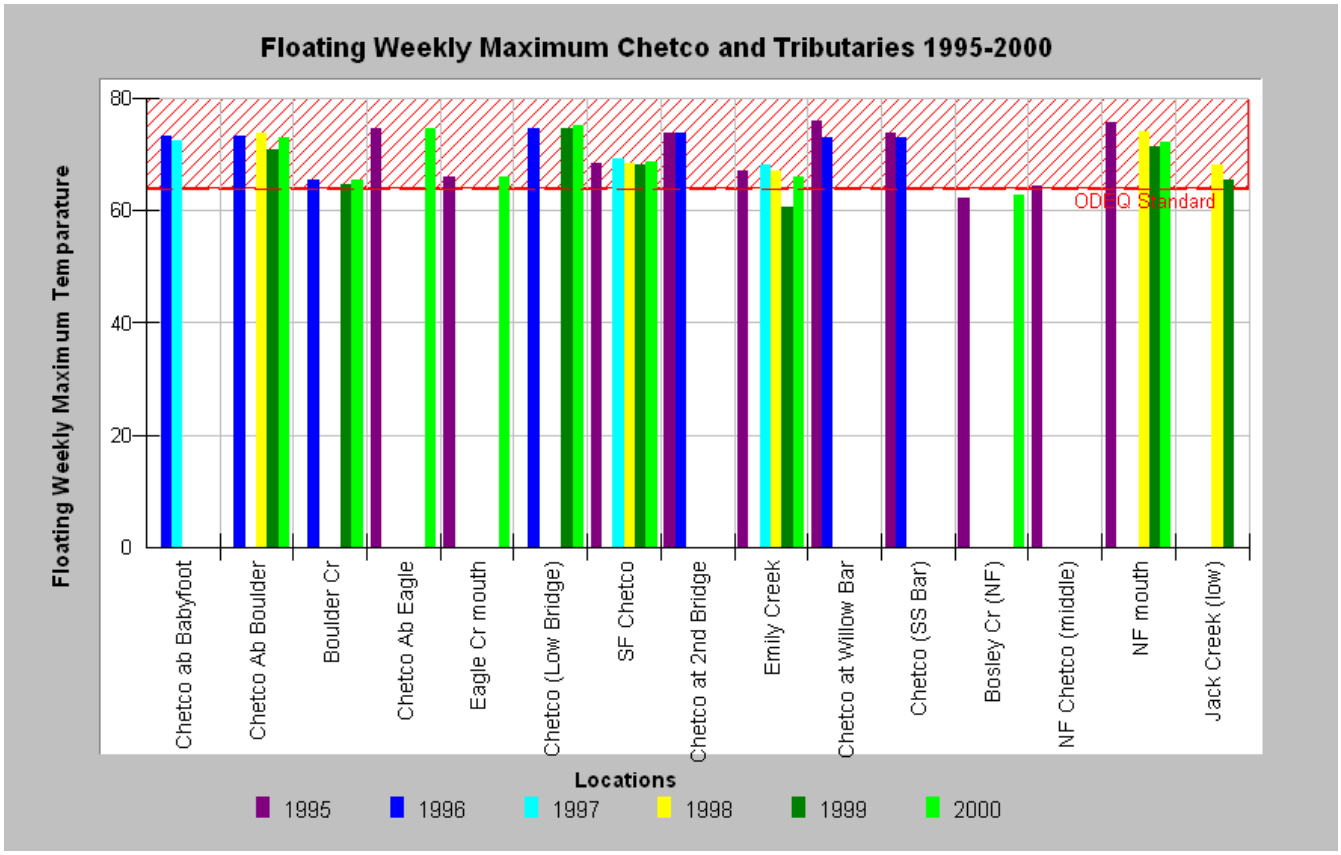

Figure 13-3. Maximum floating weekly maximum temperatures (MWMT). These data show that from 1995 to 2000, water temperature exceeded the 64 °F standard at most locations (Maguire 2001f).

Altered Hydrologic Function

In late summer and early fall, water withdrawals that reduce flow in the lower Chetco River and tributaries are of concern. The lower Chetco River, North Fork Chetco, middle mainstem Chetco, and Jack Creek are over-allocated during low flow months (Massingill 2001f). In 1964, the State of Oregon Water Rights Division established a minimum flow requirement of 80 cfs for the Chetco River. Total allocated water rights for out of stream use are 59 cfs (Maguire 2001f). Minimum flow levels were not met in 11 of the 25 years from 1970 to 1994, and the number of days per year below this level ranged from two to 77 days (USFS 1996b). These reduced flows disrupt juvenile rearing habitat as well as migration of smolts. Base flows may also decrease in the first ten years following clear cutting because of the increase in water use by young trees growing in dense stands (Murphy 1995) and the lack of water holding capability of the soil. Disconnection of the floodplain and channel disrupts exchange of surface water and groundwater that helps maintain cool water temperatures needed for juvenile rearing of coho salmon (Chapter 3).

Two areas have been identified by ODFW as Streamflow Restoration Priority Areas: Jack Creek and the Chetco River mainstem above the North Fork. These areas were determined to have both “need” (due to their fish resources) and “optimism” (availability of water resources) (Maguire 2001f).

Altered Sediment Supply

Altered sediment supply poses an overall medium stress to coho salmon in the Chetco River. Sediment contribution from landslides and erosion occurs naturally in the Chetco River basin; however, roads, timber harvest, and bank erosion following removal of riparian vegetation have elevated fine sediment input. Excess fine sediment directly impacts coho salmon egg viability and can reduce food for fry, juveniles and smolts. Poor pool frequency and depth throughout the Chetco River basin (Massingill 2001f) are likely due to elevated levels of fine sediment partially filling pools, a lack of scour-forcing obstructions such as large wood, and in some reaches diminished scour due to channel widening. Overall, coarse sediment supply in the Chetco River basin has declined since the 1970s (Wallick et al. 2009) due to improved management practices on public lands in the upper basin.

Barriers

One tributary, Ferry Creek, lies in a culvert for several hundred feet just upstream of its confluence which is likely a complete barrier. Road-stream crossings in the Lower, Middle and North Fork watersheds and their tributaries that could be barriers to coho salmon or other adult and juvenile salmonids have been inventoried and necessary restoration actions are planned (Maguire 2001f), although progress is unknown. Tuttle Creek, once a highly productive coho salmon tributary to the estuary has been redirected underground through culverts with an RV park directly over. The partial barrier at the mouth of Joe Hall Creek has recently been removed by the Oregon Department of Transportation.

Adverse Hatchery-Related Effects

There are no operating hatcheries in the Chetco River population area. The ODFW Expert Panel expressed concern that out-of-basin hatchery-produced coho salmon may stray into the Chetco River and affect the genetic integrity of the wild population (ODFW 2008b). Juvenile coho salmon are likely exposed to increased competition from the stocking of significant numbers of Chinook salmon. Hatchery-origin coho salmon may stray into the Chetco River; however, the proportion of adults that are of hatchery origin is likely less than five percent and there is no hatchery in the basin producing other species of salmonids. Therefore, adverse hatchery-related effects pose a low risk to all life stages (Appendix B).

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 low stress to juveniles, smolts, and adults.

13.6 Threats

Table 13-3. Severity of threats affecting each life stage of coho salmon in the Chetco River. Threat rank categories, assessment methods, and data used to assess threats are described in Appendix B.

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

[1]Key limiting threats and limited life stage

Key Limiting Threats

The two key limiting threats, those which most affect recovery of the population by influencing stresses, are urban/residential/industrial development and channelization/diking.

Urban/Residential/Industrial Development

The number of rural landowners in the Chetco River basin has increased considerably since 1950. For example, in 1950 there were less than ten adjoining property owners near the mouth of the North Fork, and in 2001 there were 92 (Massingill 2001f). The highest intrinsic potential coho habitat is centered in the lower basin where most land is privately owned and land management is often intensive. Human population growth is concentrated around Brookings Harbor at the mouth of the Chetco River and upstream to USFS ownership at the mouth of the South Fork Chetco River. As rural populations grow, so does the demand for water, the risks of

increases in peak flow, increases in sediment inputs, riparian vegetation removal, increased bank protection and water contamination. Currently, municipal uses account for most of the water withdrawals from the Chetco River and its tributaries (Massingill 2001f).

Development continues to occur adjacent to the estuary, and fill material has reduced the size and function of the estuary. Marina development and other commercial activities in and near the estuary combine with urbanization to create a high amount of impervious area that can contribute to non-point source pollution. Paved roads, parking lots, rooftops, or other surfaces that do not absorb rainfall tend to send much more water to streams, elevating peak flows and contributing pollution to streams (Booth and Jackson 1997). Leakage or percolation from rural residential septic systems is a potential source of nutrient pollution and increases the severity of summer algal blooms in the estuary.

Channelization/Diking

Nearly all of the tidal wetlands in the Chetco River have been channelized or diked and are no longer available to coho salmon. Development along the south side of the river likely eliminated limited tidal wetlands that provided off-channel habitat for coho salmon rearing and holding. Two marinas and a large jetty have been built in the estuary and most of the floodplain is developed. Many reaches of the lower Chetco River mainstem, its tributaries, and the estuary have high intrinsic potential coho salmon habitat (Williams et al. 2006); however, this portion of the river has been disconnected from the floodplain. The estuary was partially filled when levees were constructed to improve navigability into the ocean. The mouth of the river and the mainstem upstream are now channelized and diked. Tuttle Creek, which was formerly productive for coho salmon (Maguire 2001f) has been straightened, confined, and buried inside several hundred feet of culverts. The Chetco River channel above the North Fork has been confined in order to expand pastures for grazing. Streams are also forced into narrow channels due to confinement by roads throughout the population area (USFS 1996b). This leads to reduced floodplain connectivity and function, increased current velocity, and makes reaches less suitable for coho rearing.

Roads

The highest road densities in the middle, lower, and North Fork Chetco River are on private lands. Maguire (2001f) used road crossing density to evaluate the risk of sediment impacts and found the highest density of road crossings in the Chetco coastal area and middle Chetco mainstem. There was a moderately high risk due to density of road crossings in Jack Creek, and the lower and upper Chetco mainstem. The North Fork and Eagle Creek both received moderate risk ratings. On USFS land, streams with the highest road densities are Mill, Emily, Eagle, Panther, West Coon and Quail Prairie creeks, South Fork Chetco River, and the south side of the Chetco River below Long Ridge (USFS 1996b). The Chetco River is naturally very responsive to rain events and roads contribute to even greater peak flows by quickly routing water through roadside ditches. The lower Chetco River near the coast and middle mainstem is at the highest risk of damaging peak flows due to roads (Massingill 2001f). There is a moderate risk for elevated peak flows in Jack Creek, the lower mainstem Chetco, and the North Fork Chetco.

Timber Harvest

Timber harvest in the Chetco River basin poses a high threat to coho salmon due to the overlap with high IP coho salmon habitat. Only about 12% of the population area is private industrial forest, but it is focused in the most valuable coho habitat. The effects of short rotation, high intensity forestry is disproportionate to the small percentage of the land base it occupies. Landscape-scale imagery available from Google Earth shows widespread timber harvest and extensive road networks on private timber land in the western portion of the population area. More than 50 percent of the area in many small drainages along the Chetco River from Eagle Creek to the mouth has been harvested (USFS 1996b). Other parts of the population area have also experienced intense timber harvest, such as Basin Creek which has had 60 percent of its area harvested recently. These levels of timber harvest have been found to disrupt channels and diminish Pacific salmon species diversity in other Oregon coastal basins (Reeves et al. 1993).

Mining/Gravel Extraction

In July 2013, the US Department of Interior approved a 5-year administrative withdrawal of mineral rights in 17 miles of Chetco River mainstem. The near term threat of mining has been reduced, but will return after 2018. Furthermore, most of the suction dredge activity within the Chetco watershed is occurring on tributaries such as Quail Prairie Creek, Nook Creek, and Mislatnah Creek. Gold mining claims remain in the upper Chetco River basin (Zaitz 2010), which cover several miles of stream. Mining activity could potentially increase, including use of larger dredges and heavy equipment (Zaitz 2010).

The largest active gravel mining site is in the lower Chetco River near the mouth of Jack Creek, where the river is low gradient and the valley is unconfined. In the future, this operation may work outside of Corps jurisdiction, in which case would not receive Corps or NMFS review. In-stream gravel mining is expected to continue into the future with permit applications for at least two sites.

Agricultural Practices

Grazing is the principal agricultural activity in the Chetco River basin. The conversion of land to agricultural production has led to the confinement of the lower Chetco River channel and lower portions of the North Fork Chetco River and Jack Creek creating a disconnection from the historic floodplain. The levees, dikes, and general encroachment of pasture and agricultural lands onto the floodplain have greatly reduced off channel rearing habitat availability.

Dams/Diversions

One major tributary to the estuary, Ferry Creek, is dammed just upstream of its confluence. There are no other known diversions that block fish passage. Dams and diversions lead to an overall loss of water from the stream by diverting water for agricultural or municipal use. The lower Chetco River, North Fork Chetco, middle mainstem Chetco, and Jack Creek are over-allocated during low flow months (Massingill 2001f). In 1964, the State of Oregon Water Rights Division established a minimum flow requirement of 80 cfs for the Chetco River. Minimum flow levels were not met in 11 of the 25 years from 1970 to 1994, and the number of days per year below this level ranged from two to 77 days (USFS 1996). Currently, municipal uses

account for most of the water withdrawals from the Chetco River and its tributaries (Massingill 2001f).

High Severity Fire

Extensive portions of the Chetco River population area burned in the 23,500 acre Silver Fire of 1987. The Biscuit Fire of 2002 burned most of the upper Chetco River, including most of the Kalmiopsis Wilderness area (Azuma et al. 2004). However, 63 percent of the area burned in the Biscuit Fire was at low to very low intensity. In the North Fork Chetco, sudden oak death syndrome is killing tan oak and bay laurel trees (ODA 2008), which can elevate fire risk because dead trees are more flammable.

Climate Change

Climate change in this region will have the greatest impact on juveniles, smolts, and adults. Although the current climate is generally cool, modeled regional average temperature predicts a moderate increase over the next 50 years. Average temperature could increase by up to 1.5^{o} C in the summer and by 1° C in the winter. Annual precipitation in this area is predicted to stay within the natural range of current variability; however seasonal patterns in precipitation will likely occur (Mote and Salathe 2010). Overall, the range and degree of variability in temperature and precipitation are likely to increase. The vulnerability of the estuary and coast to sea level rise is moderate to high in this coastal population. Rising sea level may impact the quality and extent of wetland rearing habitat.

Road-Stream Crossing Barriers

There are nine remaining barriers which have been identified as problematic for fish passage. High road densities, especially on private lands, indicate the likelihood of other barriers yet to be identified. These private lands overlap most of the high IP coho salmon habitat.

Hatcheries

Hatcheries pose a low threat to all life stages of coho salmon in the Chetco River population area. The rationale for these ratings is described under the “Adverse Hatchery-Related Effects” stress.

Invasive Non-Native/Alien Species

Sudden oak death (SOD) is a non-native pathogen which affects almost all native plants, trees, and shrubs. SOD infections often result in mortalities to some species of oaks and bay laurels. There are known outbreaks of SOD in Curry County and the Chetco River. SOD infestation in Oregon is focused in the North Fork Chetco River and is quickly spreading. The quarantine area is now 264 square miles. SOD infections, and the control efforts to limit outbreaks, result in effects to riparian function by removing trees from riparian areas. SOD poses a medium threat to SONCC coho salmon due to the current infestation and rate of spreading.

Japanese knotweed (*Polygonum cuspidatum*) has spread into the Chetco River (ODA 2010) and efforts are underway to control its spread and distribution. This is a concern because Japanese

knotweed is aggressive, fast growing, and out-competes native vegetation in riparian areas. Scotch broom and gorse are also locally common and similarly invasive. If these plants replace conifers or hardwoods in riparian zones, it substantially impacts coho salmon habitat.

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 low threat to juveniles, smolts, and adults.

13.7 Recovery Strategy

The most important factor limiting recovery of coho salmon in the Chetco River is a deficiency in the amount of suitable rearing habitat for juveniles. The processes that create and maintain such habitat must be restored by increasing channel complexity, restoring flow, and reducing stream temperatures. Channel complexity should be improved by restoring large wood in streams, restoring those processes that provide large wood to streams, constructing off-channel ponds or backwater habitat, restoring wetlands, moving levees, or limiting development and fill. Areas adjacent to the stream should be replanted with conifers to re-establish mature streamside forest as a source for large wood recruitment. Restoration of sufficient water may require changes in water use and allocation.

Habitat restoration and threat reduction in the Chetco River should be focused on those areas currently occupied by coho salmon, which would allow for immediate benefits to the population. Unoccupied areas must also be restored to provide enough habitat to achieve population viability and provide for conditions suitable to allow for re-colonization. The effects of fishing on this population's ability to meet its viability criteria should be evaluated.

Table 13-4 on the following page lists the recovery actions for the Chetco River population.

Table 13-4. Recovery action implementation schedule for the Chetco 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-CheR.2.8.4	Floodplain and Channel Structure	Yes	Improve timber harvest practices	Improve regulatory mechanisms	Population wide	1
SONCC-CheR.2.8.4.1	*Determine how to revise Oregon Forest Practice Rules so that they do not limit recovery of SONCC coho salmon and make appropriate revisions*					
SONCC-CheR.2.8.4.2	*Adopt rules for fish-bearing streams sufficient to protect both water quality and fish habitat*					
SONCC-CheR.2.8.4.3	*Adopt rules to increase protection of non-fish-bearing streams that address practices that adversely impact water quality and fish habitat*					
SONCC-CheR.2.8.4.4	*Ensure management measures for landslide prone areas include protection of water quality and fisheries habitat*					
SONCC-CheR.2.8.4.5	*Until more permanent regulatory mechanisms can be put in place, immediately adopt interim rules that increase protection for salmon habitat in forested areas, including increased natural recruitment of large wood on perennial and intermittent streams likely to deliver wood downstream, increased shade on all perennials, and protective buffers on small intermittent streams*					
SONCC-CheR.2.4.9	Floodplain and Channel Structure	Yes	Improve estuarine habitat	Restore tidally influenced habitats	Areas of estuary where coho salmon would benefit immediately	2a
SONCC-CheR.2.4.9.1	*Assess coho use of different estuarine habitats and develop a plan to enhance those habitats (i.e. brackish wetlands, tidal sloughs, salt marshes, and tidally influenced freshwater)*					
SONCC-CheR.2.4.9.2	*Restore tidally influenced habitats, guided by the plan*					
SONCC-CheR.2.4.69	Floodplain and Channel Structure	Yes	Improve estuarine habitat	Restore tidally influenced habitats	Population wide	2b
SONCC-CheR.2.4.69.1	*Assess coho use of different estuarine habitats and develop a plan to enhance those habitats (i.e. brackish wetlands, tidal sloughs, salt marshes, and tidally influenced freshwater)*					
SONCC-CheR.2.4.69.2	*Restore tidally influenced habitats, guided by the plan*					
SONCC-CheR.22.2.43	Urban, Residential, Industrial Development	Yes	Improve flow timing or volume	Increase instream flows	Mainstem and tributaries downstream of the Kalmiopsis Wilderness	2a
SONCC-CheR.22.2.43.1	*Identify, map, and quantify all surface water diversions*					
SONCC-CheR.22.2.43.2	*Assess water diversions, prioritize, and adjust management to benefit life history requirements of coho*					
SONCC-CheR.22.2.43.3	*Secure dedicated unused water diversion rights*					
SONCC-CheR.22.2.43.4	*Verify permitted water diversions*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.2.5.8	Floodplain and Channel Structure	Yes	Improve tidal exchange of water	Set back or remove dikes or levees	Areas of estuary where coho salmon would benefit immediately	2a
SONCC-CheR.2.5.8.1	*Assess and prioritize levees for setback or removal*					
SONCC-CheR.2.5.8.2	*Remove or setback levees, guided by assessment results*					
SONCC-CheR.2.5.70	Floodplain and Channel Structure	Yes	Improve tidal exchange of water	Set back or remove dikes or levees	Population wide	2b
SONCC-CheR.2.5.70.1	*Assess and prioritize levees for setback or removal*					
SONCC-CheR.2.5.70.2	*Remove or setback levees, guided by assessment results*					
SONCC-CheR.7.1.46	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve grazing practices	Private lands where coho salmon would benefit immediately	2a
SONCC-CheR.7.1.46.1	*Assess grazing contribution to sediment delivery, pollutants, and impaired riparian conditions*					
SONCC-CheR.7.1.46.2	*If problems are identified, develop and implement grazing management strategy that decreases delivery of sediment and pollutants to streams and improves riparian condition*					
SONCC-CheR.7.1.46.3	*Monitor effectiveness of grazing management to ensure grazing does not limit recovery of SONCC coho salmon*					
SONCC-CheR.7.1.75	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve grazing practices	Population wide	2b
SONCC-CheR.7.1.75.1	*Assess grazing contribution to sediment delivery, pollutants, and impaired riparian conditions*					
SONCC-CheR.7.1.75.2	*If problems are identified, develop and implement grazing management strategy that decreases delivery of sediment and pollutants to streams and improves riparian condition*					
SONCC-CheR.7.1.75.3	*Monitor effectiveness of grazing management to ensure grazing does not limit recovery of SONCC coho salmon*					
SONCC-CheR.7.1.3	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve long-range planning	Population wide	2a
SONCC-CheR.7.1.3.1	*Review General Plan or City Ordinances to ensure coho salmon habitat needs are accounted for. Revise if necessary*					
SONCC-CheR.7.1.3.2	*Develop watershed-specific guidance for managing riparian vegetation. Consider larger riparian buffers in coho occupied habitat and discourage development adjacent to the estuary*					
SONCC-CheR.2.1.44	Floodplain and Channel Structure	Yes	Increase channel complexity	Improve and protect habitat	Jack Creek upstream of South Bank Road and Hamilton Creeks	2a
SONCC-CheR.2.1.44.1	*Acquire conservation easement from willing sellers/landowners*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.2.1.6	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	North Fork Chetco basin, alluvial terraces along the Lower Chetco, and Jacks Creek, and all streams where coho salmon would benefit immediately	2a
SONCC-CheR.2.1.6.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-CheR.2.1.6.2	*Place instream structures, guided by assessment results*					
SONCC-CheR.2.1.66	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Population wide	2b
SONCC-CheR.2.1.66.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-CheR.2.1.66.2	*Place instream structures, guided by assessment results*					
SONCC-CheR.2.2.5	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	North Fork Chetco basin, South Fork Chetco basin, alluvial terraces along the Lower Chetco, Jacks Creek, estuary, and all streams where coho salmon would benefit immediately	2a
SONCC-CheR.2.2.5.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-CheR.2.2.5.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-CheR.2.2.68	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Population wide	2b
SONCC-CheR.2.2.68.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-CheR.2.2.68.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-CheR.2.2.32	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	All streams where coho salmon would benefit immediately	2a
SONCC-CheR.2.2.32.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for landowners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-CheR.2.2.32.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-CheR.2.2.32.3	*Reintroduce or relocate beaver if appropriate, guided by the plan*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.2.2.67	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Population wide	2b
SONCC-CheR.2.2.67.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for landowners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-CheR.2.2.67.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-CheR.2.2.67.3	*Reintroduce or relocate beaver if appropriate, guided by the plan*					
SONCC-CheR.22.5.10	Urban, Residential, Industrial Development	Yes	Improve estuarine habitat	Improve water quality	Estuary	2b
SONCC-CheR.22.5.10.1	*Determine causal mechanisms for nutrient pollution, algae blooms, and anoxia in the estuary, starting with understanding circulation patterns in the estuary. Make recommendations for reducing algal blooms*					
SONCC-CheR.22.5.10.2	*Implement recommendations to improve water quality, guided by assessment results*					
SONCC-CheR.7.1.36	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Federal forest lands	2b
SONCC-CheR.7.1.36.1	*Develop an appropriate timber harvest management plan for benefits to coho salmon habitat*					
SONCC-CheR.7.1.36.2	*Plant conifers, guided by the plan*					
SONCC-CheR.22.3.48	Urban, Residential, Industrial Development	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase regulatory oversight	All coho bearing streams	2b
SONCC-CheR.22.3.48.1	*Strengthen city and county ordinances to limit development within the 100 year channel migration zone*					
SONCC-CheR.22.3.48.2	*Strengthen city and county ordinances to limit development within the 50 year flood elevation*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.2.1.42	Floodplain and Channel Structure	Yes	Increase channel complexity	Improve placer mining practices	All streams where coho salmon would benefit immediately, Moderate and high IP stream reaches on USFS lands in the watersheds of Quail Prairie Creek and Mislatnah Creek	2b
SONCC-CheR.2.1.42.1	*Assess the actual impacts of suction mining for gold*					
SONCC-CheR.2.1.42.2	*Develop regulations that minimize or prevent impacts to coho salmon from placer mining. Consider special closed areas, closed seasons, and restrictions on methods and operations*					
SONCC-CheR.2.1.42.3	*Educate miners regarding the ESA, coho salmon, and effects to habitat from proposed mining activities*					
SONCC-CheR.2.1.42.4	*If impacts cannot be avoided, limit placer mining*					
SONCC-CheR.2.1.7	Floodplain and Channel Structure	Yes	Increase channel complexity	Protect estuarine habitat	Estuary	2b
SONCC-CheR.2.1.7.1	*Limit development and filling of estuarine habitat through the development of regulatory mechanisms such as county or city ordinances*					
SONCC-CheR.2.1.7.2	*Maintain or strengthen current estuarine protection measures*					
SONCC-CheR.22.1.45	Urban, Residential, Industrial Development	Yes	Reduce pollutants	Increase regulatory oversight	Population wide	2b
SONCC-CheR.22.1.45.1	*Increase application of Low Impact Development (LID) techniques through education and incentives*					
SONCC-CheR.22.1.45.2	*Incorporate LID in Clean Water Act permits for projects that result in stormwater discharge*					
SONCC-CheR.22.1.49	Urban, Residential, Industrial Development	Yes	Reduce pollutants	Increase regulatory oversight	Population wide	2b
SONCC-CheR.22.1.49.1	*Strengthen city and county ordinances to minimize new impervious surfaces and require treatment to current standards*					
SONCC-CheR.22.1.49.2	*Strengthen city and county ordinances to require treatment to current standards when existing impervious surfaces are expanded, reconditioned, reconstructed or replaced*					
SONCC-CheR.22.1.49.3	*Develop local regulatory mechanisms that reduce amount of total impervious area through incentives*					
SONCC-CheR.26.1.62	Low Population Dynamics	No	Increase population abundance	Rescue and relocate stranded juveniles	Population wide	2b
SONCC-CheR.26.1.62.1	*Survey coho-bearing tributaries and relocate juveniles stranded in drying pools*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.2.2.58	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Improve regulatory mechanisms	Population wide	2b
SONCC-CheR.2.2.58.1	*Improve protective regulations for beaver and develop guidelines for relocation that are practical for restoration groups*					
SONCC-CheR.3.1.11	Hydrology	No	Improve flow timing or volume	Increase instream flows	Lower mainstem Chetco River, Jacks Creek, and all streams where coho salmon would benefit immediately	2c
SONCC-CheR.3.1.11.1	*Determine instream flow needs for coho salmon, utilize existing USGS gauging station information*					
SONCC-CheR.3.1.11.2	*Perform a groundwater study to determine the volume of aquifer storage and the role of aquifers in streamflow*					
SONCC-CheR.3.1.11.3	*Provide incentives and education to landowners to reduce water consumption and reduce groundwater pumping and surface water diversion by utilizing conservation and storage*					
SONCC-CheR.3.1.72	Hydrology	No	Improve flow timing or volume	Increase instream flows	Population wide	2d
SONCC-CheR.3.1.72.1	*Determine instream flow needs for coho salmon, utilize existing USGS gauging station information*					
SONCC-CheR.3.1.72.2	*Perform a groundwater study to determine the volume of aquifer storage and the role of aquifers in streamflow*					
SONCC-CheR.3.1.72.3	*Provide incentives and education to landowners to reduce water consumption and reduce groundwater pumping and surface water diversion by utilizing conservation and storage*					
SONCC-CheR.10.2.16	Water Quality	No	Reduce pollutants	Set standard	Population wide	2d
SONCC-CheR.10.2.16.1	*Develop TMDLs for water bodies listed under Clean Water Act Section 303(d)*					
SONCC-CheR.2.1.65	Floodplain and Channel Structure	Yes	Increase channel complexity	Improve placer mining practices	Population wide	3b
SONCC-CheR.2.1.65.1	*Assess the actual impacts of suction mining for gold*					
SONCC-CheR.2.1.65.2	*Develop regulations that minimize or prevent impacts to coho salmon from placer mining. Consider special closed areas, closed seasons, and restrictions on methods and operations*					
SONCC-CheR.2.1.65.3	*Educate miners regarding the ESA, coho salmon, and effects to habitat from proposed mining activities*					
SONCC-CheR.2.1.65.4	*If impacts cannot be avoided, limit placer mining*					
SONCC-CheR.7.1.47	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve grazing practices	Federal lands	3b
SONCC-CheR.7.1.47.1	*Monitor effectiveness of grazing management to ensure grazing does not limit recovery of SONCC coho salmon*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.7.1.33	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	BLM lands	3b
SONCC-CheR.7.1.33.1	*Manage timber harvest (and associated activities) on Federal lands in accordance with the Aquatic Conservation Strategy of the NWFP, or with the updated ACS guidance contained in newly revised Resource Management Plans or Land and Resource Management Plans, in order to achieve riparian and stream channel improvements for coho salmon*					
SONCC-CheR.5.1.12	Passage	No	Improve access	Remove barriers	Barriers identified in population profile (i.e. Ferry Creek, Tuttle Creek, and road-stream crossings in Lower, Middle, and North Fork watershed)	3b
SONCC-CheR.5.1.12.1	*Evaluate and prioritize barriers for removal*					
SONCC-CheR.5.1.12.2	*Remove barriers, based on evaluation*					
SONCC-CheR.5.1.37	Passage	No	Improve access	Remove barriers	BLM lands	3b
SONCC-CheR.5.1.37.1	*Evaluate and prioritize barriers for removal*					
SONCC-CheR.5.1.37.2	*Remove barriers, based on evaluation*					
SONCC-CheR.5.1.74	Passage	No	Improve access	Remove barriers	Population wide	3c
SONCC-CheR.5.1.74.1	*Evaluate and prioritize barriers for removal*					
SONCC-CheR.5.1.74.2	*Remove barriers, based on evaluation*					
SONCC-CheR.3.1.61	Hydrology	No	Improve flow timing or volume	Improve regulatory mechanisms	Population wide	3b
SONCC-CheR.3.1.61.1	*Establish a comprehensive groundwater permit process*					
SONCC-CheR.3.1.51	Hydrology	No	Improve flow timing or volume	Increase instream flows	All streams with ODFW water rights for fish and all streams where coho salmon would benefit immediately	3b
SONCC-CheR.3.1.51.1	*Secure adequate instream flows to fulfill ODFW water rights for fish*					
SONCC-CheR.3.1.73	Hydrology	No	Improve flow timing or volume	Increase instream flows	Population wide	3d
SONCC-CheR.3.1.73.1	*Secure adequate instream flows to fulfill ODFW water rights for fish*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.28.1.13	Roads	No	Reduce sediment delivery to streams	Reduce road-stream hydrologic connection	All areas where coho salmon would benefit immediately	3b
SONCC-CheR.28.1.13.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-CheR.28.1.13.2	*Decommission roads, guided by assessment*					
SONCC-CheR.28.1.13.3	*Upgrade roads, guided by assessment*					
SONCC-CheR.28.1.13.4	*Maintain roads, guided by assessment*					
SONCC-CheR.28.1.71	Roads	No	Reduce sediment delivery to streams	Reduce road-stream hydrologic connection	Population wide	3d
SONCC-CheR.28.1.71.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-CheR.28.1.71.2	*Decommission roads, guided by assessment*					
SONCC-CheR.28.1.71.3	*Upgrade roads, guided by assessment*					
SONCC-CheR.28.1.71.4	*Maintain roads, guided by assessment*					
SONCC-CheR.10.2.41	Water Quality	No	Reduce pollutants	Reduce pesticides	All areas where coho salmon would benefit immediately	3c
SONCC-CheR.10.2.41.1	*Develop a pesticide management plan*					
SONCC-CheR.10.2.41.2	*Implement pesticide management plan and technical assistance program*					
SONCC-CheR.10.2.63	Water Quality	No	Reduce pollutants	Reduce pesticides	Population wide	3d
SONCC-CheR.10.2.63.1	*Develop a pesticide management plan*					
SONCC-CheR.10.2.63.2	*Implement pesticide management plan and technical assistance program*					
SONCC-CheR.10.7.60	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	All streams where coho salmon would benefit immediately	3c
SONCC-CheR.10.7.60.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-CheR.10.7.60.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-CheR.10.7.64	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	Population wide	3d
SONCC-CheR.10.7.64.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-CheR.10.7.64.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-CheR.1.2.31	Estuary	No	Improve estuarine habitat	Assess and improve estuary and tidal wetland habitat	Estuary	3d
SONCC-CheR.1.2.31.1	*Identify parameters to assess condition of estuary and tidal wetland habitat*					
SONCC-CheR.1.2.31.2	*Complete a full assessment of the estuary using identified parameters*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-CheR.16.1.17	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-CheR.16.1.17.1	*Determine impacts of fisheries management on SONCC coho salmon in terms of VSP parameters*					
SONCC-CheR.16.1.17.2	*Identify level of fishing impacts that does not limit attainment of population-specific viability criteria*					
SONCC-CheR.16.1.18	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-CheR.16.1.18.1	*Determine actual fishing impacts*					
SONCC-CheR.16.1.18.2	*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-CheR.16.2.19	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-CheR.16.2.19.1	*Determine impacts of scientific collection on SONCC coho salmon in terms of VSP parameters*					
SONCC-CheR.16.2.19.2	*Identify level of scientific collection impact that does not limit attainment of population-specific viability criteria*					
SONCC-CheR.16.2.20	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-CheR.16.2.20.1	*Determine actual impacts of scientific collection*					
SONCC-CheR.16.2.20.2	*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*					
SONCC-CheR.10.2.15	Water Quality	No	Reduce pollutants	Educate stakeholders	North Fork Chetco, Jacks Creek, lower Chetco, estuary	3d
SONCC-CheR.10.2.15.1	*Develop an educational program that teaches landowners and businesses about avoiding pollution from septic systems, backyard pesticides, fuels, and nutrients*					
SONCC-CheR.7.1.2	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Timberland	BR
SONCC-CheR.7.1.2.1	*Assess riparian zone to prioritize locations for planting disease-resistant Port Orford cedar trees*					
SONCC-CheR.7.1.2.2	*Plant disease-resistant Port Orford cedar trees, guided by assessment results*					