11. Hunter Creek Population

Northern Coastal Stratum

Dependent Population

Recovery criteria: 80% of available IP habitat must be occupied in years following spawning of brood years with high marine survival

Habitat likely available to support all life stages

44.5 mi^2 watershed (38% Federal ownership)

15 IP-km (9 IP-mi) (13% High)

Dominant Land Uses are Timber Harvest and Urban/Rural Development

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

Key Limiting Threats are 'Roads' and 'Timber Harvest'

Highest Priority Recovery Actions

• Increase streamflows • Reconnect estuarine habitat by installing new bridge at Highway 101 • Construct off-channel habitats, alcoves, backwater habitat, and old stream oxbows	• Remove, setback, or reconfigure levees and dikes • Increase large woody debris (LWD), boulders or other instream structure • Improve timber harvest practices by revising Oregon Forest Practices Act

11.1 History of Habitat and Land Use

Hunter Creek enters the Pacific Ocean just south of the town of Gold Beach, which is located at the mouth of the Rogue River. Farming and ranching on the lower terraces began in the 1850s. Some coho salmon habitat was likely impacted, although basin-wide productivity remained high. Only about 20 people lived in lower Hunter Creek through the 1930s (Massingill 2001d), but today there are hundreds of residents as rural development has spread outward from Gold Beach.

Forestry is the dominant land use in the Hunter Creek basin. Like most southwest Oregon river basins, Hunter Creek was extensively logged after World War II (EA Engineering, Science, and Technology 1998). In the 1950s, there were as many as 17 active mills in the Gold Beach/Hunter Creek area (Massingill 2001d). Private timber land was substantially logged by 1960, and reforestation was limited (Maguire 2001d). U.S. Forest Service (USFS) and Bureau of Land Management (BLM) lands in the headwaters of the upper mainstem and North Fork of Hunter Creek were logged from the 1950s to the 1980s (EA Engineering, Science, and Technology 1998). Damage in Hunter Creek from the floods of 1955 and 1964 was extensive.

In 1995, an area of lower Hunter Creek with a human population of about 414 people was annexed to the City of Gold Beach (Maguire 2001d). Residential development is concentrated in the lower basin. Residential, commercial, and industrial development in lower Hunter Creek and the estuary have also contributed to coho salmon habitat degradation.

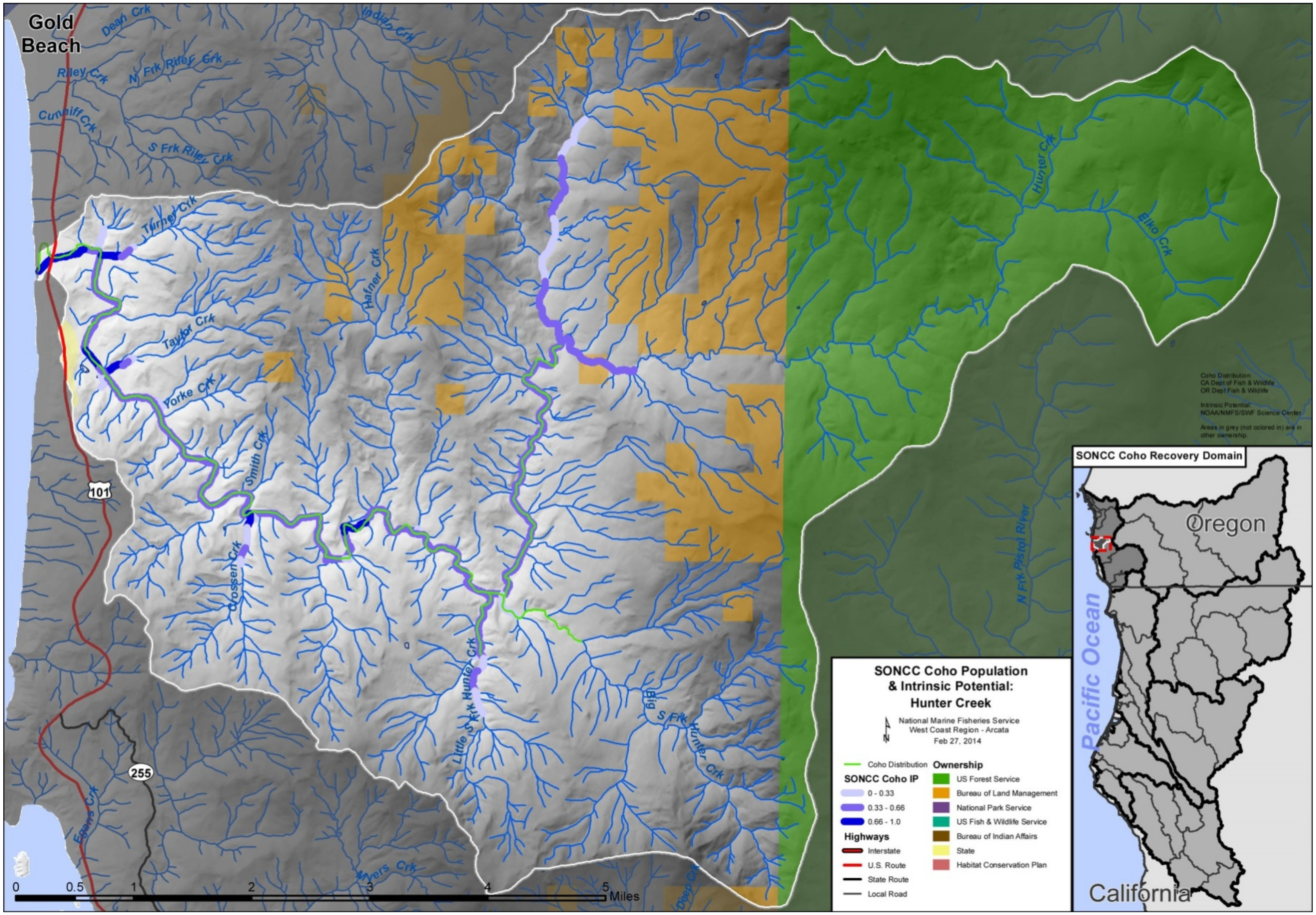

Figure 11-1. The geographic boundaries of the Hunter Creek coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (ODFW 2013a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Northern Coastal diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

11.2 Historic Fish Distribution and Abundance

Historic data on the distribution and abundance of coho salmon in Hunter Creek is limited. Annual estimates of coho salmon adults in Hunter Creek were 136 in 2001, 52 in 2002, 17 in 2004, 22 in 2005 and 35 in 2008 (ODFW 2009a). Williams et al. (2006) identified the estuary, lower mainstem, and tributaries below Conn Creek as having the highest coho salmon intrinsic potential habitat (IP > 0.66) in the basin. Hunter Creek has a total of 14.63 IP-km of coho salmon rearing habitat. Table 11-1 lists streams with high IP coho salmon habitat in the Hunter Creek population area.

Table 11-1 Tributaries with high IP reaches (IP > 0.66). (Williams et al. 2006).

Stream Name	Stream Name
Crossen Creek	Taylor Creek
Hunter Creek Estuary	Turner Creek
Lower Mainstem Hunter Creek	

11.3 Status of Hunter Creek Coho Salmon

Spatial Structure and Diversity

Coho salmon still inhabit their historic range in Hunter Creek from the Big South Fork Hunter Creek downstream, including the lowest extent of the Big South Fork Hunter Creek and Little South Fork Hunter Creek (Maguire 2001d). However, in dive surveys of three reaches of Hunter Creek (upstream of Yorke Creek, downstream of Little South Fork Hunter Creek, and upstream of North Fork Hunter Creek) in 2002-2004, coho salmon were only found at the reach downstream of Little South Fork Hunter Creek and were at very low densities (0.038 and 0.063/sq. meter) (ODFW 2005a). This indicates patchy distribution and likely a small population, which would generally have less genetic diversity than larger ones. Thus, spatial structure and diversity is likely low.

Population Size and Productivity

The Oregon Department of Fish and Wildlife (ODFW 2009a) estimated coho salmon populations for the period 1998 to 2008 for south coast Oregon, including Hunter Creek. Coho salmon adults were found in 5 of 11 years, with annual estimates of 136 in 2001, 52 in 2002, 17 in 2004, 22 in 2005 and 35 in 2008. One year class appears to be completely missing and the lack of consistent returns in other brood years indicates very low productivity in the Hunter Creek. There is no information regarding consistency of ODFW survey effort across years, so some qualification of these results is required. Also, in high flow years, surveys can be difficult or impossible. Consequently, the population may be somewhat larger than estimated and there may have been some coho salmon adults in years when the population estimate was zero. The productivity and size of this population is driven not only by the dynamics of the Hunter Creek population, but by those of nearby populations as well, which contribute spawners as strays. However, the supply of strays to Hunter Creek is not expected to be substantial or consistent in the near term because most adjacent populations in the SONCC coho salmon ESU are at low levels.

Extinction Risk

Not applicable because Hunter Creek is not an independent population.

Role in SONCC Coho Salmon ESU Viability

The Hunter Creek population is considered dependent because it does not have a high likelihood of sustaining itself over a 100-year time period in isolation and likely received sufficient immigration to alter its dynamics and extinction risk (Williams et al. 2006). Although such populations cannot be viable on their own, they increase connectivity by allowing dispersal among independent populations, acting as a source of colonists in some cases. Historically, the Hunter Creek population would have interacted with the Northern Coastal independent populations such as the lower Rogue River to the north, and with other dependent populations such as the Pistol River to the south. Any restored habitat in Hunter Creek provides potential connectivity that could assist with metapopulation function in the SONCC coho salmon ESU.

11.4 Plans and Assessments

State of Oregon

Expert Panel Limiting Factors Report for Southwest Oregon

ODFW (2008b) convened a panel of fisheries and watershed science experts 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 Hunter Creek population as follows:

> Key concerns were a loss of over-winter tributary habitat complexity and floodplain connectivity for juveniles, especially in the lowlands which are naturally very limited in these systems and have been impacted by past and current urban, rural residential, and forestry development and practices. High water temperatures for summer parr due to a loss of riparian function and channel straightening is also a key concern in this stream. The secondary concern was related to a loss of over-winter, lowland habitat complexity due to past and current agricultural practices.

Oregon Plan for Salmon and Watersheds
http://www.oregon.gov/OPSW/about_us.shtml

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 salmon 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 success, and annual reports can be found at http://www.oregon.gov/OPSW/.

South Coast Watersheds Council (SCWC)

Hunter Creek Watershed Assessment

The Hunter Creek Watershed Assessment (Maguire 2001d) was prepared for the Hunter Creek Watershed Council by the SCWC. The purpose of the assessment was to compile, summarize, and synthesize existing data and information pertaining to the Hunter Creek basin's condition. This information is the foundation for the prioritization of projects outlined in the Hunter Creek Watershed Action Plan.

Hunter Creek Watershed Action Plan

The Hunter Creek Watershed Action Plan (Massingill 2001d) lays out a restoration strategy with specific recommended actions for Hunter Creek. These actions include: increasing the size and complexity of the estuary, identifying and restoring wetlands, identifying current and potential sediment sources in the basin, protecting existing riparian vegetation and planting new riparian vegetation, converting alder-dominated stands to conifer, and assessing the risk of failure of road crossings in earthflow areas."

11.5 Stresses

Table 11-2. Severity of stresses affecting each life stage of coho salmon in Hunter Creek. 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	Lack of Floodplain and Channel Structure[1]	Medium	Very High	Very High[1]	Very High	High	Very High
2	Degraded Riparian Forest Conditions[1]	-	Very High	Very High[1]	High	Medium	Very High
3	Altered Sediment Supply	High	Medium	High	High	Medium	High
4	Impaired Water Quality	Low	High	Very High	High	Low	High
5	Impaired Estuary/Mainstem Function	-	Low	Very High	High	Medium	High
6	Altered Hydrologic Function	Medium	Medium	Medium	Medium	Low	Medium
7	Barriers	-	Low	Low	Low	Low	Low
8	Adverse Hatchery-Related Effects	Low	Low	Low	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 stress for this population.

Key Limiting Stresses, Life Stages, and Habitat

The juvenile life stage is most limited and quality winter rearing habitat is lacking as vital habitat for the population. Degraded riparian conditions eliminated the source of large wood recruitment. The complexity of the channel has been significantly reduced by the combined effect of excess fine sediment that fills pools and the lack of structure to meter out sediment or provide scour mechanisms which create and maintain pools. These findings are consistent with those of the Oregon Expert Panel (Section 11.4).

Lack of Floodplain and Channel Structure

The lack of floodplain and channel structure is the most limiting stress to coho salmon. Channelization of lower Hunter Creek has disconnected the stream from its riparian zone and wetlands and has likely disrupted surface water-groundwater interactions. Large fallen conifers and root masses that formerly forced the scour of pools are now scarce or absent, depriving coho salmon of necessary cover in their summer and winter habitats (Appendix B). ODFW and USFS conducted large wood surveys and found poor levels of large wood (<1 key piece per 100m). Wood has been removed from stream channels (EA Engineering, Science, and Technology 1998).

ODFW and USFS habitat surveys of the Hunter Creek basin found that pool frequency varied from fair (10 to 20 percent) in lower Big South Fork and upper mainstem Hunter to good (20 to 35 percent) in the mainstem above the North Fork and the lower North Fork (Appendix B). Surveys of lower Hunter Creek found pool frequencies greater than 35 percent and pool depths greater than three feet, which ODFW rates as very good (Appendix B). However, pool frequencies and depths are probably substantially reduced from historic conditions. For example, nearby Quosatana Creek in the Lower Rogue River sub-basin has a watershed with similar size to Hunter Creek but has mainstem pool depths of 10 feet (USFS 1996a). Hunter Creek pools historically may have approached or exceeded this depth.

Degraded Riparian Forest Conditions

There are few large trees capable of providing large wood in the riparian zone of Hunter Creek. Specifically, ODFW found there were fewer than 75 conifers greater than 36” in diameter per 1000 ft. in all reaches of Hunter Creek (Appendix B). Large conifers stabilize bank structure, maintain shade, and improve both thermal and nutrient buffering. The riparian zone of Hunter Creek is significantly altered, and hardwood trees like alder and willow are now the most abundant species in alluvial valleys. These species do not provide long lasting large wood for channel forming processes (Cederholm et al. 1997). Serpentine soils naturally limit the presence of large-diameter conifer forests in much of the east side of the Hunter Creek basin. In serpentine areas, Port Orford cedar is an important riparian tree that has suffered high mortality due to the spread of introduced Port-Orford cedar root rot (EA Engineering, Science, and Technology 1998). Sediment deposition and shifting bedload may cause mortality of streamside hardwoods and conifers, inhibiting riparian recovery and succession.

Altered Sediment Supply

Sediment contribution from landslides and erosion occurs naturally in the Hunter Creek basin; however, roads, timber harvest, and bank erosion following removal of riparian vegetation have elevated fine sediment input. In lower Hunter Creek, where coho salmon are known to occur, sand and fine sediment has degraded (Appendix B). 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 Hunter Creek basin (Maguire 2001d) is 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.

Impaired Water Quality

Hunter Creek is recognized as temperature impaired from its mouth to 18.4 miles upstream (Oregon Department of Environmental Quality (ODEQ) 2002a). This is the area that contains some of the highest IP coho salmon habitat in the basin. North Fork Hunter Creek is also listed by ODEQ (2002a) as temperature impaired in the lower 4.8 miles. Upper mainstem temperatures are naturally warm (72 to 75 °F) because the headwaters have serpentine soils where vegetation is naturally sparse and stream shade low (Massingill 2001d). The Little South Fork is currently too warm during the summer, as is lower Hunter Creek which has temperatures as high as 74 to 75 °F. Only the lower Big South Fork is currently cool enough for rearing coho salmon. Aquatic insect samples on federal lands in the South Fork show that communities are diverse and very good in headwaters, but decline to fair or poor in lower reaches.

Lower Hunter Creek is pH-impaired during the summer. Septic systems could be a source of pollution (Massingill 2001d). Reduced flow levels combined with increased nutrients contribute to nuisance algae blooms that can elevate pH during the day and depress dissolved oxygen levels at night.

Impaired Estuary/Mainstem Function

The lack of estuary function is a high stress to juveniles and smolts. The Hunter Creek estuary has occasional nuisance algae blooms (Figure 11-2) and has lost both depth and complexity due to excess fine sediment deposition. Almost all former estuarine habitat has been altered. Highway 101 bisects the estuary just upstream of the mouth and acts as a dike along most of its length. There are also dikes along the south side of the estuary in front of a large commercial development. Further upstream, former estuarine habitat has been diked and filled for other commercial and agricultural use. One large side channel remains, but this channel, along with most of the estuary, shows signs of fine sediment accretion and lacks complex features such as large wood and deep pools. There appear to be no remaining tidal wetlands in the Hunter Creek estuary. Water quality is poor in the estuary during the low-flow season due to high water temperatures and the presence of algae blooms.

Figure 11-2. Algal bloom in the Hunter Creek estuary.

Altered Hydrologic Function

Altered hydrologic function is a low stress to Hunter Creek coho salmon. Maguire (2001d) notes that residential development and increased water demand have the potential to compromise flows. Timber harvest and roads have likely increased peak flows in the Hunter Creek basin (EA Engineering, Science, and Technology 1998). Such peak flows are known to cause channel scour, loss of large wood and pool filling. Disconnection of the channel and floodplain also may disrupt surface and groundwater connections that can provide a cooling influence that benefits coho salmon and other salmonids.

Barriers

Barriers to coho salmon migration exist in Hunter Creek, including several in the Lower Hunter Creek mainstem watershed (Maguire 2001d). Because coho salmon have access to most of the Hunter Creek basin, barriers represent a low stress.

Adverse Hatchery-Related Effects

There are no operating hatcheries in the Hunter Creek population area. Hatchery-origin coho salmon may stray into Hunter Creek; 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.

11.6 Threats

Table 11-3. Severity of threats affecting each life stage of coho salmon in Hunter Creek. 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	Roads[1]	Medium	Very High	Very High[1]	Very High	Very High	Very High
2	Timber Harvest[1]	Very High	Very High	Very High[1]	Very High	Medium	Very High
3	Channelization/Diking	Low	Very High	Very High	Very High	Very High	Very High
4	Agricultural Practices	Low	High	High	High	High	High
5	Urban/Residential/Industrial Dev.	Low	Medium	High	High	High	High
6	Dams/Diversion	Low	Medium	Medium	Medium	Low	Medium
7	High Severity Fire	Low	Medium	Medium	Medium	Medium	Medium
8	Road-Stream Crossing Barriers	-	Low	Medium	Medium	Medium	Medium
9	Climate Change	Low	Low	Medium	Medium	Medium	Medium
10	Mining/Gravel Extraction	Low	Low	Low	Low	Low	Low
11	Hatcheries	Low	Low	Low	Low	Low	Low
12	Invasive and Non-Native/Alien Species	-	Low	Low	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 roads and timber harvest.

Roads

Roads have been identified as a major source of sediment in the Hunter Creek watershed (EA Engineering, Science, and Technology 1998). Lower Hunter Creek, the Little Fork Hunter Creek, and Big South Fork Hunter Creek all have densities of over 3 miles of road per square mile of basin (mi/mi^2). USFS and BLM lands in the headwaters of the North Fork and mainstem Hunter Creek have road densities of 1.6 to 2.5 mi/mi^2. Unpaved roads often concentrate surface runoff and deliver sediment to stream channels. They also can initiate slope failures and landslides. Paved roads increase runoff and peak flows.

Channelization/Diking

Almost all high IP (>0.66) habitat areas in Hunter Creek have been altered by channelization and diking. Constriction of the channel by dikes and levees increases current velocity, making it unsuitable for winter rearing, and increases bedload mobility that scours redds and causes mortality of eggs. Road berms that parallel streams confine the channel, cutting it off from its floodplain and adjacent wetlands (Figure 11-3). Filling of the Hunter Creek estuary to enable commercial development has isolated formerly productive wetlands and decreased coho salmon rearing habitat. Channel migration in the estuary is also constrained by the Highway 101 bridge.

Figure 11-3. Lower Hunter Creek flows adjacent to residential development. Creek is closely confined by a berm for Hunter Creek Road. Some houses encroach closely upon the creek and fully occupy the riparian floodplain.

Timber Harvest

Private industrial timber lands cover much of the middle and lower Hunter Creek basin, including tributaries occupied by coho salmon habitat in their lowest reaches. Harvest cycles are on 30 to 50 year rotations. A high percentage (over 50%) of Hunter Creek is industrial timberlands managed under the Oregon Forest Practices Act. The high harvest rates and associated roads negatively impact multiple aspects of coho salmon habitat. In addition, nearly all intrinsic potential streams are surrounded by private industrial forestlands. Active timber harvest on private lands within the Hunter Creek basin is widespread and occurring rapidly with the expectation it will continue. Use of herbicides for site preparation after clear cutting to prevent growth of hardwoods or shrubs may also pose a risk to salmonids (Ewing 1999).

Agricultural Practices

Most of the upper Hunter Creek basin is unsuitable for agriculture. Agricultural practices occur in much of the high IP area in the lower basin, and pose a high threat to coho salmon. River terraces were cleared for farming and channels moved to accommodate greater agricultural production. Although agriculture may have been responsible for original changes to aquatic habitat, much of what was formerly farm land has now been converted to residential or industrial use.

Urbanization/Residential Development

Development in the Hunter Creek basin poses an overall high threat to coho salmon. Most development has occurred on the floodplain of the lower and middle reaches of Hunter Creek and the estuary, where coho salmon habitat occurs. Rural residences use both surface water and groundwater, which can deplete streamflows. This diminishes habitat and contributes to stream warming. Rural residential septic systems may leach nutrients or pollutants into nearly streams, and pesticides and herbicides used on lawns can pollute nearby waterways. Commercial and industrial land use in lower Hunter Creek and the upper estuary may also contribute to non-point source pollution.

Dams/Diversions

There are no dams known to impede passage in Hunter Creek; however, diversions are a concern, particularly in lower Hunter Creek. Massingill (2001d) notes that Hunter Creek water rights are over-allocated from May through October, but approximately 25 percent of the water rights are junior to the in-stream rights held by ODFW which date from 1964.

High-Intensity Fire

The proximity of the Hunter Creek basin to the coast is a strong moderating factor on fire risk. However, serpentine terrain in the upper Hunter Creek basin has sparse vegetation and drier site conditions that make fires more frequent than in coastal rain forests. Early seral conditions with crowded trees elevate the risk of catastrophic fire regionally (Southwest Oregon Resource Conservation and Development Council 2003). If fire causes widespread loss of ground cover, substantial erosion may wash fine sediment into streams and degrade coho salmon habitat. Thus, fire poses an overall medium risk to coho salmon.

Road-stream Crossing Barriers

Road-stream crossings pose a low threat to coho salmon. The Big South Fork Hunter Creek has the highest density of stream crossings of any watershed in the basin, while the Lower and Middle Hunter Creek mainstem have moderate to high densities of road crossings (Maguire 2001d). Road crossing surveys were conducted to assess erosion potential; however, it is likely that some of these crossings impede fish migration.

Climate Change

There is low risk of change in average precipitation over the next 50 years (Appendix B). Modeled regional average temperature shows a moderate increase over the next 50 years (Appendix B). Average temperature could increase by up to 1^{o} C in the summer and by a similar amount in the winter. The risk of sea level rise is high (Thieler and Hammer-Klose 2000), which may impact the quality and extent of wetland juvenile and smolt habitat. Adults may be negatively impacted by climate-related ocean acidification, changes in ocean conditions, and prey availability (see Independent Science Advisory Board 2007, Feely et al. 2008, Portner and Knust 2007).

Mining/Gravel Extraction

Sand and gravel have been extracted from gravel bars along the lower 10 km of Hunter Creek since at least the 1960s (Jones et al. 2011). Gravel mining at two sites is covered under a NMFS biological opinion until September 2016 (NMFS 2011b). Gravel mining can reduce instream habitat complexity, but it is unknown whether this has occurred in Hunter Creek. Air photo analysis indicates a decline in bar area from 1940-2009, but the reasons are unknown (Jones et al. 2011).

Hatcheries

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

Invasive and Non-Native/Alien Species

Given the extent of residential development in the lower floodplain of Hunter Creek, it is likely that invasive plant species will spread from residential landscaping into riparian areas, particularly if there are pre-existing gaps in the riparian vegetation. Some of these species could impede restoration of riparian forests and wetlands. The extent to which this has already occurred is unknown.

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 stress to juveniles, smolts, and adults.

11.7 Recovery Strategy

The most immediate need for habitat restoration and threat reduction in Hunter Creek is in those areas currently occupied by coho salmon in mainstem Hunter Creek, Little South Fork Hunter Creek, and Big South Fork Hunter Creek. Unoccupied areas must also be restored to provide enough habitat for coho salmon recovery.

The Hunter Creek population is dependent and therefore cannot be viable on its own; however, it is necessary to restore habitat within the basin so that it can support all life stages of coho salmon and provide connectivity between other populations in the ESU. The recovery criterion for this population is that 80% of available IP habitat must be occupied in years following spawning of brood years with high marine survival. The most important factor limiting recovery of coho salmon in Hunter Creek 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 habitat complexity within the channel, re-establishing off-channel rearing areas, restoring riparian forests, and reducing threats to instream habitat. The effects of fishing on this population's ability to meet its viability criteria should be evaluated.

Table 11-4 on the following page lists the recovery actions for the Hunter Creek population.

Table 11-4. Recovery action implementation schedule for the Hunter Creek 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-HunC.2.4.15	Floodplain and Channel Structure	Yes	Improve estuarine habitat	Reconnect estuarine habitat	Highway 101 bridge	2b
SONCC-HunC.2.4.15.1	*Develop plan to replace Highway 101 bridge that will allow Hunter Creek to meander across estuarine floodplain*					
SONCC-HunC.2.4.15.2	*Install new bridge, guided by plan*					
SONCC-HunC.2.4.17	Floodplain and Channel Structure	Yes	Improve estuarine habitat	Restore estuarine habitat	Hunter Creek Estuary, immediately upstream of Highway 101	2b
SONCC-HunC.2.4.17.1	*Assess tidally influenced habitat and develop a plan to restore tidal channels*					
SONCC-HunC.2.4.17.2	*Restore tidal wetlands and tidal channels in historic estuary, guided by the plan*					
SONCC-HunC.19.1.4	Timber Harvest	Yes	Improve timber harvest practices	Improve regulatory mechanisms	Population wide	2b
SONCC-HunC.19.1.4.1	*Determine how to revise Oregon Forest Practice Rules so that they do not limit recovery of SONCC coho salmon and make appropriate revisions*					
SONCC-HunC.19.1.4.2	*Adopt rules for fish-bearing streams sufficient to protect both water quality and fish habitat*					
SONCC-HunC.19.1.4.3	*Adopt rules to increase protection of non-fish-bearing streams that address practices that adversely impact water quality and fish habitat*					
SONCC-HunC.19.1.4.4	*Ensure management measures for landslide prone areas include protection of water quality and fisheries habitat*					
SONCC-HunC.19.1.4.5	*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-HunC.7.1.1	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve long-range planning	Private land	2b
SONCC-HunC.7.1.1.1	*Review General Plan or City/County Ordinances to ensure coho salmon habitat needs are accounted for. Revise if necessary*					
SONCC-HunC.7.1.1.2	*Develop watershed-specific guidance for managing riparian vegetation. Consider larger riparian buffers in coho occupied habitat*					
SONCC-HunC.2.1.13	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	All streams where coho salmon would benefit immediately	2b
SONCC-HunC.2.1.13.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-HunC.2.1.13.2	*Place instream structures, guided by assessment results*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-HunC.2.1.42	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Population wide	2c
SONCC-HunC.2.1.42.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-HunC.2.1.42.2	*Place instream structures, guided by assessment results*					
SONCC-HunC.2.2.11	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Lower mainstem Hunter Creek, including estuary and tributaries within the floodplain, and all streams where coho salmon would benefit immediately	2b
SONCC-HunC.2.2.11.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-HunC.2.2.11.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-HunC.2.2.44	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Population wide	2c
SONCC-HunC.2.2.44.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-HunC.2.2.44.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-HunC.2.2.10	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Lower mainstem Hunter Creek and tributaries within floodplain, and all streams where coho salmon would benefit immediately	2b
SONCC-HunC.2.2.10.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for land owners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-HunC.2.2.10.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-HunC.2.2.10.3	*Reintroduce or relocate beaver if appropriate, guided by the plan*					
SONCC-HunC.2.2.43	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Population wide	2c
SONCC-HunC.2.2.43.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for land owners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-HunC.2.2.43.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-HunC.2.2.43.3	*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-HunC.2.2.16	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Remove, set back, or reconfigure levees and dikes	Lower Hunter Creek	2b
SONCC-HunC.2.2.16.1	*Assess feasibility and develop a plan to remove or set back levees and dikes that includes restoring the natural channel form and floodplain connectivity once the levees and dikes have been removed or set back*					
SONCC-HunC.2.2.16.2	*Remove or set back levees and dikes and restore channel form and floodplain connectivity, guided by the plan*					
SONCC-HunC.28.2.27	Roads	Yes	Reduce pollutants and stormflow	Increase regulatory oversight	Population wide	2b
SONCC-HunC.28.2.27.1	*Strengthen city and county ordinances to minimize new impervious surfaces and require treatment to current standards*					
SONCC-HunC.28.2.27.2	*Strengthen city and county ordinances to require treatment to current standards when existing impervious surfaces are expanded, reconditioned, reconstructed or replaced*					
SONCC-HunC.28.2.27.3	*Develop local regulatory mechanisms that reduce amount of total impervious area through incentives*					
SONCC-HunC.28.1.12	Roads	Yes	Reduce sediment delivery to streams	Reduce road-stream hydrologic connection	Prioritize middle and lower reaches of basin, Big South Fork, and all streams where coho salmon would benefit immediately	2b
SONCC-HunC.28.1.12.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-HunC.28.1.12.2	*Decommission roads, guided by assessment*					
SONCC-HunC.28.1.12.3	*Upgrade roads, guided by assessment*					
SONCC-HunC.28.1.12.4	*Maintain roads, guided by assessment*					
SONCC-HunC.28.1.46	Roads	Yes	Reduce sediment delivery to streams	Reduce road-stream hydrologic connection	Population wide	2c
SONCC-HunC.28.1.46.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-HunC.28.1.46.2	*Decommission roads, guided by assessment*					
SONCC-HunC.28.1.46.3	*Upgrade roads, guided by assessment*					
SONCC-HunC.28.1.46.4	*Maintain roads, guided by assessment*					
SONCC-HunC.12.1.28	Agricultural Practices	No	Improve agricultural practices	Improve regulatory mechanisms	Population wide	2b
SONCC-HunC.12.1.28.1	*Determine the best way to revise the Agricultural Water Quality Management Act (AWQMAP) so that it does not limit recovery of SONCC coho salmon and recommend appropriate revisions*					
SONCC-HunC.12.1.28.2	*Ensure basin rules are specific and linked to implementing AWQMAP recommendations, including developing specific standards for riparian buffers*					
SONCC-HunC.12.1.28.3	*Ensure that AWQMA plans address both impaired areas and proactive prevention of water quality impairment*					
SONCC-HunC.12.1.28.4	*Adopt interim buffers equal to the buffer standards NMFS is recommending in Washington state until the state establishes its own buffers*					
SONCC-HunC.12.1.28.5	*Change the complaint-based compliance monitoring process to a focused compliance program*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-HunC.2.2.38	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Improve regulatory mechanisms	Population wide	2c
SONCC-HunC.2.2.38.1	*Improve protective regulations for beaver and develop guidelines for relocation that are practical for restoration groups*					
SONCC-HunC.10.2.8	Water Quality	No	Reduce pollutants	Set standard	Population wide	2d
SONCC-HunC.10.2.8.1	*Develop TMDLs for water bodies listed under Clean Water Act Section 303(d)*					
SONCC-HunC.7.1.26	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase regulatory oversight	All coho salmon bearing streams	3b
SONCC-HunC.7.1.26.1	*Strengthen city and county ordinances to limit development within the 100 year channel migration zone*					
SONCC-HunC.7.1.26.2	*Strengthen city and county ordinances to limit development within the 50 year flood elevation*					
SONCC-HunC.22.2.25	Urban, Residential, Industrial Development	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-HunC.22.2.25.1	*Secure adequate instream flows to fulfill ODFW water rights for fish*					
SONCC-HunC.22.2.45	Urban, Residential, Industrial Development	No	Improve flow timing or volume	Increase instream flows	Population wide	3d
SONCC-HunC.22.2.45.1	*Secure adequate instream flows to fulfill ODFW water rights for fish*					
SONCC-HunC.7.1.2	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Forest federal lands	3c
SONCC-HunC.7.1.2.1	*Develop an appropriate timber harvest management plan for benefits to coho salmon habitat*					
SONCC-HunC.7.1.2.2	*Plant conifers, guided by the plan*					
SONCC-HunC.10.7.40	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	All streams where coho salmon would benefit immediately	3c
SONCC-HunC.10.7.40.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-HunC.10.7.40.2	*Supply marine-derived nutrients to streams guided by the plan*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-HunC.10.7.41	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	Population wide	3d
SONCC-HunC.10.7.41.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-HunC.10.7.41.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-HunC.7.1.3	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Remove invasive species	Lower mainstem	3d
SONCC-HunC.7.1.3.1	*Remove invasive species from lower river riparian zones and replace with conifers or native hardwood species, such as cottonwoods*					
SONCC-HunC.7.1.3.2	*Develop an educational program that teaches local landowners the methods and benefits of restoring riparian stand functions*					
SONCC-HunC.10.2.14	Water Quality	No	Reduce pollutants	Educate stakeholders	Population wide	3d
SONCC-HunC.10.2.14.1	*Develop an educational program that teaches landowners and businesses about avoiding pollution from septic systems, backyard pesticides, fuels, and nutrients*					
SONCC-HunC.10.2.24	Water Quality	No	Reduce pollutants	Increase regulatory oversight	Population wide	3d
SONCC-HunC.10.2.24.1	*Increase application of Low Impact Development (LID) techniques through education and incentives*					
SONCC-HunC.10.2.24.2	*Incorporate LID in Clean Water Act permits for projects that result in stormwater discharge*					
SONCC-HunC.10.2.23	Water Quality	No	Reduce pollutants	Reduce pesticides	Population wide	3d
SONCC-HunC.10.2.23.1	*Develop a pesticide management plan*					
SONCC-HunC.10.2.23.2	*Implement pesticide management plan and technical assistance program*					
SONCC-HunC.3.1.5	Hydrology	No	Improve flow timing or volume	Educate stakeholders	Lower mainstem	BR
SONCC-HunC.3.1.5.1	*Develop an educational program that teaches landowners to implement water conservation measures*					
SONCC-HunC.3.1.6	Hydrology	No	Improve flow timing or volume	Educate stakeholders	Lower mainstem and tributaries	BR
SONCC-HunC.3.1.6.1	*Install additional flow gages in the lower river and tributaries to study surface and groundwater use*					

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