# 11. Hunter Creek Population

- Northern Coastal Stratum
- Dependent Population
- Recovery criteria: 20% of IP habitat must be occupied in years following spawning of brood years with high marine survival
- 44.5 $mi^2$
- 15 IP km (9 mi) (13% High)
- Dominant Land Uses are Timber Harvest and Grazing
- Principal Stresses are 'Lack of Floodplain and Channel Structure' and 'Degraded Riparian Forest Conditions'
- Principal Threats are 'Roads' and 'Channelization and Diking'

## 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 outwards 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. Commercial and industrial development in lower Hunter Creek and the estuary have also contributed to coho salmon habitat degradation.

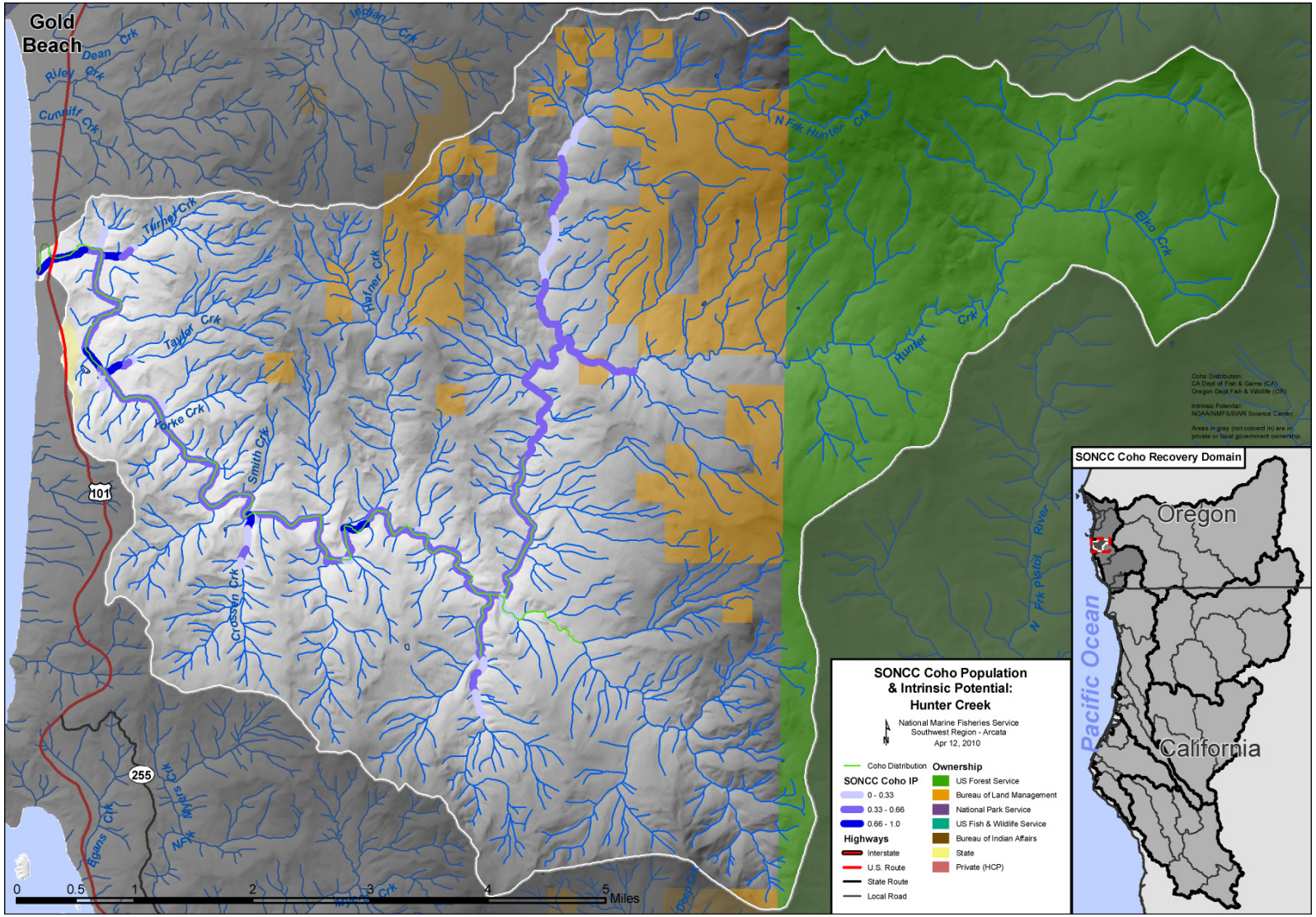


Figure 11-1. The geographic boundaries of the Hunter Creek coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (ODFW 2010a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Interior Rogue 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. 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.

Table 11-1 Tributaries with instances of 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

The more restricted and fragmented the distribution of individuals within a population, and the more spatial distribution and habitat access diverge from historical conditions, the greater the extinction risk. 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). 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 have been found in only 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 how consistent ODFW survey effort was between years, so some qualification of these results is required. Also, in high flow years, surveys may 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.

### 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, 2008). Although such populations may not be fully viable on their own, they do 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 other Northern Coastal potentially independent populations, such as the lower Rogue River to the north, or with other dependent populations like 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 1990's. 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

*Hunter Creek Watershed Assessment*

The Hunter Creek Watershed Assessment (Maguire 2001d) was prepared for the Hunter Creek Watershed Council (HCWC) by the SCWC. The purpose was to compile, summarize, and synthesize existing data and information pertaining to the Hunter Creek basin's condition. This information provides a 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) was crafted for the HCWC by the SCWC. It lays out a restoration strategy with specific recommended actions for Hunter Creek, including "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 and assessment methods are described in Appendix C, and the data used to assess stresses for the initial threats assessment (described in Appendix C) is presented in Appendix H.

| Stresses (Limiting Factors)[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[1] | Low | High | Very High[1] | High | Low | Very High |
| 5 | Impaired Estuary/Mainstem Function | - | Low | High | High | Low | Medium |
| 6 | Barriers | - | Low | Low | Low | Low | Low |
| 7 | Altered Hydrologic Function | Low | Low | Low | Low | - | Low |
| 8 | Adverse Hatchery-Related Effects | Low | Low | Low | Low | Low | Low |
| 9 | Adverse Fishery-Related Effects | - | - | - | - | Low | Low |

[1]Key limiting factor(s) and limited life stage(s).
[2]Increased Disease/Predation/Competition is not considered a stress for this population.

### 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 filling 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 stressor 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. ODFW and USFS conducted large wood surveys and found poor levels of large wood (<1 key piece per 100m). Wood removal from stream channels has occurred in the Hunter Creek basin (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. However, pool frequencies and depths are probably substantially reduced from historic conditions. For example, nearby Quosatana Creek in the Lower Rogue River subbasin has a watershed with similar size to Hunter Creek but has mainstem pool depths of 10 feet (USFS 1996b). Hunter Creek pools historically may have approached or exceeded this depth before disturbance.

### 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. Large conifers stabilized bank structure, maintained shade, and improved 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 but unfortunately 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 be causing mortality of streamside hardwoods and conifers that inhibits 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 increases to levels recognized as poor coho salmon habitat (>17 percent). 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), which is the reach that contains some of the highest IP coho salmon habitat. North Fork Hunter Creek is also listed by ODEQ (2002a) as temperature impaired in its 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) but this has not been investigated. Reduced flow levels combined with increased nutrients can 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, but overall a medium stress for Hunter Creek coho salmon. The Hunter Creek estuary has occasional nuisance algae blooms (Figure 11-) and has lost both depth and complexity due to excess fine sediment deposition (Figure 11-). Almost all of the former estuarine habitat has been altered. Highway 101 completely 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 tourist-related commercial development. Further upstream, former estuarine habitat has been diked and filled for other commercial and agricultural use. There is one large side channel that 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 appears to be no tidal wetlands remaining. Water quality is likely poor in the estuary during the low-flow season due to high water temperatures and the presence of algae blooms.

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

Figure 11-3. Large wedge of sediment (noted with red arrow) in the middle of the channel. There is commercial development in the riparian zone of the upper Hunter Creek estuary.

### Barriers

Barriers to coho salmon migration exist, including several in the Lower Hunter Creek mainstem watershed (Maguire 2001d). A barrier on the Little South Fork Hunter Creek noted by Maguire (2001d) has now been removed and replaced with a bridge. Coho salmon still have access to most of the Hunter Creek basin; consequently, barriers represent a low stress.

### Altered Hydrologic Function

Altered hydrologic function is believed to be a low stress for Hunter Creek coho salmon. Maguire (2001d) notes that residential development and increased water demand have the potential to compromise flows, although there have been no related studies. Timber harvest and roads have likely increased peak flows in the Hunter Creek basin (EA Engineering, Science, and Technology 1998), which 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.

### Adverse Hatchery-Related Effects

The effects of hatchery fish on all life stages of coho salmon are described in Chapter 3. There are no operating hatcheries in the Hunter Creek population area. Hatchery-origin coho salmon may stray into Hunter Creek, but hatchery-origin adults may stray into the population area; however, the proportion of adults that are of hatchery origin is unknown. Adverse hatchery-related effects pose a low risk to all life stages, because less than five percent of adults are presumed to be of hatchery origin and there are no hatcheries in the basin (Appendix B).

### Adverse Fishery-Related Effects

NMFS has determined that federally- and state-managed fisheries in Oregon are not likely to jeopardize the continued existence of the SONCC coho salmon ESU (Appendix B).

## 11.6 Threats

Table 11-3. Severity of threats affecting each life stage of coho salmon in Hunter Creek. Threat rank categories and assessment methods are described in Appendix B, and the data used to assess threats for the initial threats assessment (described in Appendix B) is presented in Appendix H.

| Threats | | Egg | Fry | Juvenile | Smolt | Adult | Overall Threat Rank |
|---|---|---|---|---|---|---|---|
| 1 | Roads | Medium | Very High | Very High | Very High | Very High | Very High |
| 2 | Channelization/Diking | Low | Very High | Very High | Very High | Very High | Very High |
| 3 | Timber Harvest | Low | Very High | Very High | Very High | Very High | Very High |
| 4 | Agricultural Practices | Low | High | High | High | High | High |
| 5 | Urban/Residential/Industrial | Low | Medium | High | High | High | High |
| 6 | Dams/Diversion | Low | Medium | Medium | Medium | Medium | Medium |
| 7 | High Intensity 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 |

### 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) 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-). Filling of the Hunter Creek estuary to enable commercial development isolates formerly productive wetlands and decreases coho salmon rearing habitat. Channel migration in the estuary is also constrained by the Highway 101 bridge.

Figure 11-4. 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 that are occupied coho salmon habitat in their lowest reaches. Harvest cycles are on 30 to 50 year rotations, which do not allow sufficient time for basin recovery. 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

Agricultural practices occur in much of the high IP area in the lower basin, and therefore pose a high threat to coho salmon. However, most of the upper Hunter Creek basin is unsuitable for agriculture. 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, which is where suitable 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 in back yards 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 and Diversions

Although dams and diversions are ranked a medium threat, there are no agricultural dams that are 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). These 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 (NCAR 2009). 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 has been extracted from gravel bars along the lower 10 km of Hunter Creek since at least the 1960s (Jones et al. 2011). 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

The directed recreational fishery for hatchery coho salmon in Oregon likely encounters more coho salmon than the Chinook-directed fisheries that account for much of the bycatch mortality of SONCC coho salmon. This is because coho salmon are the targeted species in the directed recreational fishery. The exploitation rates associated with this freshwater fishery and all other fisheries managed by the State of Oregon were found to be low enough to avoid jeopardizing the existence of the ESU (National Marine Fisheries Service (NMFS) 1999). The standard applied to make that determination was a jeopardy standard, not a species viability standard, because recovery objectives to achieve species viability had not been established for SONCC coho salmon at that time (NMFS 1999). As of April 2011, NMS has not authorized future collection of coho salmon for research purposes in Hunter Creek.

## 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 considered 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 20% of 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.

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.

| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|---|---|---|---|---|---|---|
| ***Step ID*** | ***Step Description*** | | | | | |
| SONCC-HunC.2.2.10 | Floodplain and Channel Structure | Yes | Reconnect the channel to the floodplain | Increase beaver abundance | Population wide, particularly lower mainstem Hunter Creek and tributaries within floodplain | 3 |
| *SONCC-HunC.2.2.10.1* | *Develop program to educate and provide incentives for landowners to keep beavers on their lands* | | | | | |
| *SONCC-HunC.2.2.10.2* | *Implement beaver program (may include reintroduction)* | | | | | |
| SONCC-HunC.2.2.11 | Floodplain and Channel Structure | Yes | Reconnect the channel to the floodplain | Construct off channel ponds, alcoves, backwater habitat, and old stream oxbows | Lower mainstem Hunter Creek, including estuary and tributaries within the floodplain | 3 |
| *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 as guided by assessment results* | | | | | |
| SONCC-HunC.2.1.13 | Floodplain and Channel Structure | Yes | Increase channel complexity | Increase LWD, boulders, or other instream structure | Population wide | 3 |
| *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* | | | | | |
| 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 | 3 |
| *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 have been removed* | | | | | |
| *SONCC-HunC.2.2.16.2* | *Remove levees and restore channel form and floodplain connectivity* | | | | | |
| SONCC-HunC.7.1.1 | Riparian | Yes | Improve wood recruitment, bank stability, shading, and food subsidies | Improve long-range planning | Private land | BR |
| *SONCC-HunC.7.1.1.1* | *Review General Plan or City 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* | | | | | |

| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|---|---|---|---|---|---|---|
| ***Step ID*** | | ***Step Description*** | | | | |
| SONCC-HunC.7.1.2 | Riparian | Yes | Improve wood recruitment, bank stability, shading, and food subsidies | Increase conifer riparian vegetation | USFS and BLM land | BR |
| *SONCC-HunC.7.1.2.1* | | *Determine appropriate silvicultural prescription for benefits to coho salmon habitat* | | | | |
| *SONCC-HunC.7.1.2.2* | | *Thin, or release conifers, guided by prescription* | | | | |
| *SONCC-HunC.7.1.2.3* | | *Plant conifers, guided by prescription* | | | | |
| SONCC-HunC.7.1.3 | Riparian | Yes | Improve wood recruitment, bank stability, shading, and food subsidies | Remove invasive species | Lower mainstem | BR |
| *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.7.1.4 | Riparian | Yes | Improve wood recruitment, bank stability, shading, and food subsidies | Improve timber harvest practices | Lower Hunter Creek | BR |
| *SONCC-HunC.7.1.4.1* | | *Revise Oregon Forest Practice Act Rules in consideration of IMST (1999) and NMFS (1998) recommendations* | | | | |
| SONCC-HunC.1.1.15 | Estuary | No | Improve connectivity of tidally-influenced habitat | Reconnect estuarine habitat | Highway 101 bridge | BR |
| *SONCC-HunC.1.1.15.1* | | *Develop plan to replace Highway 101 bridge that will allow Hunter Creek to meander across estuarine floodplain* | | | | |
| *SONCC-HunC.1.1.15.2* | | *Install new bridge, guided by plan* | | | | |
| SONCC-HunC.1.2.17 | Estuary | No | Improve estuarine habitat | Restore estuarine habitat | Hunter Creek Estuary, immediately upstream of Highway 101 | 3 |
| *SONCC-HunC.1.2.17.1* | | *Assess tidally influenced habitat and develop a plan to restore tidal channels* | | | | |
| *SONCC-HunC.1.2.17.2* | | *Restore tidal wetlands and tidal channels in historic estuary, guided by the plan* | | | | |
| 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* | | | | |

| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|---|---|---|---|---|---|---|
| ***Step ID*** | | ***Step Description*** | | | | |
| 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.* | | | | |
| SONCC-HunC.27.2.9 | Monitor | No | Track habitat condition | Track habitat indicators related to spawning, rearing, and migration | Population wide | 3 |
| *SONCC-HunC.27.2.9.1* | | *Measure indicators for spawning and rearing habitat. Conduct a comprehensive survey* | | | | |
| *SONCC-HunC.27.2.9.2* | | *Measure indicators for spawning and rearing habitat once every 15 years, sub-sampling 10% of the original habitat surveyed* | | | | |
| SONCC-HunC.27.1.18 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Estimate juvenile spatial distribution | Population wide | 3 |
| *SONCC-HunC.27.1.18.1* | | *Conduct presence/absence surveys for juveniles (3 years on; 3 years off)* | | | | |
| SONCC-HunC.27.2.19 | Monitor | No | Track habitat condition | Track habitat indicators related to the stress 'Lack of Floodplain and Channel Structure' | All IP habitat | 3 |
| *SONCC-HunC.27.2.19.1* | | *Measure the indicators, pool depth, pool frequency, D50, and LWD* | | | | |
| SONCC-HunC.27.2.20 | Monitor | No | Track habitat condition | Track habitat indicators related to the stress 'Degraded Riparian Forest Condition' | All IP habitat | 3 |
| *SONCC-HunC.27.2.20.1* | | *Measure the indicators, canopy cover, canopy type, and riparian condition* | | | | |
| SONCC-HunC.27.1.21 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Refine methods for setting population types and targets | Population wide | 3 |
| *SONCC-HunC.27.1.21.1* | | *Develop supplemental or alternate means to set population types and targets* | | | | |
| *SONCC-HunC.27.1.21.2* | | *If appropriate, modify population types and targets using revised methodology* | | | | |
| SONCC-HunC.27.2.22 | Monitor | No | Track habitat condition | Determine best indicators of estuarine condition | Estuary | 3 |
| *SONCC-HunC.27.2.22.1* | | *Determine best indicators of estuarine condition* | | | | |

| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|---|---|---|---|---|---|---|
| ***Step ID*** | ***Step Description*** | | | | | |
| SONCC-HunC.8.1.12 | Sediment | No | Reduce delivery of sediment to streams | Reduce road-stream hydrologic connection | Population wide; prioritize middle and lower reaches of basin, as well as Big South Fork | BR |
| *SONCC-HunC.8.1.12.1* | *Assess and prioritize road-stream connection, and identify appropriate treatment to meet objective* | | | | | |
| *SONCC-HunC.8.1.12.2* | *Decommission roads, guided by assessment* | | | | | |
| *SONCC-HunC.8.1.12.3* | *Upgrade roads, guided by assessment* | | | | | |
| *SONCC-HunC.8.1.12.4* | *Maintain roads, guided by assessment* | | | | | |
| SONCC-HunC.10.2.8 | Water Quality | No | Reduce pollutants | Set standard | Population wide | 3 |
| *SONCC-HunC.10.2.8.1* | *Develop TMDLs for 303(d) listed water bodies* | | | | | |
| SONCC-HunC.10.2.14 | Water Quality | No | Reduce pollutants | Educate stakeholders | Population wide | BR |
| *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.* | | | | | |