8. Brush 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
- 12 mi^2
- 6 IP km (4 IP mi) (18% High)
- Dominant Land Uses are Recreation, Timber Harvest
- Principal Stresses are 'Lack of Floodplain and Channel Structure' and 'Degraded Riparian Forest Conditions'
- Principal Threats are 'Roads' and 'Channelization and Diking'

8.1 History of Habitat and Land Use

Maguire (2001b) notes the Brush Creek watershed is poorly studied and the history of land use in the area is inconsistent. The creek bottom was the main trail north and south for Native Americans and then white settlers before a road was built through Brush Creek canyon just after 1920. The State of Oregon made its first purchase of land for Humbug Mountain State Park in 1926 and continued to expand the park to its current size (1800 acres) over the following 50 years. Maguire (2001b) could not substantiate whether there was a mill in middle Brush Creek reaches, but historic logging was widespread. Although Maguire (2001b) did not mention recent logging, it is evident in aerial photos as is the power line corridor, which can be easily seen because of the early seral conditions (Figure 8-2). The Highway 101 corridor confines the stream for long reaches and constitutes the most significant disturbance in the Brush Creek basin

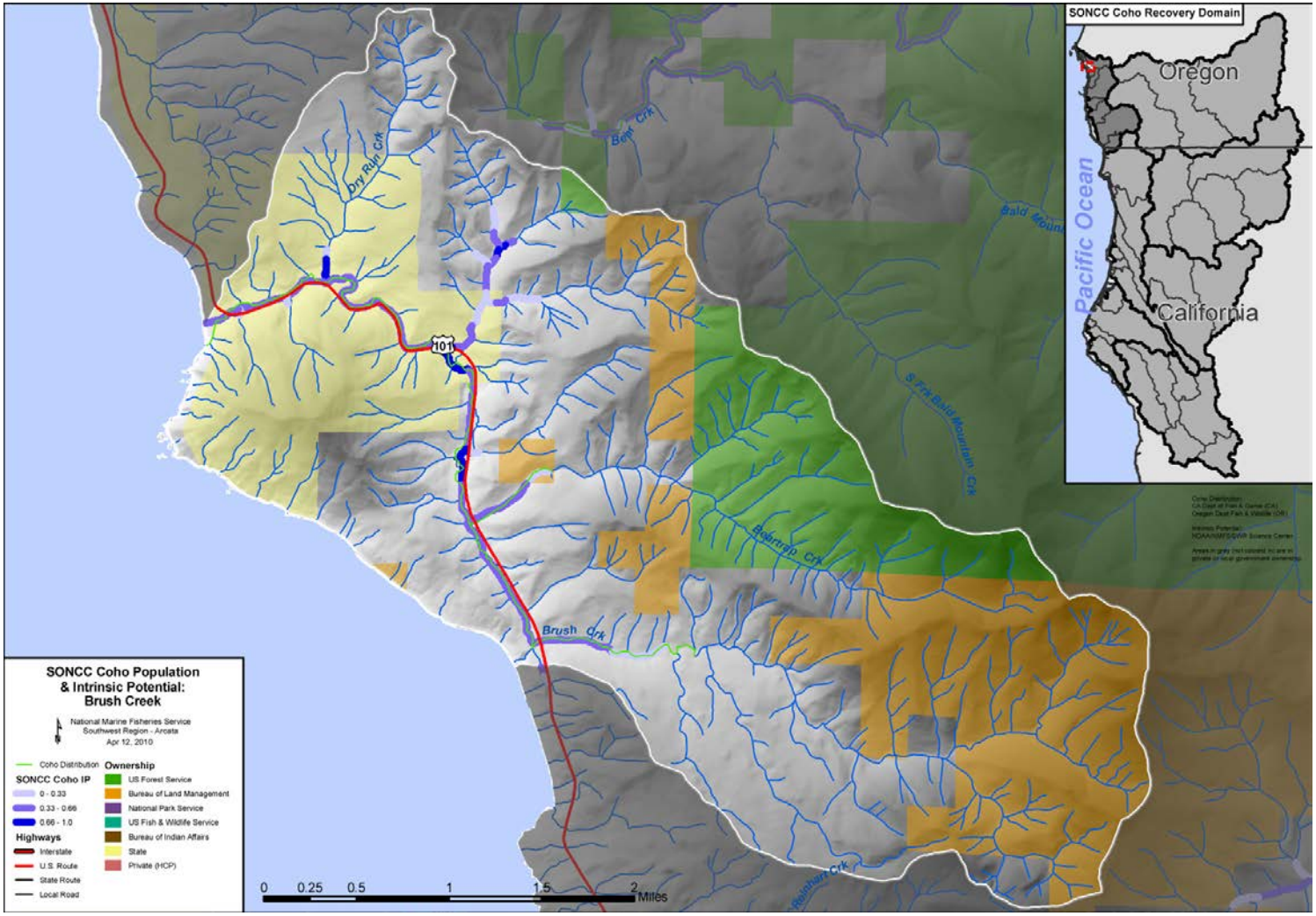

Figure 8-1. The geographic boundaries of the Brush Creek coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (ODFW 2010a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Interior Rogue diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

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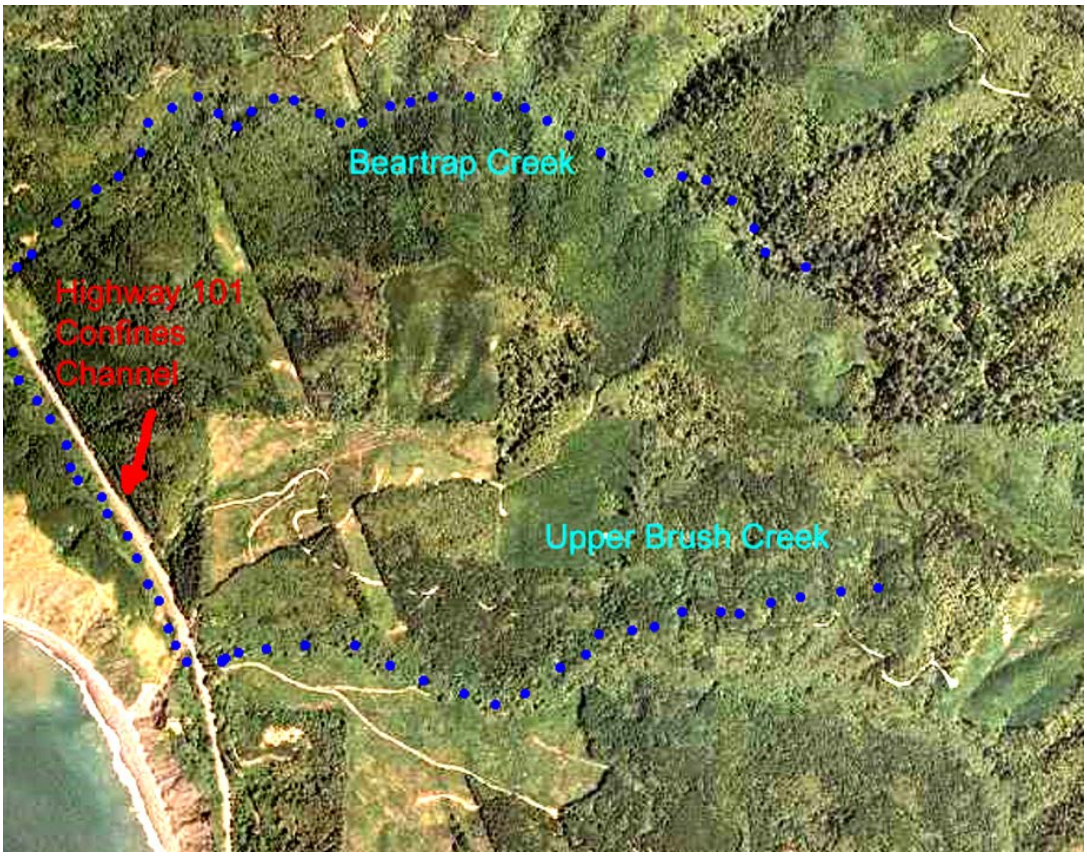

Figure 8-2. Upper Brush and tributary Beartrap Creek watersheds. Photo shows power line corridor, clearcut logging and Highway 101 running right along the stream. Blue dots approximate USGS (1984) streams.

8.2 Historic Fish Distribution and Abundance

There are 5.68 km of IP habitat in the Brush Creek basin, which is one of three coho salmon populations near Port Orford, Oregon (Maguire 2001b). Brush Creek has a higher gradient and greater natural valley confinement than its neighbor to the north, Hubbard Creek, with the bulk of high IP (>0.66) coho salmon habitat concentrated in the middle mainstem (Figure 8-1). Upper mainstem Brush Creek and the majority of Beartrap Creek are too steep for successful use by coho salmon. Table 8-1 lists the high intrinsic potential reaches and tributaries of Brush Creek.

Table 8-1. Tributaries with instances of high IP reaches (IP > 0.66). (Williams et al. 2006).

Stream Name	Stream Name	Stream Name
Brush Creek Mainstem	Dry Run Creek	Unnamed Tributary (lower Brush)

8.3 Status of Brush 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 have diverged from historical conditions, the greater the extinction risk. The confined mainstem channel conditions caused by Highway 101 restrict coho salmon use due to changes in stream velocity. ODFW (2005a) snorkeled two reaches, bracketing the area upstream and downstream of where Brush Creek first meets Highway 101, and found coho salmon in both reaches at very low densities (0.002 and 0.071 juveniles/m^2) in 2003 but did not find them in those same reaches in 2002. This suggests few adult spawners find suitable habitat in the Brush Creek basin, resulting in reduced diversity of the gene pool.

Population Size and Productivity

The very low density of coho salmon juveniles in Brush Creek found by ODFW in 2003 is likely associated with low adult population size caused by a reduction in the creek's carrying capacity due to channelization.

Extinction Risk

Not applicable because Brush Creek is not an independent population.

Role in SONCC Coho Salmon ESU Viability

The Brush 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 would likely receive sufficient immigration to alter its dynamics and extinction risk (Williams et al. 2006). Although such populations are not viable on their own, they do increase connectivity by allowing dispersal among independent populations and provide areas of refugia for other populations, acting as a source of colonists in some cases. The Brush Creek population likely interacts with other Northern Coastal dependent populations of coho salmon, such as Hubbard and Mussel creeks, as well as larger independent populations such as those in the Elk and Rogue rivers. Any restored habitat in Brush Creek provides potential connectivity that assists metapopulation function in the SONCC ESU.

8.4 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 Brush Creek population as follows:

Key concerns in Brush Creek were primarily loss of over-winter tributary 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. A diversion that flows over a cliff and into the ocean is also a key concern. Secondary concerns were related to a loss of over-winter, lowland habitat complexity due to past and current agricultural practices. In addition, high water temperatures exist for summer parr due to a loss of riparian function and channel straightening.

South Coast Watersheds Council

Port Orford Watershed Assessment

The Port Orford Watershed Assessment (Maguire 2001b) is a summary of conditions, historic changes, and restoration needs for Mill, Hubbard, and Brush creeks.

Port Orford Action Plan

The Port Orford Action Plan (Massingill 2001b) is a companion document to the Watershed Assessment. It describes a restoration strategy with specific recommended actions.

8.5 Stresses

Table 8-2. Severity of stresses affecting each life stage of coho salmon in Brush Creek. Stress rank categories and assessment methods are described in Appendix B, and the data used to assess stresses for the initial threats assessment (described in Appendix B) 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]	Very High	Very High	Very High[1]	Very High	Very High	Very High
2	Degraded Riparian Forest Conditions[1]	-	High	Very High[1]	High	High	Very High
3	Altered Sediment Supply	Low	Medium	High	Medium	Low	Medium
4	Impaired Estuary/Mainstem Function	-	Low	Low	Medium	Low	Low
5	Impaired Water Quality	Low	Low	Low	Low	Low	Low
6	Barriers	-	Low	Low	Low	Low	Low
7	Altered Hydrologic Function	Low	Low	Low	Low	-	Low
8	Adverse Fishery-Related Effects	-	-	-	-	Low	Low
9	Adverse Hatchery-related Effects	Low	Low	Low	Low	Low	Low

[1]Key limiting factor(s) and limited life stage(s).
[2]Increased Disease/Predation/Competition is not a 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. Degraded riparian conditions eliminated the source of large wood recruitment. Most historically available habitat in the estuary has been altered by development, channelization, and diking. These findings are consistent with those of the Oregon Expert Panel (ODFW 2008b) (Section 8.4). The diversion mentioned in ODFW (2008b) is discussed under the Altered Hydrologic Function stress, which rated as a low overall basin-wide stress.

Lack of Floodplain and Channel Structure

Highway 101 has caused major alterations of the Brush Creek channel, including relocation and confinement. This channel confinement resulted in increased velocity, which compromises adult coho salmon passage and decreases the quality of summer and winter rearing habitat. These high velocities could also increase bedload movement in confined reaches, leading to bed scour and loss of eggs and alevins. Large wood supply in Brush Creek is limited according to ODFW habitat data, and pool frequency is low. Where large wood has been restored to the channel, it has increased pool depth and created more complex habitats.

Degraded Riparian Forest Conditions

There are few large conifers in the riparian zone of Brush Creek above Humbug Mountain State Park, except for large trees in the headwaters of Brush Creek which are well above the range of coho salmon. The remainder of Brush Creek's riparian zone is comprised of hardwoods, including willow and alder. These species do not provide long lasting large wood for channel forming processes (Cederholm et al. 1997). Riparian development is impeded by the highway in some channelized sections. ODFW riparian surveys found the lower mainstem of Brush Creek to have poor riparian conditions (<75 conifers 36" diameter at breast height/1000 feet) due to development of campgrounds and recreational access.

Altered Sediment Supply

Altered sediment supply poses an overall medium stress to coho salmon in Brush Creek. Sediment contribution from landslides and erosion occurs naturally in the Brush Creek basin; however, roads, timber harvest, and bank erosion following removal of riparian vegetation have elevated fine sediment input. Habitat surveys in the lower section of Brush Creek found poor (>17 percent fines) silt/sand surface conditions except in reaches confined by Highway 101, where scores rose to good levels (12 to 15 percent fines). 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 Brush Creek basin 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 Estuary/Mainstem Function

Estuary function is important to the population because of its unique role in the life history and survival of coho salmon (Miller and Sadro 2003, Koski 2009). Brush Creek meets the Pacific Ocean after passing through a narrow canyon opening spanned by Highway 101. The estuary is

surrounded by very steep and unstable land at the base of Humbug Mountain and along the creek to the north. Although small in size, this estuary remains in good condition, with land being protected within Humbug Mountain State Park. The estuary/lagoon currently has little cover and complexity and has very little salmon rearing habitat. Because the estuary is naturally small, this lack of rearing habitat is not considered a threat for juveniles. However, lagoon breaching during the summer months may be affected by excess fine sediment and cause stress to outmigrating smolts.

Figure 8-3. Mouth of Brush Creek. Photo shows poorly developed estuary/lagoon, visible as a depression in the sandy beach that affords little opportunity for salmonid juvenile rearing.

Impaired Water Quality

Brush Creek's maximum floating weekly average water temperature (MWMT) value of less than 16° C is well under the ODEQ criteria of 18.4° C (64° F). Pesticide and herbicide use on both public and private lands contribute deleterious effects to water quality in Brush Creek. More significantly, Brush Creek's immediate adjacency to Highway 101 along most of its main stem makes it particularly vulnerable to herbicides from the Oregon Department of Transportations (ODOT) vegetation management program for invasive weed control.

Barriers

Maguire (2001b) reports only one potential barrier to juvenile salmonids in the Brush Creek basin, at the mouth of Dry Run Creek.

Altered Hydrologic Function

There are no dams or low-flow diversions in Brush Creek other than for use at Humbug Mountain State Park. However, timber harvest and associated roads may result in altered peak

flows (Grant et al. 2008). In addition, extreme high flows are diverted into the ocean through an overflow channel about 3 miles upstream of the mouth (NMFS 2005b) (see Dams/Diversions section below).

Adverse Fishery-Related Effects

The National Marine Fisheries Service (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).

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 Brush Creek population area. Hatchery-origin coho salmon may stray into Brush 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).

8.6 Threats

Table 8-3. Severity of threats affecting each life stage of coho salmon in Brush 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[1]		Egg	Fry	Juvenile	Smolt	Adult	Overall Threat Rank
1	Roads	Very High	Very High	Very High	Very High	Very High	Very High
2	Channelization/Diking	High	High	High	High	High	High
3	Timber Harvest	Medium	Medium	Medium	Medium	Medium	Medium
4	Climate Change	Low	Low	Medium	Medium	Medium	Medium
5	High Intensity Fire	Low	Low	Low	Low	Low	Low
6	Urban/Residential/Industrial	Low	Low	Low	Low	Low	Low
7	Road-Stream Crossing Barriers	-	Low	Low	Low	Low	Low
8	Dams/Diversions	-	Low	Low	Low	Low	Low
9	Fishing and Collecting	-	-	-	-	Low	Low
10	Hatcheries	Low	Low	Low	Low	Low	Low

[1] Agricultural Practices, Mining/Gravel Extraction, and Invasive and Non-Native/Alien Species are not considered threats to this population.

Roads

A greater problem than high overall road densities is the fact that Highway 101 follows and confines almost the entire mainstem of Brush Creek.

Channelization/Diking

Channelization and diking pose a high threat to Brush Creek coho salmon because of the effects of Highway 101, which runs adjacent to most of the mainstem of the creek. The highway causes confinement, accelerated currents and channel simplification, all of which affect coho salmon negatively. Development of campgrounds and day use recreation areas on the former flood terrace of the stream also confine the channel.

Timber Harvest

Timber harvesting in Brush Creek between 1972 and 1992 was less than 10 percent, except for patches of more intense activity where elevated road densities are also apparent (Bredensteiner et al. 2003). Maguire (2001b) produced a timber harvest map (Figure 8-4) that shows outlines of logged areas but does not provide information on when harvests took place or the harvest methods. Timber harvests in riparian zones and in headwater areas are likely to have played a role in decreased large wood supply. Forestry practices, past and present, in rain-dominated watersheds may combine to increase hydrologic risk as past practices may still be influencing the routing of water and causing channel modifications or increased fine sediment routing and turbidity (Maguire 2001b).

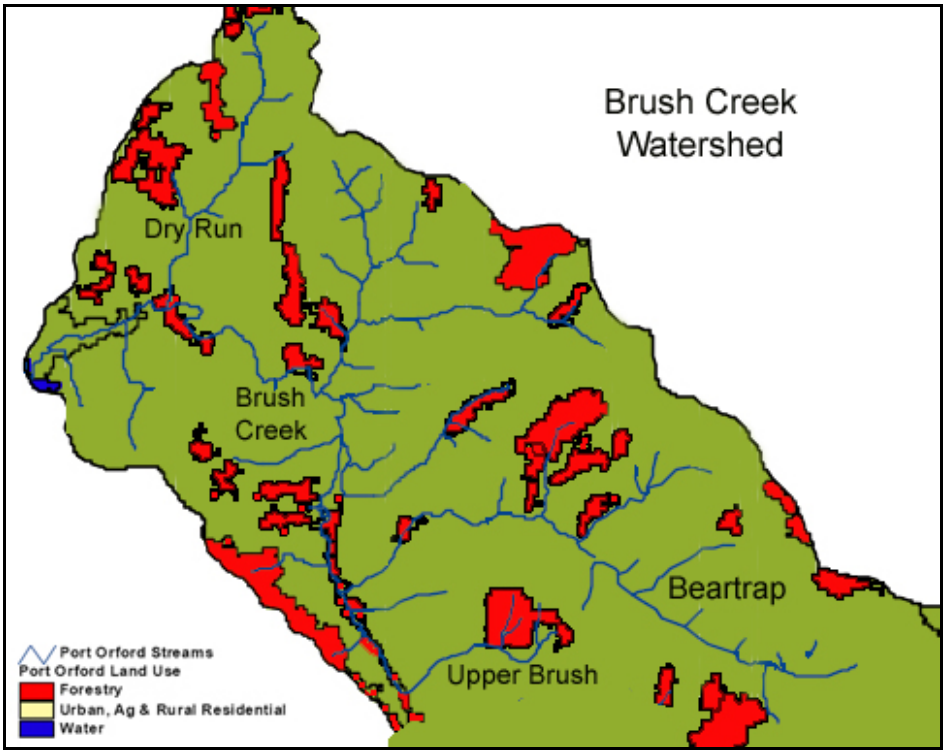

Figure 8-4. Map of timber harvest. This map was adapted from the Port Orford Watershed Assessment (Maguire 2001b) with polygons of timber harvests filled in with red. No metadata are available to understand harvest methods or dates.

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° 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).

High Intensity Fire

Brush Creek lies within the immediate coastal strip of southern Oregon and is subject to marine temperature mediation resulting in moist cool summers and high rainfall during fall, winter and spring. These attributes combine for a generally wet environment year-round and as a result a low threat score for fire.

Urbanization/Residential/Industrial Development

There is a relatively low level of urban and rural residential development in the Brush Creek basin.

Road-stream Crossing Barriers

A potential road-stream crossing barrier for juvenile coho salmon and other salmonids has been identified at the mouth of Dry Run Creek (Maguire 2001b).

Dams/Diversions

Near where Brush Creek first meets Highway 101, an overflow channel diverts peak flows from Brush Creek off a steep cliff into the ocean (NMFS 2005b). The overflow reduces roadway flooding downstream, but is unscreened and any coho entrained are killed. The overflow is now triggered during flows greater than 700 cfs, which are expected to occur on average once every 15 years

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 (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 Brush Creek.

Hatcheries

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

8.7 Recovery Strategy

The most immediate need for habitat restoration and threat reduction in Brush Creek is in those areas currently occupied by coho salmon, which according to the limited available data is the mainstem of Brush Creek. Unoccupied areas must also be restored to provide enough habitat for coho salmon to complete their life cycle.

The Brush 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. Despite impaired habitat conditions, Brush Creek has maintained use by coho salmon, possibly through straying from larger independent populations like the Elk River and Rogue River nearby. Highway 101, which is not likely to be relocated, is the major impediment to achieving full coho salmon potential in Brush Creek.

The most important factor limiting recovery of coho salmon in Brush 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 8-4 on the following page lists the recovery actions for the Brush Creek population.

Table 8-4. Recovery action implementation schedule for the Brush Creek population.

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	***Step Description***					
SONCC-BruC.2.1.1	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Mainstem within Humbug Mountain State Park	3
SONCC-BruC.2.1.1.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-BruC.2.1.1.2	*Place instream structures, guided by assessment results*					
SONCC-BruC.2.1.2	Floodplain and Channel Structure	Yes	Increase channel complexity	Improve timber harvest practices	Population wide	BR
SONCC-BruC.2.1.2.1	*Revise Oregon Forest Practice Act Rules in consideration of IMST (1999) and NMFS (1998) recommendations*					
SONCC-BruC.2.2.3	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Lower mainstem	3
SONCC-BruC.2.2.3.1	*Develop program to educate and provide incentives for landowners to keep beavers on their lands*					
SONCC-BruC.2.2.3.2	*Implement beaver program (may include reintroduction)*					
SONCC-BruC.2.2.9	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel ponds, alcoves, backwater habitat, and old stream oxbows	Population wide	3
SONCC-BruC.2.2.9.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-BruC.2.2.9.2	*Implement restoration projects that improve off channel habitats as guided by assessment results*					
SONCC-BruC.7.1.6	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Lower mainstem, estuary/lagoon	BR
SONCC-BruC.7.1.6.1	*Determine appropriate silvicultural prescription for benefits to coho salmon habitat*					
SONCC-BruC.7.1.6.2	*Thin, or release conifers, guided by prescription*					
SONCC-BruC.7.1.6.3	*Plant conifers, guided by prescription*					
SONCC-BruC.27.2.8	Monitor	No	Track habitat condition	Track habitat indicators related to spawning, rearing, and migration	Population wide	3
SONCC-BruC.27.2.8.1	*Measure indicators for spawning and rearing habitat. Conduct a comprehensive survey*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID		***Step Description***				
SONCC-BruC.27.2.8.2		*Measure indicators for spawning and rearing habitat once every 15 years, sub-sampling 10% of the original habitat surveyed*				
SONCC-BruC.27.1.12	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Estimate juvenile spatial distribution	Population wide	3
SONCC-BruC.27.1.12.1		*Conduct presence/absence surveys for juveniles (3 years on; 3 years off)*				
SONCC-BruC.27.2.13	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Lack of Floodplain and Channel Structure'	All IP habitat	3
SONCC-BruC.27.2.13.1		*Measure the indicators, pool depth, pool frequency, D50, and LWD*				
SONCC-BruC.27.2.14	Monitor	No	Track habitat condition	Track habitat indicators related to the stress 'Degraded Riparian Forest Condition'	All IP habitat	3
SONCC-BruC.27.2.14.1		*Measure the indicators, canopy cover, canopy type, and riparian condition*				
SONCC-BruC.27.1.15	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Refine methods for setting population types and targets	Population wide	3
SONCC-BruC.27.1.15.1		*Develop supplemental or alternate means to set population types and targets*				
SONCC-BruC.27.1.15.2		*If appropriate, modify population types and targets using revised methodology*				
SONCC-BruC.27.2.16	Monitor	No	Track habitat condition	Determine best indicators of estuarine condition	Estuary	3
SONCC-BruC.27.2.16.1		*Determine best indicators of estuarine condition*				
SONCC-BruC.5.1.7	Passage	No	Improve access	Remove barriers	Population wide, particularly mouth of Dry Run Creek	BR
SONCC-BruC.5.1.7.1		*Assess and prioritize barriers using the ODFW fish passage barrier database*				
SONCC-BruC.5.1.7.2		*Remove barriers*				
SONCC-BruC.8.1.10	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	Population wide	BR
SONCC-BruC.8.1.10.1		*Assess and prioritize road-stream connection, and identify appropriate treatment to meet objective*				
SONCC-BruC.8.1.10.2		*Decommission roads, guided by assessment*				

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	***Step Description***					
SONCC-BruC.8.1.10.3	*Upgrade roads, guided by assessment*					
SONCC-BruC.8.1.10.4	*Maintain roads, guided by assessment*					
SONCC-BruC.10.2.5	Water Quality	No	Reduce pollutants	Educate stakeholders	Population wide	BR
SONCC-BruC.10.2.5.1	*Develop an educational program that teaches landowners and businesses about avoiding pollution from septic systems, backyard pesticides, fuels, and nutrients.*					
SONCC-BruC.10.2.11	Water Quality	No	Reduce pollutants	Educate stakeholders	Population wide	BR
SONCC-BruC.10.2.11.1	*Develop stormwater management plan, consistent with ODEQ specifications, to minimize non-point source pollution from entering Brush Creek from HWY 101 and campgrounds*					