17. Wilson Creek Population

- Central Coastal Diversity Stratum
- Dependent Population
- Recovery criteria: 20% of IP habitat must be occupied in years following spawning of brood years with high marine survival
- 26.5 mi^2
- 19 IP km (12 mi) (54% High)
- Dominant Land Uses are Timber Harvest and Recreation
- Principal Stresses are 'Lack of Floodplain and Channel Structure' and 'Degraded Riparian Forest Conditions'
- Principal Threat is 'Roads'

17.1 History of Habitat and Land Use

Historically, timber harvest dominated the land use in the population area, and continues in many areas today. Lasting impacts to instream habitat from historic logging operations include increased sedimentation and erosion from unpaved logging roads and road crossings, decreased large wood recruitment, and decreased channel complexity. Currently 75 percent of land in the watershed is used for timber production while the remaining 25 percent is the Del Norte Coast Redwoods State Park and Redwood National Park (Pacific Watershed Associates (PWA) 2004). In the early 1900s, California established Del Norte Coast Redwoods State Park, which has numerous intact old-growth stands, while the federal government has managed Redwood National Park, which includes some previously harvested lands, for conservation goals since 1968. In 1994, the State of California and the National Park Service agreed to manage the parks jointly. Highway 101, built in 1926, continues to impair estuarine function of some streams and is a barrier to fish passage on at least one stream. While in a relatively rural area, there has been residential and industrial development in and around the Wilson Creek population area. In the streams immediately south of Crescent City, rural development and roads impact coho salmon habitat through alterations to fish passage and stream function. More recently, the housing developments in the northern part of the population area have encroached on these small coastal creeks.

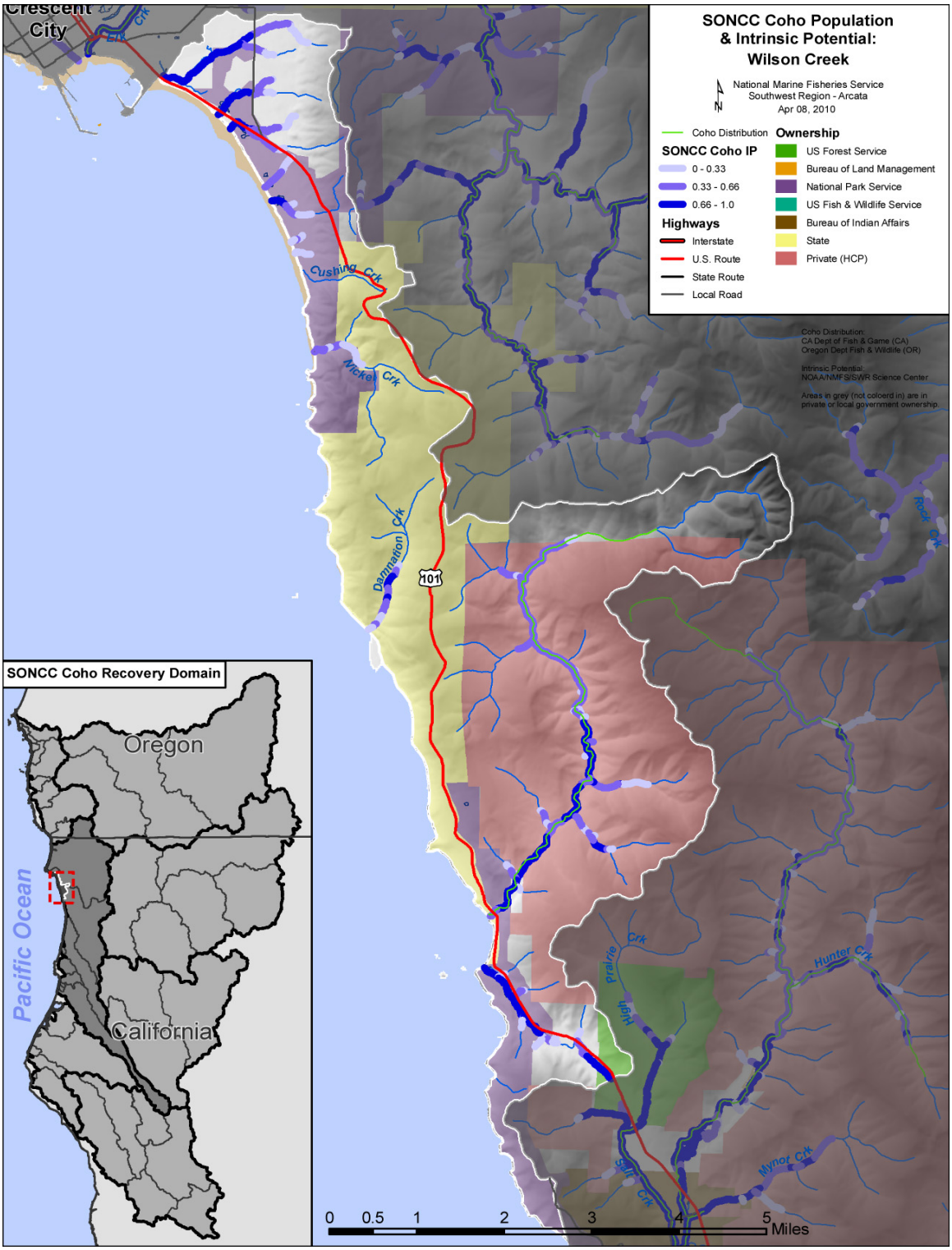

Figure 17-1 The geographic boundaries of the Wilson Creek coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (CDFG 2009a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Northern Coastal diversity stratum (Williams et al. 2006) Grey areas indicate private ownership.

17.2 Historic Fish Distribution and Abundance

The Wilson Creek population area is comprised of Wilson Creek as well as several smaller creeks along the coast north and south of Wilson Creek. The population area includes seven small creeks just south of Crescent City, which are currently unnamed, as well as Cushing Creek, Nickel Creek, Damnation Creek, Wilson Creek, and Lagoon Creek. Each of these creeks contributes to the persistence and continued survival of the Wilson Creek population of coho salmon. Aside from a small subset of historical data on juvenile abundance in Wilson Creek, no long-term data exist on coho salmon characteristics in the Wilson Creek population area. Fish rescue data taken between 1939 and 1952 ranged from 41,507 juveniles in 1940 to 1,957 juveniles in 1952 (Brown and Moyle 1991) and suggest highly variable, but at times substantial, numbers of juvenile coho salmon occupying the Wilson Creek drainage.

The lower four miles of the creek has high intrinsic potential (IP > 0.66). Other creeks in the area also exhibit high IP values for coho salmon including Nickel Creek, Cushing Creek, Lagoon Creek and several unnamed, small coastal streams south of Crescent City. The highest potential is primarily restricted to the coastal bottomlands of these streams. Many of these streams may have supported coho salmon in the past and likely provided habitat for occasional strays and juveniles in years with abundant returns. Wilson Creek is probably the only creek in the population area to have independently supported large coho salmon runs in the past.

Table 17-1. Tributaries with instances of high IP reaches (IP > 0.66) (Williams et al. 2006).

Subarea	Stream Name
Wilson Creek	Cushing Creek
	Damnation Creek
	Lagoon Creek
	Wilson Creek[1]
	Unnamed coastal creeks approximately 2 miles south of Crescent City

[1]Denotes a "Key Stream" as identified in the State of California's Coho Salmon Recovery Strategy

17.3 Status of Wilson 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 geographic extent of this population, which occupies an area less than 30 square miles, and encompasses only a few small coastal watersheds, make it naturally isolated. Although the availability of suitable, high IP habitat suggests that historically coho may have occupied streams throughout the population area, recent surveys suggest their current distribution is limited to the Wilson Creek drainage.

Many of the creeks within the population area have never been surveyed for fish presence or habitat condition, and only Wilson Creek has been thoroughly surveyed for coho salmon. Survey data is lacking for determining the presence and distribution of juveniles in the additional

drainages in the basin, but the presence of high IP habitat suggests these areas could potentially support coho salmon. The unnamed creeks just south of Crescent City have the highest potential for having had historic runs and supporting current runs, but current presence/absence data does not exist. A very limited amount of habitat and/or fisheries data is available for Lagoon Creek, Nickel Creek, and Cushing Creek, and none confirm the presence of coho salmon in these small watersheds. The presence of steelhead in Nickel Creek, however, suggests current habitat conditions may be suitable for coho salmon.

Within Wilson Creek, natural fish passage barriers and stream conditions restrict the availability of summer rearing habitat. Known rearing habitat is found in most of the area upstream of the Redwood National and State Parks boundary (below which the stream is intermittent in summer) and downstream of the Green Diamond Resource Company (GDRC) property line (above which a natural waterfall exists). This reach is approximately 5 miles long with four major tributaries. High IP values in this reach exist in the first 2.5 miles upstream of the park boundary. Survey data indicates the presence of coho salmon juveniles although no documented spawning by coho salmon occurs in the area. While other high IP areas exist in the Wilson Creek basin, it is likely that these areas are degraded by historic and current land use activities such as logging, road building, and development. Salmon spawn in only 2.5 km of the historic 18.8 kilometers of habitat (13 percent), indicating a severe restriction in distribution and spatial structure.

Population Size and Productivity

Data suggest the size of the Wilson Creek population is highly variable and the population is dependent on production from other populations. Williams et al. (2008) characterized the population as dependent because of its low productive potential and high degree of outside influence. NMFS is aware of only one coho spawning survey for the population, conducted in Wilson Creek, which documented only one redd. However, the presence of juvenile coho salmon (GDRC 2009) and use of Wilson Creek by other salmonid species for spawning confirms the presence of suitable spawning conditions (GDRC 2006). In small spawning populations, the survival and production of eggs or offspring may suffer because it may be difficult for spawners to find mates, or predation pressure may become too great. This situation accelerates a decline toward extinction.

It is likely that much of the production that occurs in this population is in Wilson Creek, where coho salmon juveniles consistently occur. The number of juveniles has varied widely as indicated by Green Diamond summer surveys between 1995 and 2010. The estimated population was almost 1,400 in 1995, fell to fewer than 50 by 1999 and 2000, fluctuated between about 500 to 11,000 juveniles from 2001 to 2008, was 0 in 2009, and then rose to 1843 in 2010 (GDRC 2011a). Prior to this sampling effort, CDFG observed only two outmigrating coho smolts leaving the system in 1987, and concluded the low recruitment was due to low young-of-the-year (YOY) survival and an overall lack of suitable rearing habitat. Coho salmon presence was detected for 13 of 16 brood years sampled in the years 1983 to 2002 (Jong et al. 2008). Despite the fairly consistent presence of coho salmon in the Wilson Creek population, the low abundance of spawners and the highly variable population numbers indicate low population size and poor productivity.

Extinction Risk

Not applicable because Wilson Creek is not an independent population.

Role in SONCC Coho Salmon ESU Viability

The Wilson Creek population is 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 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 Wilson Creek population would have interacted with other potentially independent populations, such as the Smith River to the north or the Lower Klamath River to the south, as well as the dependent Elk Creek population to the north. Any restored habitat in Wilson Creek provides potential connectivity and increased resiliency in the SONCC coho salmon ESU.

17.4 Plans and Assessments

State of California

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

The California Fish and Game Commission adopted the Recovery Strategy for California Coho Salmon in February 2004. The CDFG Recovery Strategy for the Wilson Creek population includes recommendations for the Wilson Creek hydrologic sub-area (HSA) but not for the other watersheds in the population area. The recommendations developed by CDFG for all SONCC coho salmon populations have been considered and incorporated into the recovery strategy and list of recovery actions where appropriate.

Wilson Creek Watershed Assessment and Erosion Prevention Planning Project

This CDFG-funded project (PWA 2004) identified current and future sources of sediment from roads within the Wilson Creek watershed. This work included a) an analysis of historic photos to determine road construction history; b) an inventory of current and future road-related sediment sources for 109 miles of logging road; and c) a prioritized plan for cost-effective erosion control and erosion prevention treatments for the Wilson Creek basin. The analysis identified 520 sites with the potential to deliver sediment to streams and prioritized the areas for treatment before they deliver sediment to Wilson Creek and its tributaries.

Redwood National and State Parks

Fish Distribution and Status Survey

In 2006, the RNSP surveyed seven watersheds within the park to determine the distribution and status of threatened and non-listed salmonid species. Included in this survey was an assessment of the lower 135 meters of Nickel Creek.

California Conservation Corps

Green Diamond Resource Company

Habitat Conservation Plan

Green Diamond Resource Company (GDRC) owns forestland in the Wilson Creek basin. The GDRC developed an Habitat Conservation Plan, which was finalized in 2006 and is valid through 2056, in accordance with ESA section 10 to minimize and mitigate the potential adverse effects of any authorized taking of aquatic species that may occur incidental to Green Diamond's activities; to ensure that any authorized take and its probable impacts will not appreciably reduce the likelihood of survival and recovery in the wild of aquatic species; and contribute to efforts to reduce the need to list currently unlisted species under the ESA in the future by providing early conservation benefits to those species (GDRC 2006). The plan contains a number of provisions designed to protect coho salmon and salmon habitat throughout the population area.

17.5 Stresses

Table 17-2. Severity of stresses affecting each life stage of coho salmon in the Wilson Creek population. 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]	High	High	Very High[1]	High	High	High
2	Degraded Riparian Forest Conditions[1]	-	High	High[1]	High	High	High
3	Altered Sediment Supply	High	High	High	Medium	Medium	High
4	Altered Hydrologic Function	Medium	Medium	Medium	Medium	-	Medium
5	Impaired Estuary/Mainstem Function	-	Low	Medium	Medium	Medium	Medium
6	Adverse Fishery-Related Effects	-	-	-	-	Medium	Medium
7	Impaired Water Quality	Low	Low	Low	Low	Low	Low
8	Barriers	-	Low	Low	Low	Low	Low
9	Adverse Hatchery-Related Effects	Low	Low	Low	Low	Low	Low
10	Adverse Fishery-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 considered a stress for this population.

Limiting Stresses, Life Stages, and Habitat

Lack of floodplain and channel structure and degraded riparian conditions are the limiting stressors for the Wilson Creek coho salmon population. These stressors are likely limiting

juveniles by causing decreases in rearing habitat, large wood, simplifying instream habitat, and causing the disconnection of refugia for winter and summer rearing habitat. Additionally, these stresses affect adult coho salmon by decreasing available spawning habitat in high IP streams and tributaries.

Lack of Floodplain and Channel Structure

The lack of floodplain and channel structure and associated decreases in rearing habitat pose a high or very high stress to coho salmon across all life history stages. Alterations to instream habitat have led to a significant decrease in the quality and quantity of rearing habitat, which is the limiting factor for juvenile coho survival and viability in the Wilson Creek population area. Sedimentation from current and historic logging, road building, and development has led to the filling, widening and simplification of stream channels, disconnection of floodplains and other off channel areas, and the loss of pool habitat. These changes have also affected flow regime, the availability and quality of spawning habitat, and bedload movement throughout the basin.

The amount of in-channel large wood is likely substantially lower than historical conditions. There have been two habitat surveys in the Wilson Creek watershed, one in 1994 (GDRC 2006) and another in 2005 (GDRC 2011b). The total number of pieces of large wood in the active channel increased from 2.1 per 100 feet to 2.9 per 100 feet, with most of the change due to an increase in the number of pieces in the smallest size category (6-20 feet long and 1-1.9 feet diameter). This increase is likely due to the placement of large wood structures in Wilson Creek over the past 10 years. The amount of large wood in Wilson Creek is lower than in most other inventoried streams on Green Diamond land (GDRC 2006), well below levels required for healthy stream function, and the small size of this wood (less than 2 foot diameter) reflects the alder-dominant riparian zones prevalent in the watershed. The lack of large diameter wood results in decreased amounts of in channel shelter and decreases the formation of pools and other refugia vital to juvenile survival (CH2MHILL 2006). Percent pools by length remained static between the 1994 and 2005 surveys at 28-29 percent, while the proportion of pools greater than 3ft deep by occurrence decreased from 55 percent to 48 percent.

Channels predicted to be moderate IP habitat in some small unnamed streams in the lowlands of the northern portion of the population area appear to have been filled in to accommodate agriculture and residential development, because they currently lack defined stream channels but there is riparian vegetation present upstream (Figure 17-2).

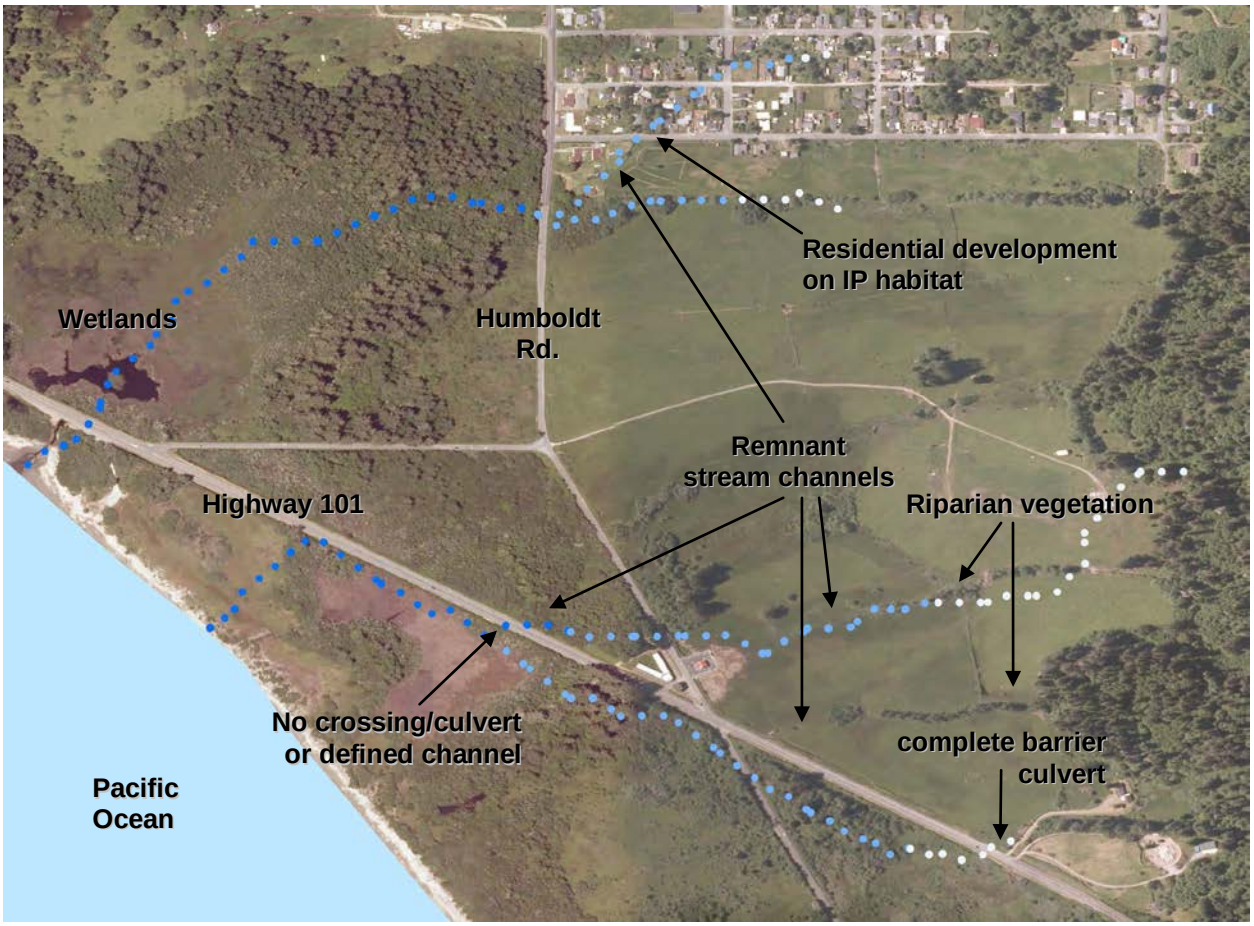

Figure 17-2. Aerial photo of the floodplain of un-named creeks in the northern portion of the population area, just south of Crescent City. Dotted lines represent IP habitat (Williams et al. 2006). Photo from the U.S. Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) taken in 2010.

Degraded Riparian Forest Conditions

The impacts of degraded riparian conditions on juvenile and adult coho salmon include increased sedimentation and bank instability, and lack of stream complexity due to poor wood recruitment. These impacts are the result of historic and current logging practices and residential development throughout the watershed. Mean percent canopy in Wilson Creek decreased from 79 percent in 1994 to 58 percent in 2005 and is provided almost entirely by hardwoods (GDRC 2006, 2011b).

Altered Sediment Supply

Altered sediment supply is a high stress to the early life stages of coho salmon in the Wilson Creek population. Alterations to the sediment supply have resulted from historic and current logging in the basin, road building in unstable areas, and removal of vegetation from riparian areas and upslope sites for urban development. Sediment loading has led to the filling in and widening of stream channels, increase in fine sediment, decreases in pool depth and complexity, mortality of eggs and smothering of redds, and changes in channel form that may result in passage problems. In lower Wilson Creek, sediment deposits have eliminated surface flows during certain times of the year, limiting connectivity for migrating juveniles. Assessments of

erosion and sedimentation in the watershed (PWA 2004) confirm the high level of this stress. The percent of pool tailouts with 0-25% embeddedness decreased from 37 percent in 1994 to 28 percent in 2005 (GDRC 2006, 2011b), suggesting the fine sediment levels may be decreasing in Wilson Creek.

Altered Hydrologic Function

Sediment from logging and road construction negative affects the hydrologic function of streams in the population area. Sediment has eliminated surface flows in up to 3 miles of the lower part of Wilson Creek during low flow conditions, which has limited connectivity and decreased rearing habitat availability for juveniles. Summer fish surveys by Green Diamond in 2010 and 2011 found that the creek remained wet for approximately another 0.5 miles downstream than it did between 1995 and 2009 (GDRC 2011b), to the most upstream high IP habitat shown in Figure 17-1. A review of aerial photos indicates annual variability of which portions of the lower creek are dry. Natural hydrologic function is important for maintaining summer rearing habitat for juvenile coho, and can be improved by improving timber harvest practices, treating road systems, decommissioning roads, and managing development for increased ecosystem function.

Impaired Estuary/Mainstem Function

The major coho-producing stream, Wilson Creek, lacks an estuary (GDRC 2006). It is unclear if this is a natural condition or is caused by channel confinement and fill associated with Highway 101. Other small streams in the population area are experiencing loss of estuarine habitat and degradation of estuarine conditions due to diking, development of wetlands (Figure 17-2), and changes to the hydrograph. Highway 101 creates a permanent dike near the mouths of some of the unnamed streams immediately south of Crescent City, diminishing tidal exchange, creating passage barriers, and disconnecting vital estuarine and off channel wetland habitat. Estuarine and brackish habitats can increase the size and survival of out migrating juvenile salmon. Eliminating impediments to natural estuarine function would increase the value of this habitat and increase growth and survival of juveniles.

Impaired Water Quality

Water temperatures at monitored locations are highly suitable for coho salmon in Wilson Creek (GDRC 2006, 2011b), suggesting that the coastal climate maintains cool water despite the poor riparian shade. Groundwater seeps could also potentially contribute to cool water temperatures. Instream measurements are lacking, but turbidity during winter storm events is likely high. Highway 101 runs through the lower portions of the streams in the population area and is a potential source of chemical/petroleum spills from accidents. Also, the lower end of Lagoon Creek in the southern part of the population area was historically a millpond and is known to contain chemical contaminants (Anderson 2010).

Barriers

Overall, barriers present a low level of stress to the Wilson Creek population. The PWA (2004) Wilson Creek assessment identified 91 road-stream crossings in the watershed, including three sites identified as potential fish barriers located on tributaries with moderate IP habitat. Green

Diamond has since remedied all three sites (Bourque 2011). Surveys have identified at least two impassible culverts on creeks with high IP values in unnamed creeks south of Crescent City (CalFish 2009), one of which is located on Highway 101 and has little or no IP habitat upstream (Figure 17-2). In addition, there is no culvert across Highway 101 at one stream with predicted moderate IP, because either the stream channel never existed or it was filled in (Figure 17-2). Road-stream crossings may prevent juvenile movement and migration during certain times of the year and identified impassable culverts prevent coho salmon from using habitat in those smaller watersheds. Additionally, a number of barriers may exist in key streams, which cause decreased habitat availability and limit the potential spatial structure in the population area.

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 Wilson Creek population area. 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 managed fisheries are not likely to jeopardize the continued existence of the SONCC coho salmon ESU (Appendix B). NMFS has not formally evaluated the effect of fisheries managed by the state of California on the continued existence of the SONCC coho salmon ESU (Appendix B).

17.6 Threats

Table 17-3. Severity of threats affecting each life stage of coho salmon in the Wilson Creek population. 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	High	Very High	Very High	High	High	High
2	Timber Harvest	Medium	Medium	Medium	Medium	Medium	Medium
3	Fishing and Collecting	-	-	-	-	Medium	Medium
4	Climate Change	Low	Low	Low	Low	Medium	Low
5	Urban/Residential/Industrial	Low	Low	Medium	Low	Low	Low
6	Agricultural Practices	Low	Low	Low	Low	Low	Low
7	Channelization/Diking	Low	Low	Low	Low	Low	Low
8	Dams/Diversion	Low	Low	Low	Low	Low	Low
9	High Intensity Fire	Low	Low	Low	Low	Low	Low
10	Road-Stream Crossing Barriers	-	Low	Low	Low	Low	Low
11	Hatcheries	Low	Low	Low	Low	Low	Low

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

Roads

Road density within the Wilson Creek population area is over 3 miles of road per square mile of watershed area. Roads are not maintained in many areas, creating landslides, increased sedimentation and alteration of hydrologic function throughout the population area. Watersheds with high road density are thought to be "not properly functioning" (NMFS 1996). Over 109 miles of road in the Wilson Creek watershed exist, of which only a portion are needed for timber operations in the area. Although timber harvest in Redwood National and State Parks ceased in 1968, the remaining roads (many of which are now trails) continue to degrade stream conditions on public lands. Roads contribute the majority of the sediment to the creeks in the Wilson Creek population area and cause loss of habitat complexity within streams (PWA 2004). Much of the excess sediment sources in the Wilson Creek basin originate from poorly built road-stream crossings, areas of landslide erosion, and road surface and ditch erosion. Increased sediment delivery in Wilson Creek has filled pools, widened channels, and simplified stream habitat, decreasing spawning and rearing habitat quantity and quality throughout the area. The Enderts Beach Road/Del Norte Redwoods Coastal Trail, which was originally the historic Highway 101, runs along the entire coast within the Del Norte Coast Redwoods State Park, potentially blocking

fish passage in some areas and contributing to sedimentation and erosion in small coastal watersheds (Burgess 2008, Sanders 2008).

Timber Harvest

Although timber harvest was once considered a major threat to coho salmon in the Wilson Creek population, it currently presents a medium threat due to the more limited extent of timber harvest today. Nevertheless, a distinct contrast in tree size is evident between private lands in Wilson Creek (with mainly small trees 10 to 19.9" in diameter) and public lands in western Wilson Creek and in Damnation Creek (with mainly large trees >30" in diameter). The threats posed by timber harvest are confined to the Wilson Creek watershed where logging continues within the roughly 5,000 acres owned by Green Diamond. Within Green Diamond property, harvest occurs at a moderate level and under the direction of the company's HCP, which addresses ways to minimize and mitigate effects from timber harvest through measures related to road and riparian management, slope stability, and harvesting activities. Poor riparian conditions in Wilson Creek and throughout the population area are attributed to past and present timber harvest and continue to be a threat to the Wilson Creek population in many areas. Although some watersheds outside of Wilson Creek may have partly recovered some riparian structure and function, the cessation of timber harvest in riparian areas has been too recent to allow many areas to progress to the necessary late seral stage that provides benefits for salmonids. While working under an HCP provides direction for less intensive and harmful timber harvest activities, the continuation of any amount of timber harvesting will continue to be a threat to the Wilson Creek coho salmon population.

Fishing and Collecting

California-managed fisheries for species other than coho salmon occur in estuaries, freshwater, and nearshore marine areas. NMFS has not formally evaluated the effects of these fisheries on the continued existence of the SONCC coho salmon ESU.

Climate Change

There is moderate risk of a 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 low (Thieler and Hammer-Klose 2000). 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).

Urban/Residential/Industrial Development

Due to the current land ownership, threats from urban, residential, and industrial development are minimal in most of the population area; however there is potential for additional development in the floodplain and watersheds of the small unnamed creeks south of Crescent City.

Agricultural Practices

Most of the Wilson Creek population area (80 percent) is comprised of state, federal, and timberlands covered by an HCP. Given that only a fraction of the land base is used for agricultural production, agriculture poses a low threat to all life stages of coho salmon in the population area. There is some cattle grazing on private non-HCP land the Wilson Creek watershed (Bourque 2011), but potential effect on aquatic habitat is unknown. Legacy effects of past agriculture appear to include the filling of channels in some unnamed streams south of Crescent City to facilitate increased agricultural production (Figure 17-2).

Channelization/Diking

Channelization and diking is a low threat to coho salmon in the area, although Highway 101 acts as a dike near the mouth of several unnamed streams south of Crescent City and interferes with hydrologic connectivity. The highway may also act as a dike on Lagoon Creek, which has been highly altered and lacks much of its historic hydrologic function.

Dams/Diversions

Dams and diversions present a low threat to the Wilson Creek coho salmon population. A logjam located near the mouth of Lagoon Creek is probably related to a dam or structure that was built to form the mill pond at the old mill site. It is unknown if this jam is creating a passage problem for fish or causing other hydrologic issues. A natural lagoon may have once been present at this site but was also likely modified to help form the millpond. The likelihood that illegal withdrawal is occurring is minimal since most of the land is in Redwood National and State Parks, or owned by Green Diamond.

High Intensity Fire

The Wilson Creek population area is located in a cool, Mediterranean climate, with no history of episodic or seasonal fire. The area is characterized by cool, wet winters and surrounding redwood forests keep forest conditions moist and fire potential low.

Road-Stream Crossing Barriers

Road-stream crossing barriers pose a low threat to the Wilson Creek coho salmon population. However, a number of barriers exist in key streams and limit or prevent access to high IP stream reaches and reduce connectivity within high IP streams. Road-stream crossings preventing fish passage barriers have been identified in the Wilson Creek watershed, and at least two impassable culverts have been identified in the creeks south of Crescent City.

Hatcheries

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

17.7 Recovery Strategy

The most immediate need for habitat restoration and threat reduction in the Wilson Creek population area is the mainstem of Wilson Creek, which is the only creek currently occupied by coho salmon. Unoccupied areas must also be restored to provide enough habitat for coho salmon recovery.

The inherent capacity to support coho salmon in the Wilson Creek population area is evident, yet the Wilson Creek population is severely depressed and likely occupies only one small coastal watershed with less than 5 miles of stream habitat. The Wilson 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 coho salmon must occupy 20% of IP habitat in years following spawning of brood years with high marine survival. The most important factor limiting recovery of coho salmon in Wilson Creek is a lack 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.

Little is known about creeks in the population area other than Wilson Creek, but occupancy of these creeks would provide greater spatial diversity and capacity to the population. Before time or money is invested in these creeks, however, it must be determined whether coho salmon are present, and the quality and quantity of the habitat there should be evaluated.

Table 17-4 on the following page lists the recovery actions for the Wilson Creek population.

Table 17-4. Recovery action implementation schedule for the Wilson Creek population.

Action ID / Step ID	Strategy	Key LF	Objective	Action Description	Area	Priority
SONCC-WilC.2.1.1	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Unnamed creeks south of Crescent City and Wilson Creek	3
SONCC-WilC.2.1.1.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-WilC.2.1.1.2	*Place instream structures, guided by assessment results*					
SONCC-WilC.2.2.10	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Unnamed creeks south of Crescent City and Lower Wilson Creek	3
SONCC-WilC.2.2.10.1	*Develop program to educate and provide incentives for landowners to keep beavers on their lands*					
SONCC-WilC.2.2.10.2	*Implement beaver program (may include reintroduction)*					
SONCC-WilC.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	Unnamed creeks south of Crescent City and Lower Wilson Creek	3
SONCC-WilC.2.2.11.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-WilC.2.2.11.2	*Implement restoration projects that improve off channel habitats as guided by assessment results*					
SONCC-WilC.7.1.2	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Population wide	BR
SONCC-WilC.7.1.2.1	*Determine appropriate silvicultural prescription for benefits to coho salmon habitat*					
SONCC-WilC.7.1.2.2	*Thin, or release conifers, guided by prescription*					
SONCC-WilC.7.1.2.3	*Plant conifers, guided by prescription*					
SONCC-WilC.7.1.3	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	Population wide	BR
SONCC-WilC.7.1.3.1	*Apply best management practices for timber harvest*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-WilC.27.2.8	Monitor	No	Track habitat condition	Track habitat indicators related to spawning, rearing, and migration	Population wide	3
SONCC-WilC.27.2.8.1	*Measure indicators for spawning and rearing habitat. Conduct a comprehensive survey*					
SONCC-WilC.27.2.8.2	*Measure indicators for spawning and rearing habitat once every 15 years, sub-sampling 10% of the original habitat surveyed*					
SONCC-WilC.27.1.9	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Assess coho habitat use	Unnamed creeks south of Crescent City	BR
SONCC-WilC.27.1.9.1	*Assess coho population use of tributaries and other small streams on RNSP lands*					
SONCC-WilC.27.1.9.2	*Assess coho population use of tributaries and other small streams on private lands*					
SONCC-WilC.27.1.12	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Estimate juvenile spatial distribution	Population wide	3
SONCC-WilC.27.1.12.1	*Conduct presence/absence surveys for juveniles (3 years on; 3 years off)*					
SONCC-WilC.27.1.13	Monitor	No	Track population abundance, spatial structure, productivity, or diversity	Refine methods for setting population types and targets	Population wide	3
SONCC-WilC.27.1.13.1	*Develop supplemental or alternate means to set population types and targets*					
SONCC-WilC.27.1.13.2	*If appropriate, modify population types and targets using revised methodology*					
SONCC-WilC.27.2.14	Monitor	No	Track habitat condition	Determine best indicators of estuarine condition	Estuary	3
SONCC-WilC.27.2.14.1	*Determine best indicators of estuarine condition*					
SONCC-WilC.5.1.4	Passage	No	Improve access	Remove barriers	Lagoon Creek and unnamed coastal creeks, Highway 101	BR
SONCC-WilC.5.1.4.1	*Evaluate and prioritize barriers for removal*					
SONCC-WilC.5.1.4.2	*Remove barriers*					
SONCC-WilC.5.1.5	Passage	No	Improve access	Remove structural barriers	Population wide	BR
SONCC-WilC.5.1.5.1	*Size culverts to 100 year occurrence flows with a minimum diameter of 24 inches.*					

Action ID	Strategy	Key LF	Objective	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-WilC.8.1.6	Sediment	No	Reduce delivery of sediment to streams	Improve regulatory mechanisms	Population wide	BR
SONCC-WilC.8.1.6.1	*Limit road construction on steep streamside slopes, headwall swales, and shallow-deep seated landslide areas*					
SONCC-WilC.8.1.6.2	*Limit loading and hauling of logs during high risk periods (high rainfall periods)*					
SONCC-WilC.8.1.7	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	RNSP lands in lower Wilson Creek, Nickel Creek, and unnamed tributaries	3
SONCC-WilC.8.1.7.1	*Decommission roads, guided by Wilson Creek Watershed Assessment and Erosion Prevention Planning Project*					