28. Bear River Population

Southern Coastal Stratum

Non-Core 2, Potentially Independent Population

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

Habitat likely available to support all life stages

83.61 mi² (0% Federal ownership)

48 IP-km (30 IP-mi) (27% High)

Dominant Land Uses are Timber Harvest and Agriculture

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

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

Highest Priority Recovery Actions

• Increase large woody debris (LWD), boulders, or other instream structure • Construct off-channel habitats, alcoves, backwater habitat, and old oxbows • Reduce road-stream hydrologic connection	• Improve timber harvest practices by revising California Forest Practice Rules • Improve grazing practices • Increase riparian vegetation

28.1 History of Habitat and Land Use

Bear River is a fourth order, 30 km-long coastal stream draining approximately 151.5 km^2 (53,287 acres) to the Pacific Ocean (Ricker 2002). The connection between the Bear River and the Pacific Ocean is periodically blocked by a temporary sand bar during summer low flow. The lagoon-type estuary is approximately one-quarter mile in length (Humboldt Redwood Company (HRC) 2008, Bliesner et al. 2006). The two major land uses in the basin consist of agricultural grazing and timber harvest. Humboldt Redwood Company (formerly Pacific Lumber) owns 16,537 acres of land in the upper portion of the watershed, all of which is covered by its 1999 Habitat Conservation Plan (HCP) (Wisniewski and Garinger 2006). One hundred and sixty one acres is owned by State Parks and the remaining 36,839 acres in the watershed are privately owned.

The headwaters of the watershed have been managed for timber production since 1950. Early timber harvest operations removed trees from large tracts and burned residual slash. Most of the trees in the riparian areas were harvested. Logs were skidded downhill with tractors, often utilizing watercourses for skid trails. There was little replanting of harvested sites during the 1950s and 1960s, and site regeneration was left to natural seeding or sprouting. Consequently, much of the area harvested during this period is now comprised primarily of hardwood (e.g., tanoak) (Blair et al. 2006). The flood of 1964 altered the morphology of the lower river, transporting large amounts of sediment, removing the majority of the remaining riparian vegetation and decreasing the size and depth of the estuary (Ricker 2002).

Land use in the lower watershed (Figure 28-2) is predominately rangeland and grazed primarily by cattle and sheep (Ricker 2002). No dams exist in the Bear River drainage, however small water diversions exist throughout the basin for domestic use, livestock watering, irrigation, and dust abatement (road watering). None of these diversions exceed 1 cubic foot per second (Bliesner et al. 2006).

Since 1998, CDFG (through the Fisheries Restoration Grants Program-SB 271) funded ten projects in the Bear River watershed, including landowner education, roads assessment, temperature monitoring, riparian enhancement and planting, log structure placement, livestock exclusionary fencing, and gully and streambank stabilization.

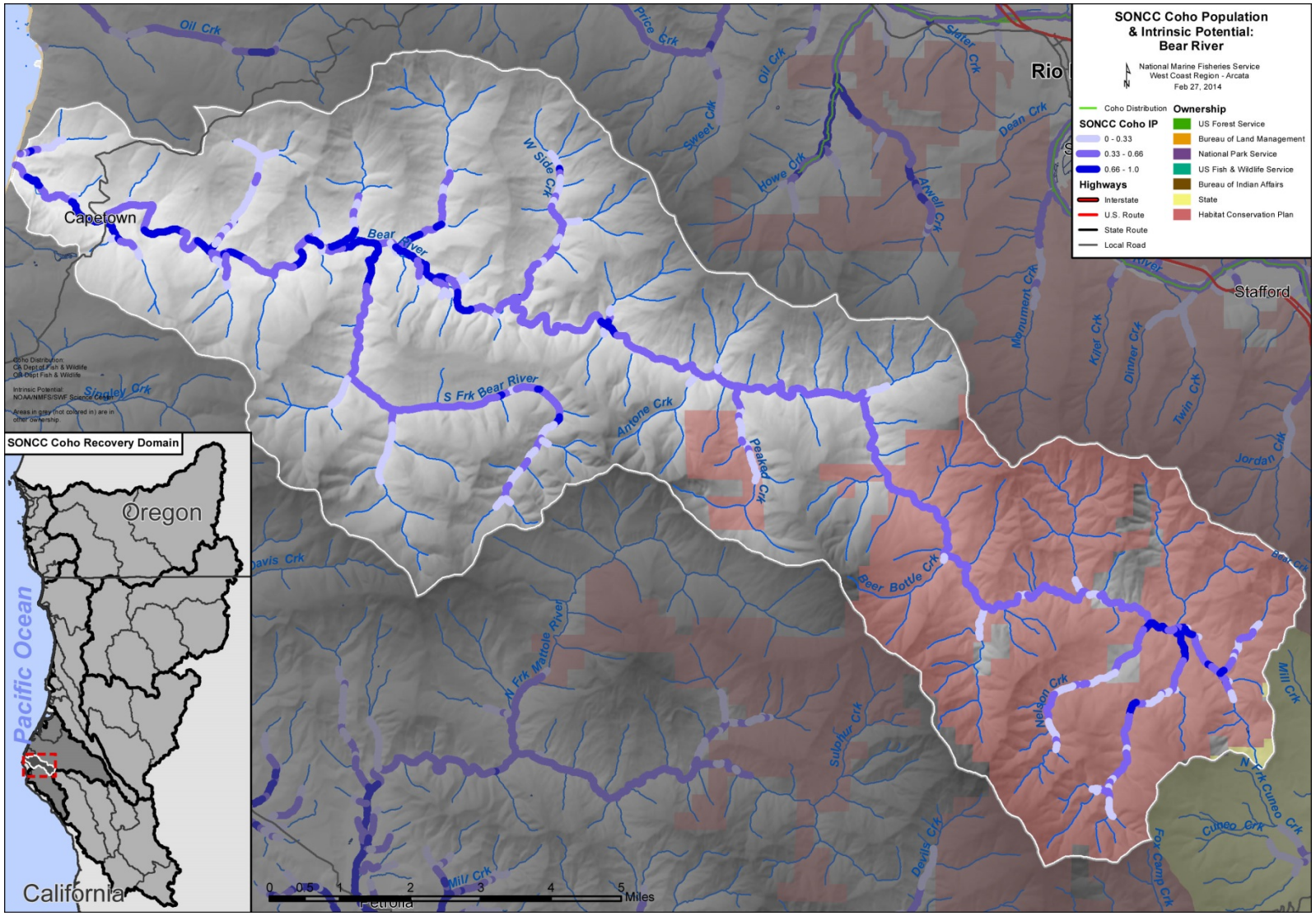

Figure 28-1. The geographic boundaries of the Bear River coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (CDFG 2012a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Southern Coastal diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

28.2 Historic Fish Distribution and Abundance

There is no historic documentation of coho salmon presence in Bear River (Bliesner et al. 2006); and no individuals were collected in juvenile outmigrant traps in 2000 to 2001 (Ricker 2002). Furthermore, CDFG's North Coast California Coho Salmon Investigation (NCCSI) detected no coho salmon when they sampled the mainstem and south fork Bear River between 2001 and 2003. Most recently, in the summer of 2012, HRC conducted a snorkel survey of Bear River including Upper Bear River, Middle Bear River, Harmonica Creek, and Pullen Creek, and no juvenile coho salmon were recorded (HRC 2013). CDFG habitat surveys indicated suitable habitat for coho salmon in lower Bear River and portions of South Fork Bear River (CDFG 2004b), including a high degree of sinuosity, low gradient, and deep pools in the lower river (Bliesner et al. 2006). The majority of the high IP reaches in the Bear River are in the lower river, in several reaches in South Fork Bear River, and in Upper Bear River near the mouths of Harmonica and Nelson Creeks (Figure 28-1, Figure 28-2 and Table 28-1) (Williams et al 2006). Bear River supports populations of CC Chinook and NC steelhead, and therefore likely historically supported SONCC coho salmon.

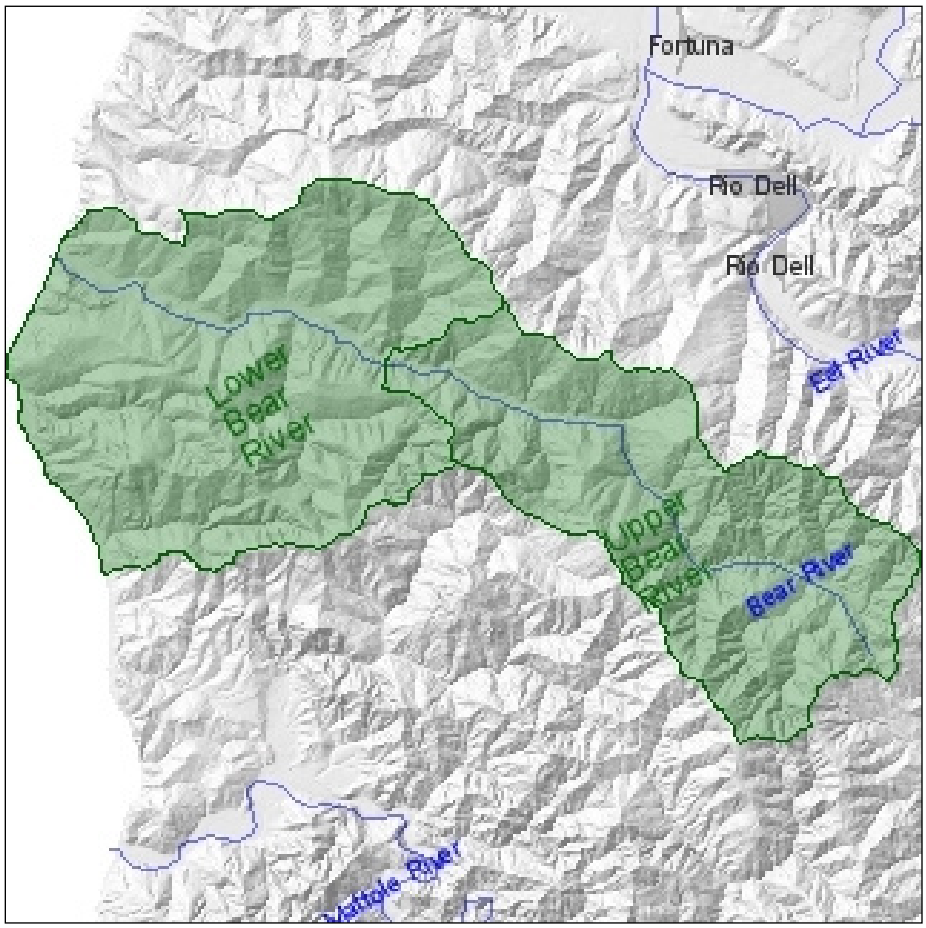

Figure 28-2. Location of lower and upper Bear River. Capetown HSA, Cape Mendocino HU.

Table 28-1. Tributaries with high IP reaches (IP > 0.66). (Williams et al. 2006).

Stream Name	Stream Name
Bear River	Harmonica Creek
South Fork Bear River	Nelson Creek

28.3 Status of Bear River 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. Williams et al. (2008) determined that at least 40 coho salmon per-IP-km of habitat are needed (1,900 spawners total) to approximate the historical distribution of Bear River coho salmon and habitat. Although CC Chinook salmon and NC steelhead are present, SONCC coho salmon have not been documented in Bear River. There are no documented barriers within the Bear River watershed that currently restrict the spatial structure of the population. Because no coho salmon have been documented, the population may be functionally extinct and therefore lacks diversity.

Population Size and Productivity

No adult or juvenile coho salmon have been documented in Bear River.

Extinction Risk

The Bear River population is at high risk of extinction because NMFS estimates the ratio of the three consecutive years of lowest abundance within the last twelve years to the amount of IP-km in a watershed is less than one, the criterion described by Williams et al. (2008). However, because the population is a non-core 2 population, the recovery target for the population is not to reduce the risk of extinction; rather, 80% of available IP habitat must be occupied in years following spawning of brood years with high marine survival.

Role of Population in SONCC Coho Salmon ESU Viability

The Bear River population is considered to be a non-core 2 "Potentially Independent" population within the Southern Coastal diversity stratum meaning that it has a high likelihood of persisting in isolation over a 100-year time scale, but is too strongly influenced by immigration from other populations to exhibit independent dynamics. The demographic target for recovery is juvenile occupancy. Because the Bear River population may be functionally extinct, nearby populations such as the Mattole and Eel River populations are needed to provide a source of straying individuals that could recolonize the Bear River population area.

The Mattole, just south of Bear River is a Functionally Independent population. The Eel River basin is just to the north of Bear River and consists of eight populations, all of which are Functionally or Potentially Independent. Due to its location, Bear River should provide habitat

to stray coho from neighboring populations. Habitat availability is important in populations like Bear River to provide connectivity between populations and throughout the ESU.

28.4 Plans and Assessments

Humboldt Redwood Company

Pacific Lumber Habitat Conservation Plan

The Pacific Lumber Company (PALCO) Habitat Conservation Plan (HCP) was finalized in 1999 and the associated Incidental Take Permit is effective through 2049. The HCP was adopted by the Humboldt Redwood Company upon acquisition of the PALCO lands in 2008. NMFS issued a Section 10(a)(1)(B) permit authorizing incidental take of SONCC coho salmon by PALCO and determined that this taking would not appreciably reduce the likelihood of survival and recovery of the species in the wild (PALCO 1999b). Although the goal of the HCP is to maintain or achieve, over time, a properly functioning aquatic habitat condition, the HCP acknowledges that not all essential habitat elements (e.g., large wood recruitment) will be attainable within the 50-year life of the plan (PALCO 1999a). Site-specific prescriptions, which are designed to promote a properly functioning aquatic habitat condition, are contained in the Bear River watershed analysis (HRC 2008).

The Bear River Watershed Analysis was completed in October 2006, and the Hillslope Management and Riparian Management Prescriptions were completed in April, 2007 (PALCO 2007). The hillslope management/mass wasting avoidance strategy uses a three-step approach for the identification and avoidance or mitigation of high hazard unstable areas during the planning and implementation of forestry activities. These steps are: slope stability training; site-specific and project-specific "screening" for unstable areas; and enforceable site-specific prescriptions for road construction, re-construction, or timber harvest on unstable areas designated as "High Hazard." Also required is review and approval of a professional licensed geologist.

In general, no timber harvest will occur within the Channel Migration Zone, defined as the flood-prone area in stream reaches with less than 4 percent gradient, which is generally the 100-year floodplain (PALCO 2007). In addition, all streams will have a riparian management zone. The riparian management zone for Class I (fish-bearing) streams is 150 feet wide, with no timber harvest permitted within the first 50 feet. More information about HCPs in the Bear River watershed can be found in Section 3.2.5.

State of California

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

The Recovery Strategy for California Coho Salmon was adopted by the California Fish & Game Commission in February 2004. The Plan describes challenges for coho salmon recovery in the Mendocino hydrologic unit including deleterious summer water temperatures, high levels of fine sediment, lack of suitable spawning gravel, and lack of habitat complexity (deep pools, cover, and other elements).

28.5 Stresses

Table 28-2. Severity of stresses affecting each life stage of coho salmon in Bear River. Stress rank categories, assessment methods, and data used to assess stresses are described in Appendix B.

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

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

Key Limiting Stresses, Life Stages, and Habitat

The key limiting stresses for this population are lack of floodplain and channel structure and degraded riparian conditions, as they have the greatest impact on the population's ability to produce sufficient spawners to support recovery. A functioning riparian forest is essential to prevent excessive solar radiation that creates warm water temperatures. Historic timber harvest has degraded the riparian forest so that it no longer provides sufficient large wood inputs to Bear River. Lack of large woody debris combined with increased sediment supply; reduce complexity by filling in pools and simplifying the channel. Lack of floodplain and channel structure in Bear River is closely associated with the degraded riparian conditions and lack of large woody debris. There are very few deep pools, backwater alcoves, complex side channels and off channel ponds which are necessary to provide rearing habitat for juvenile coho salmon. If coho salmon were present in the Bear River, substrate embeddedness would limit their spawning success and the lack of instream cover and pool refugia would limit rearing success.

Lack of Floodplain and Channel Structure

Lack of floodplain and channel structure is ranked as a very high stress to nearly all life stages of coho salmon. In the high IP reaches, the pool depths in the Bear River mainstem average 3.3 feet or greater. However, in the South Fork Bear River and Nelson and Harmonica Creeks, pool depths are 2.0 feet or less, which is considered a poor condition for salmonid habitat function.

Pool frequency throughout the watershed is poor, less than 35 percent by length, due to the lack of instream wood structures throughout the mainstem and certain tributaries. Delivery of large wood to the majority of Class I streams is problematic and will continue to be so for a period of least 10 to 25 years. After 25 years, an estimated 75 percent of the HCP-covered riparian forest will be of sufficient size to benefit aquatic habitat conditions (Blair et al. 2006).

Degraded Riparian Forest Conditions

Riparian forest conditions are ranked as a high or very high stress to nearly all life stages of coho salmon, with an overall ranking of very high. The high IP habitat of lower Bear River, South Fork Bear River, as well as the upper watershed and its tributaries, generally lacks canopy cover and is dominated by hardwoods, which provide poor shading and decompose faster than conifers. On HRC lands, current riparian conditions are primarily the result of intensive mid-twentieth century timber harvest and two significant flood events of the same time period. Species composition is primarily a mixture of Douglas-fir, tanoak, red alder, willow, California bay-laurel, and big-leaf maple. Structurally, while large trees in excess of 24" diameter at breast height (dbh) occur throughout the Bear River, most stands consist of trees ranging from 12 to 24" dbh, with multiple canopy layers just beginning to develop (Blair et al. 2006).

Impaired Water Quality

Water quality is ranked as a high or very high stress to nearly all life stages of coho salmon. Seasonally warm air temperatures, at times exceeding 32° Celsius (C), emphasize the importance of maintaining over-stream shade canopy and cool riparian microclimate conditions to reduce solar heating of the water. Much of the Bear River, and the lower reaches of Harmonica Creek and Gorge Creek, have little over-stream shade canopy (Blair et al. 2006), and summertime water temperatures exceed 17°C.

Altered Sediment Supply

Sediment supply is ranked as a high or very high stress to nearly all life stages of coho salmon. The high IP habitat of lower Bear River, South Fork Bear River, as well as the upper watershed and its tributaries, have a high degree of embeddedness that reduces survival of eggs and fry, and the production of invertebrate prey, thereby diminishing rearing for 0+ and 1+ individuals (if present). The embeddedness of substrate in riffle habitat, as well as shallow pool depths described in the *Lack of Floodplain and Channel Structure* section, is caused in part by excess fine sediment, which also increases instream turbidity. Effects to coho salmon from elevated turbidity include an impaired ability to find food, gill abrasion, food assemblage changes, smothering of eggs and filling of pools with fine sediment.

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. The Bear River estuary is considered by Wisniewski and Garinger (2006) to be suffering from changes in sediment, water, and wood. The lack of LWD, reduced pool frequency, and lack of riparian vegetation have decreased the availability of refugia. Accretion of sediment is widespread in the estuary and reduces pool and channel complexity. Juveniles and smolts are the most affected by the loss of estuarine function due to the lost

opportunity for estuarine rearing and refuge. The loss of estuarine function is a medium threat for these life stages.

Adverse Fishery- and Collection-Related Effects

Based on estimates of the fishing exploitation rate, as well as the status of the population relative to depensation and the status of NMFS approval for any scientific collection (Appendix B), these activities pose a low stress to juveniles, smolts, and adults.

Altered Hydrologic Function

Hydrologic function ranks as a low or medium threat to all life stages of coho salmon. Timber harvest practices and road construction have altered the vegetation, which ultimately changed the timing and volume of runoff. Increased water velocity and increased suspended sediment diminish habitat suitability during times of high flow. Water drafting is a component of the activities covered under the PALCO HCP and is also covered under a Lake and Streambed Alteration Agreement under the California Fish and Game Code. However, no estimate of annual volume or location of water withdrawal is available.

Barriers

No fish passage barriers have been identified (CalFish 2009).

Adverse Hatchery-Related Effects

There are no operating hatcheries in the Bear River population area. Hatchery-origin coho salmon may stray into Bear River; however, the proportion of adults that are of hatchery origin is likely less than five percent and there are no hatcheries in the basin. Therefore, adverse hatchery-related effects pose a low risk to all life stages (Appendix B).

28.6 Threats

Table 28-3. Severity of threats affecting each life stage of coho salmon in Bear River. Threat rank categories, assessment methods, and data used to assess threats are described in Appendix B.

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

[1]Key limiting threats and life stage
[2]Urban/Residential/Industrial Development, and Invasive and Non-Native Species are not considered threats to this population.

Key Limiting Threats

The two key limiting threats, those which most affect recovery of the population by influencing stresses, are roads and timber harvest.

Roads

Road density, which serves as part of the water and sediment transport system, is high (greater than 3 miles of road per square mile of watershed) throughout the majority of the watershed and ranked as a very high threat to the majority of coho life stages. Roads accelerate delivery of sediment to the riparian and aquatic habitat, and alter the stream hydrograph. The majority of roads are associated with land managed for industrial timber under the HRC HCP, which requires HRC to stormproof roads at a rate of 75 miles per year on their land.

Timber Harvest

Timber harvest is ranked as a high threat to the majority of coho life stages. Legacy effects of past harvest practices, such as accelerated sediment transport, lack of wood recruitment, and lack of riparian canopy, reduce the habitat quality in Bear River and its tributaries. Effects of industrial timber harvest are expected to be reduced under the HCP measures. The remaining areas within the watershed are privately owned, where timber harvest is regulated by the State of California's Forestry Practice Regulations.

Agricultural Practices

Grazing in the lower watershed provides an overall high threat ranking for coho salmon, as it contributes to degraded riparian and aquatic habitat. Grazing-related increases in bank erosion and suspension of sediments increase turbidity and reduces light penetration, thereby interfering with visual feeding of juveniles (0+ and1+) and smolts. Production of prey is also limited by increased turbidity levels and elevated nutrient loading.

High Severity Fire

Based on information in the Humboldt County General Plan (2008), a fire in the Bear River watershed would likely be severe due to climate, vegetation characteristics, and remote location. However, because Bear River is located within the coastal zone of influence, high severity fire is expected to be a medium threat.

Climate Change

Climate change poses a medium threat, primarily to juveniles, smolts, and adults. Although the current climate is generally cool, modeled regional average temperature shows a moderate increase over the next 50 years (see Appendix B for modeling methods). Average temperature could increase by up to 1 °C in the summer and by the same amount in the winter. Annual precipitation in this area is predicted to trend downward over the next century. Overall, the range and degree of variability in temperature and precipitation is likely to increase in all populations. The vulnerability of the estuary and coast to sea level rise is low in this population. Rearing and migratory habitat is most at risk to climate change. Increasing temperatures and changes in the amount and timing of precipitation will impact water quality and hydrologic function in the summer. As with all populations in the ESU, adults will be negatively impacted by ocean acidification and changes in ocean conditions and prey availability (see Independent Science Advisory Board 2007, Feely et al. 2008, Portner and Knust 2007).

Fishing and Collecting

Based on estimates of the fishing exploitation rate, as well as the status of the population relative to depensation and the status of NMFS approval for any scientific collection (Appendix B), these activities pose a low threat to juveniles, smolts, and adults.

Channelization/Diking

There is little evidence of channelization or diking in the watershed. Because the watershed is relatively undeveloped, the threat for channelization and diking is ranked as low for all life stages.

Dams/Diversions

There are no appropriative water rights in the Bear River watershed according to the NCRWQCB. The extent of riparian water rights is unknown. There are no dams in the watershed.

Road-stream Crossing Barriers

No road-crossing barriers have been identified in the Bear River watershed, resulting in a low threat ranking.

Mining / Gravel Extraction

Historically, small-scale gravel mining has occurred in the Bear River, and the Humboldt County Public Works is currently permitted to extract 3,000 yards^3 per year and 10,000 yards^3 per three to five year period from their Branstetter Bar sites (RM 1.5). Due to the low level of extraction, and likely future extraction, mining/gravel extraction is believed to be a low threat to coho salmon.

Hatcheries

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

28.7 Recovery Strategy

The numbers of coho salmon in the Bear River are severely depressed, as evidenced by their apparent absence. The Bear River population is highly dependent on straying from the Mattole and Eel rivers for recolonization. Recovery activities in the watershed should promote recolonization by improving the habitat function for spawning and rearing in high IP habitat. Actions that improve spawning and rearing habitat include those that reduce sediment delivery, improve stream temperatures, improve long term prospects for large wood recruitment, and promote increased floodplain and channel structure. These actions should be a priority in the watershed, especially in the high IP reaches. Reducing sediment upstream of the high IP reaches is a priority since the sediment will be transported downstream. Activities that accomplish these goals will have beneficial effects on the estuary as well, although the time for these effects to be observed will likely be several decades and possibly much longer. The effects of fishing on this population's ability to meet its viability criteria should be evaluated.

Table 28-4 on the following page lists the recovery actions for the Bear River population.

Table 28-4. Recovery action implementation schedule for the Bear River population. Recovery actions for monitoring and research are listed in tables at the end of Chapter 5.

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-BeaR.7.1.7	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	Population wide	2c
SONCC-BeaR.7.1.7.1	*Amend California Forest Practice Rules to include regulations which describe the specific analysis, protective measures, and procedure required by timber owners and CalFire to demonstrate timber operations described in timber harvest plans meet the requirements specified in 14 CCR 898.2(d) prior to approval by the Director (similar to a Spotted Owl Resource Plan)*					
SONCC-BeaR.2.1.1	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	All streams where coho salmon would benefit immediately	2c
SONCC-BeaR.2.1.1.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-BeaR.2.1.1.2	*Place instream structures, guided by assessment results*					
SONCC-BeaR.2.1.41	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Population wide	2d
SONCC-BeaR.2.1.41.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-BeaR.2.1.41.2	*Place instream structures, guided by assessment results*					
SONCC-BeaR.2.2.25	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	All streams where coho salmon would benefit immediately	2c
SONCC-BeaR.2.2.25.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-BeaR.2.2.25.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-BeaR.2.2.42	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Population wide	2d
SONCC-BeaR.2.2.42.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-BeaR.2.2.42.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-BeaR.8.1.2	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	All streams where coho salmon would benefit immediately	2c
SONCC-BeaR.8.1.2.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-BeaR.8.1.2.2	*Decommission roads, guided by assessment*					
SONCC-BeaR.8.1.2.3	*Upgrade roads, guided by assessment*					
SONCC-BeaR.8.1.2.4	*Maintain roads, guided by assessment*					
SONCC-BeaR.8.1.44	Sediment	No	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	Population wide	2d
SONCC-BeaR.8.1.44.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-BeaR.8.1.44.2	*Decommission roads, guided by assessment*					
SONCC-BeaR.8.1.44.3	*Upgrade roads, guided by assessment*					
SONCC-BeaR.8.1.44.4	*Maintain roads, guided by assessment*					
SONCC-BeaR.7.1.6	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve long-range planning	Population wide	3b
SONCC-BeaR.7.1.6.1	*Review General Plan or City Ordinances to ensure coho salmon habitat needs are accounted for. Revise if necessary*					
SONCC-BeaR.7.1.6.2	*Develop watershed-specific guidance for managing riparian vegetation*					
SONCC-BeaR.7.1.5	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve grazing practices	All streams where coho salmon would benefit immediately	3c
SONCC-BeaR.7.1.5.1	*Assess grazing contribution to sediment delivery, pollutants, and impaired riparian conditions*					
SONCC-BeaR.7.1.5.2	*Develop a grazing management strategy that decreases delivery of sediment and pollutants to streams and improves riparian condition*					
SONCC-BeaR.7.1.5.3	*Implement the grazing management strategy*					
SONCC-BeaR.7.1.43	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Improve grazing practices	Population wide	3d
SONCC-BeaR.7.1.43.1	*Assess grazing contribution to sediment delivery, pollutants, and impaired riparian conditions*					
SONCC-BeaR.7.1.43.2	*Develop a grazing management strategy that decreases delivery of sediment and pollutants to streams and improves riparian condition*					
SONCC-BeaR.7.1.43.3	*Implement the grazing management strategy*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-BeaR.7.1.27	Riparian	Yes	Improve wood recruitment, bank stability, shading, and food subsidies	Increase conifer riparian vegetation	Population wide	3c
SONCC-BeaR.7.1.27.1	*Develop an appropriate timber harvest management plan for benefits to coho salmon habitat*					
SONCC-BeaR.7.1.27.2	*Thin, or release conifers, guided by the plan*					
SONCC-BeaR.7.1.27.3	*Plant conifers, guided by the plan*					
SONCC-BeaR.2.2.32	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Increase beaver abundance	Population wide	3c
SONCC-BeaR.2.2.32.1	*Develop a beaver conservation plan that includes education and outreach, technical assistance for land owners, and methods for reintroduction and/or relocation of beaver as a last resort*					
SONCC-BeaR.2.2.32.2	*Implement education and technical assistance programs for landowners, guided by the plan*					
SONCC-BeaR.2.2.32.3	*Reintroduce or relocate beaver if appropriate, guided by the plan*					
SONCC-BeaR.2.2.36	Floodplain and Channel Structure	No	Reconnect the channel to the floodplain	Improve regulatory mechanisms	Population wide	3c
SONCC-BeaR.2.2.36.1	*Improve protective regulations for beaver and develop guidelines for relocation that are practical for restoration groups*					
SONCC-BeaR.8.1.3	Sediment	No	Reduce delivery of sediment to streams	Improve regulatory mechanisms	Population wide	3c
SONCC-BeaR.8.1.3.1	*Develop grading ordinance for maintenance and building of private roads that minimizes the effects to coho*					
SONCC-BeaR.10.2.28	Water Quality	No	Reduce pollutants	Reduce pesticides	All streams where coho salmon would benefit immediately	3c
SONCC-BeaR.10.2.28.1	*Develop a pesticide management plan*					
SONCC-BeaR.10.2.28.2	*Implement pesticide management plan and technical assistance program*					
SONCC-BeaR.10.2.39	Water Quality	No	Reduce pollutants	Reduce pesticides	Population wide	3d
SONCC-BeaR.10.2.39.1	*Develop a pesticide management plan*					
SONCC-BeaR.10.2.39.2	*Implement pesticide management plan and technical assistance program*					
SONCC-BeaR.10.7.38	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	All streams where coho salmon would benefit immediately	3c
SONCC-BeaR.10.7.38.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-BeaR.10.7.38.2	*Supply marine-derived nutrients to streams guided by the plan*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-BeaR.10.7.40	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	Population wide	3d
SONCC-BeaR.10.7.40.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-BeaR.10.7.40.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-BeaR.1.2.26	Estuary	No	Improve estuarine habitat	Restore estuarine habitat	Estuary	3d
SONCC-BeaR.1.2.26.1	*Assess factors limiting coho rearing and passage in the estuary including temperature, excess sediment, and size of estuary*					
SONCC-BeaR.1.2.26.2	*Develop a plan to restore the estuary*					
SONCC-BeaR.1.2.26.3	*Implement the estuary restoration plan*					
SONCC-BeaR.16.1.10	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating salmonid fishery management plans affecting SONCC coho salmon	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-BeaR.16.1.10.1	*Determine impacts of fisheries management on SONCC coho salmon in terms of VSP parameters*					
SONCC-BeaR.16.1.10.2	*Identify level of fishing impacts that does not limit attainment of population-specific viability criteria*					
SONCC-BeaR.16.1.11	Fishing/Collecting	No	Manage fisheries consistent with recovery of SONCC coho salmon	Reduce fishing impacts to levels that do not limit recovery	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-BeaR.16.1.11.1	*Determine actual fishing impacts*					
SONCC-BeaR.16.1.11.2	*If actual fishing impacts limit attainment of population-specific viability criteria, modify management so that fishing does not limit attainment of population-specific viability criteria*					
SONCC-BeaR.16.2.12	Fishing/Collecting	No	Manage scientific collection consistent with recovery of SONCC coho salmon	Incorporate SONCC coho salmon VSP delisting criteria when formulating scientific collection authorizations affecting SONCC coho salmon	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-BeaR.16.2.12.1	*Determine impacts of scientific collection on SONCC coho salmon in terms of VSP parameters*					
SONCC-BeaR.16.2.12.2	*Identify level of scientific collection impact that does not limit attainment of population-specific viability criteria*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-BeaR.16.2.13	Fishing/Collecting	No	Manage scientific collection consistent with recovery of SONCC coho salmon	Reduce impacts of scientific collection to levels that do not limit recovery	SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon	3d
SONCC-BeaR.16.2.13.1	*Determine actual impacts of scientific collection*					
SONCC-BeaR.16.2.13.2	*If actual scientific collection impacts limit attainment of population-specific viability criteria, modify collection so that impacts do not limit attainment of population-specific viability criteria*					
SONCC-BeaR.10.1.33	Water Quality	No	Reduce water temperature, increase dissolved oxygen	Develop and implement TMDLs	Population wide	3d
SONCC-BeaR.10.1.33.1	*Develop temperature TMDL for water bodies listed under Clean Water Act Section 303(d)*					
SONCC-BeaR.10.1.33.2	*Implement temperature TMDL for water bodies listed under Clean Water Act Section 303(d)*					
SONCC-BeaR.3.1.9	Hydrology	No	Improve flow timing or volume	Educate stakeholders	Population wide	BR
SONCC-BeaR.3.1.9.1	*Provide education and training on conserving water while diverting*					
SONCC-BeaR.3.1.9.2	*Provide incentives to landowners to reduce water consumption during low flow periods*					
SONCC-BeaR.3.1.8	Hydrology	No	Improve flow timing or volume	Increase instream flows	Population wide	BR
SONCC-BeaR.3.1.8.1	*Identify alternative water sources, storage means, or seasonal withdrawal restrictions to increase streamflow during low flow periods*					
SONCC-BeaR.3.1.8.2	*Reduce diversions, using alternative sources that were identified*					
SONCC-BeaR.8.1.4	Sediment	No	Reduce delivery of sediment to streams	Reduce stream bank erosion	Population wide	BR
SONCC-BeaR.8.1.4.1	*Inventory sediment sources, and prioritize for treatment*					
SONCC-BeaR.8.1.4.2	*Treat priority sediment source sites, guided by the plan*					

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