27. Guthrie Creek Population

Southern Coastal Stratum

Dependent Population

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

Habitat likely available to support all life stages

20.74 mi² (3% Federal ownership)

14 IP-km (9 IP-mi) (57% High)

Dominant Land Uses are Timber Harvest and Agriculture

Key Limiting Stresses are 'Altered Sediment Supply' and 'Lack of Floodplain and Channel Structure'

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

Highest Prioritized Recovery Actions

• Improve grazing practices • Reduce stream bank erosion • Improve timber harvest practices by revising California Forest Practice Rules	• Reduce road-stream hydrologic connection • Minimize mass wasting • Increase riparian vegetation

27.1 History of Habitat and Land Use

The Guthrie Creek population occupies four streams along a three-mile stretch of coast south of the Eel River (Figure 27-1). These include, from north to south, Fleener Creek, Guthrie Creek, Bear Creek, and Oil Creek. These watersheds have been impacted by both natural and anthropogenic changes over the past century, leading to degraded habitat conditions for coho salmon. The soils in this area of coastal California are naturally highly erodible and tend to produce mass wasting, bank destabilization, and high volumes of silt and cementation of gravel. Landslides and bank failures are particularly common in the lower part of Guthrie, Fleener, and Oil Creek due to both natural soil instability in this area and decades of grazing. Land use throughout these watersheds has been limited by the rugged terrain and most areas have been used solely for grazing and timber production over the past century. There is little to no development in these watersheds.

Historically, the lower reach of all three primary coho streams (Guthrie, Fleener, and Oil Creeks) have been highly grazed and consequently suffer from bank instability, degraded riparian forest conditions, and sediment loading. Early timber harvest in these areas originally removed any riparian cover and since then there has been little recovery due to the effects of grazing which continue to suppress regeneration. However, through a series of recent acquisitions by the California State Coastal Conservancy, the lower portions of Guthrie and Fleener Creek are now managed by the BLM as part of the Lost Coast Headlands.

Management practices by the BLM include light and low impact passive recreational uses and managed livestock grazing. There is no public land grazing in Guthrie Creek and the established grazing allotment includes new fencing along Fleener Creek (and elsewhere) and a rotation strategy using five pastures per year with water troughs located away from riparian areas (Fuller 2010). As part of their goal to provide coastal access and recreation opportunities, the BLM has constructed two coastal trails, the Fleener Creek and Guthrie Creek trails, to provide visitor access to the coast.

Timber harvest continues to impact the middle and upper reaches of streams in the Guthrie Creek population area which are privately-owned and managed for timber production. Impacts primarily manifest through the loss of riparian conifers, lack of large woody debris in streams, and elevated rates of sediment loading and accretion. Currently, many areas are actively harvested or remain in an early seral condition

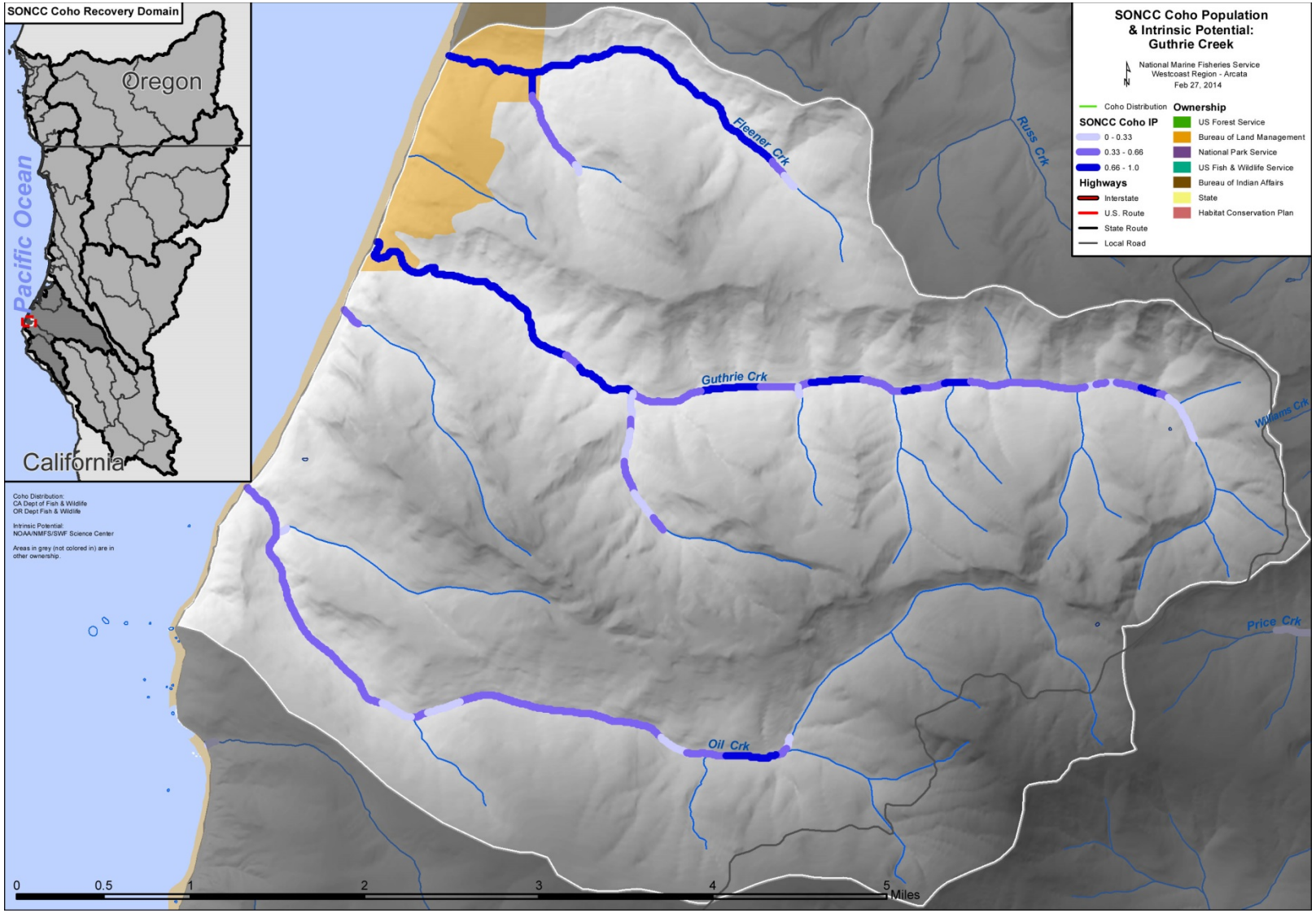

Figure 27-1. The geographic boundaries of the Guthrie Creek coho salmon population. Figure shows modeled Intrinsic Potential of habitat (Williams et al. 2006), land ownership, coho salmon distribution (CDFG 2012a), and location within the Southern-Oregon/Northern California Coast Coho Salmon ESU and the Southern Coastal diversity stratum (Williams et al. 2006). Grey areas indicate private ownership.

27.2 Historic Fish Distribution and Abundance

Based on the IP values for the streams included in the Guthrie Creek population area, Fleener, Guthrie, and Oil creek have potential for coho salmon spawning and rearing (Table 27-1). Guthrie Creek is the largest of these streams and comprises about 60 kilometers of stream channel. Habitat suitable for coho salmon quickly diminishes upstream of the lowest tributary; however, isolated pockets of high IP habitat (>0.66) occur along the mainstem up to 4 miles upstream of the mouth (Figure 27-1). The tributaries of Guthrie Creek currently do not provide substantial spawning area because of degraded conditions within the smaller channels. Within most tributaries the wetted channel narrows to less than 4 inches and is characterized by a steep incline and silt deposits that make it unsuitable for anadromous fish habitat (CDFG 1982). The lowest tributary is currently the only tributary considered to offer habitat for salmonids based on low to moderate IP values (<0.66). Based on survey data from the CDFG North Coast California Coho Salmon Investigation Project between 1982 and 2003 there were no observations of coho salmon in Guthrie Creek (CDFG 2002). Surveys were completed over three years during the study, with collected data being supplemented by literature research and anecdotal information. One streamside observation of a coho salmon exists but the year of that observation was undocumented. Currently, coho salmon abundance in the Guthrie Creek watershed is unknown and the population is presumed to be extirpated or consistently below historic levels because of habitat degradation and region-wide decline in coho salmon populations.

Based on IP habitat value, both Oil and Fleener Creeks also have potential to support coho salmon. Of the two watersheds, Fleener Creek has a larger proportion of IP habitat, with the majority of the mainstem having high IP (>0.66). The major tributary to Fleener Creek also has moderate to high IP (>0.33). Although little is known about fish use of Fleener Creek, the Bureau of Land Management in previous documents and in personal communications has stated that anadromous fish do not occupy this watershed (BLM 2005b). Residents along Fleener Creek support the claim that anadromous fish do not enter the creek, possibly because of the driftwood log jam that may act as a barrier to migration (Fuller 2010). High sediment loads and accretion along with heavy grazing in the lower mainstem may currently prevent use of any high IP habitat in this watershed

One young-of-the-year coho salmon was reported in Oil Creek in 1994 (CDFG 2004b) and the watershed has moderate IP habitat (0.33 to 0.66) throughout much of its mainstem. The stream has been significantly altered, however, and although few survey data exist, it likely is unable to support substantial numbers of coho salmon in its current state. Coho salmon that use Oil Creek must migrate upstream several miles to find suitable spawning and rearing habitat given that the lower part of the watershed has little if any riparian forest and has experienced high sedimentation. The last of the Guthrie Creek population area streams, Bear Creek, has a small amount (<0.5 miles) of moderate IP near its mouth, however the stream is likely unable to support coho salmon spawning due to its small size and degraded habitat conditions in the lower watershed. There are no records to indicate historic use of this stream by coho salmon.

Table 27-1. Tributaries with high IP reaches (IP > 0.66) (Williams et al. 2006).

Stream Name	Stream Name	Stream Name
Fleener Creek	Guthrie Creek	Oil Creek

27.3 Status of Guthrie Creek Coho Salmon

Spatial Structure and Diversity

The streams that are included in the Guthrie Creek population area are relatively short and have limited habitat available for spawning and rearing. Furthermore, the narrow and shallow qualities of most tributaries make them unsuitable for coho salmon. Although Fleener, Guthrie, and Oil Creek likely once supported coho salmon based on their IP values, there is little evidence to indicate that any of these creeks are currently used for coho spawning or rearing. The only observations of coho salmon over the past 20 years have been in Guthrie and Oil Creeks. Habitat degradation through erosion, aggradation, and loss of riparian cover likely has contributed to the decline of salmon in these streams. All of the high IP reaches in the population area have been heavily grazed over the past century and lack suitable spawning gravel and or complex rearing habitat. The upper and middle reaches of the creeks have fewer historical impacts; however, IP habitat values are lower in these regions reducing the suitability for coho salmon.

The location of the Guthrie Creek population between other larger populations, those in Eel River basin and the Mattole River, provides the potential for greater diversity within the population. The influx of genetic material and differences in life history traits from the Eel River populations to the north and the Mattole River to the south is common due to the straying that likely occurs into nearby coastal streams. Individuals who stray from nearby populations add diversity and genetic strength to the Guthrie Creek populations (Meffe 1986). Nonetheless, because the current extent of suitable spawning and rearing habitat is severely limited, the Guthrie Creek coho salmon population may not be able to support the opportunity for mixing, reducing overall diversity.

Population Size and Productivity

Guthrie Creek is known to have supported steelhead in numbers ranging from 15,000 to 25,000 in the 1930s (CDFG 1982) however the historic abundance of coho salmon in these streams is unknown. Along with steelhead populations, the current population is suspected to be either extirpated or on levels much lower than in past decades due to the apparent habitat degradation through these watersheds. In surveys conducted over the past 20 years in Guthrie Creek and Oil Creek, there have only been two records of coho salmon. Coho spawning in these watersheds is rare and likely the result of straying from either the Mattole or Eel River. If a spawning population is too small, the survival and production of eggs or offspring may suffer because it may be difficult for spawners to find mates, or predation pressure may be too great. This situation accelerates a decline toward extinction.

As a dependent population, the population's abundance and productivity is highly influenced by nearby populations, which contribute spawners as strays. Both the Eel and Mattole River populations have been severely restricted and have low numbers of returning adults compared to

historic runs. The lack of productivity in these systems and the associated reduction in strays entering Guthrie, Fleener, and Oil Creek impair its recovery potential.

Extinction Risk

Not applicable because Guthrie Creek is not an independent population.

Role in SONCC Coho Salmon ESU Viability

Although dependent populations such as the Guthrie Creek population are not viable on their own, they do increase connectivity in the ESU by allowing dispersal among independent populations and provide areas of refugia for other populations, acting as a source of colonists in some cases. Because nearby populations such as those in the Mattole and Eel Rivers have seen dramatic declines in productivity, there is likely far less interaction between populations. The individuals that do spawn in Guthrie, Fleener, or Oil Creek are likely strays from larger populations. Any restored habitat in Guthrie Creek population area provides potential connectivity that assists metapopulation function in the SONCC ESU.

27.4 Plans and Assessments

Bureau of Land Management (Arcata office)

Lost Coast Headlands Feasibility Study (BLM 2001)

In the process of first establishing the Lost Coast Headlands in 2001, the BLM conducted a feasibility study including potential acquisitions and management alternatives for the area. In this study they consulted with local residents, mapped significant resources in the area, and evaluated opportunities for protecting coastal resources, preserving coastal agriculture, and providing public coastal access.

State of California

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

The Recovery Strategy for California Coho Salmon (CDFG 2004b) 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).

27.5 Stresses

Table 27-2. Severity of stresses affecting each life stage of coho salmon in Guthrie Creek. Stress rank categories, assessment methods, and data used to assess stresses are described in Appendix B.

	Stresses[2]	Egg	Fry	Juvenile[1]	Smolt	Adult	Overall Stress Rank
1	Altered Sediment Supply[1]	High	High	High[1]	Medium	High	High
2	Lack of Floodplain and Channel Structure[1]	Low	High	High[1]	High	Medium	High
3	Degraded Riparian Forest Conditions	-	Medium	Medium	Low	Medium	Medium
4	Impaired Estuary/Mainstem Function	-	Low	Medium	Medium	Low	Medium
5	Adverse Fishery- and Collection-Related Effects	-	-	Low	Low	Low	Low
6	Barriers	-	Low	Medium	Low	Low	Low
7	Impaired Water Quality	Low	Low	Low	Low	Low	Low
8	Altered Hydrologic Function	Low	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 altered sediment supply and lack of floodplain and channel structure, as they have the greatest impact on the population's ability to produce sufficient spawners to support recovery. Little information exists regarding the habitat quantity and quality available in Guthrie Creek and its tributaries. Available data indicates that spawning and rearing habitat do exist in the watershed, but are likely limited in quality and abundance (CDFG 1982). No information exists regarding appropriate habitat for adult migration and holding, but given the small size of the stream channel, it is unlikely that there are many, if any, pools and deep areas for adult salmonids to use for holding. All life stages are affected by these stresses.

Within Guthrie, Fleener, and Oil Creek, the greatest potential refugia occurs in the middle and upper reaches where riparian cover is most extensive and the effects of sedimentation are least. Tributary streams within these reaches provide the greatest source of rearing and spawning habitat due to the lower levels of turbidity (CDFG 1982). Guthrie Creek in particular has the greatest potential for coho salmon productivity because it is both larger than the other streams and appears to have higher quality habitat. Fleener Creek has a relatively large amount of high IP habitat for its size and should be investigated for restoration opportunities such as exclusionary fencing as done by the BLM.

Sediment Supply

Altered sediment supply has been determined as the highest stress affecting all life history phases of coho salmon, imposing a high stress on eggs, fry, juveniles, and adults. High sediment loading, as a result of land use and geology, contributes to multiple problems including the simplification of stream habitat, increased turbidity, and increased embeddedness, which reduces emergence success. Areas along the stream near the coast are characterized by bare unstable slopes and eroding stream banks. A CDFG stream survey of Guthrie Creek from 1982 documented "steep and unstable" banks that were undercut and collapsing in many areas along the first 1,000 feet of the mainstem, upstream of the mouth (CDFG 1982). The mainstem was characterized by high silt content and cemented gravels for the entire length of the survey up to 3,000 feet from the mouth. The tributaries were noted to have considerably lower silt content.

Although there is no direct data on turbidity, the aquatic insect EPT parameter has been measured in Fleener Creek and was rated as poor (≤12). This parameter is a measure of the number of pollution intolerant insect taxa present (Ephemeroptera (mayflies), Plecoptera (stoneflies) and Trichoptera (caddisflies)). The limiting factor for these species is generally the high turbidity and fine sediment in the streambed. Turbidity primarily affects juvenile salmonids by interfering with gill function, feeding, and other normal behaviors. Impaired water quality is considered a medium to high stress to this population.

Due to reductions in grazing on lower Guthrie Creek since the time of this survey it is likely that conditions have improved somewhat as banks have stabilized and riparian areas have recovered. However, high sediment loading likely continues throughout the watershed as a result of timber harvest and grazing that occurs on private land upstream.

Floodplain and Channel Structure

Lack of floodplain and channel structure is an overall high stress for coho salmon in the Guthrie Creek population. The history of timber harvest and grazing along with bank instability in riparian areas has eliminated large legacy trees in the riparian zone along with the supply of LWD to streams. Wood is essential for the maintenance of pools through scouring and the general complexity of stream habitats. In addition, an excess of sediment has filled pools and caused the shallowing and widening of channels through aggradation. The overall simplified stream habitat likely provides less places of refuge for fish and likely lacks deep pools and side channels for use during high flow events or times of low water.

Riparian Forest Conditions

Riparian forests in all four watersheds in the population area have been negatively impacted by timber harvest and grazing, however, have recently improved due to changes in land management. Survey data from Guthrie Creek in 1982 (CDFG 1982) indicates that riparian cover is lacking from the mouth to about 1,000 feet upstream. Then, riparian vegetation increases to mostly alder and willow until approximately 6,000 feet from the mouth upstream of which a conifer forest canopy provides about 50 percent canopy cover for the rest of the upland channel. Although grazing has been eliminated from riparian areas in Guthrie and Fleener Creeks, lower reaches are slow to recover and riparian vegetation is still limited. Timber harvest continues to limit riparian condition in middle and upper reaches. Overall degraded riparian

condition is a medium stress to coho salmon in this population and limits the amount of cover, LWD, and rearing and spawning habitat in streams.

Impaired Estuary/Mainstem Function

The estuaries of Fleener, Guthrie, and Oil Creek are all small in size and contain little habitat for coho salmon rearing. Estuarine function has been impacted to some degree by elevated sediment aggradation which has led to decreased flows, a widened and shallowed channel, and the possible presence of fish passage barriers during low flow periods. The accumulation of driftwood, possibly due to changes in the geomorphology of the estuary in Fleener Creek, has potentially led to complete blockage of the watershed to anadromous fish (Fuller per comm. 2010). Guthrie Creek does not seem to accumulate driftwood at its mouth due to higher flows than Fleener Creek. One potential source of concern in the entire population area is the unstable headland geology, which can lead to mass wasting at the mouth of these streams. Currently, it is unknown if estuarine condition is a significant issue for this population.

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.

Barriers

There may be stream crossing barriers associated with timber management roads on private timber land, but the extent of this issue is unknown. There are no documented fish passage barriers on Federal or County roads. Therefore, fish barriers pose an overall low stress to Guthrie Creek coho salmon. There are some known diversions that could act as fish passage barriers if not properly screened.

Impaired Water Quality

Temperature was recorded between July and October of 2005 in Guthrie Creek and was very good (<15 °C) to good (15 to 16 °C) for most of that time. The temperature exceeded 17 °C only a few days during the year.

Hydrologic Function

The hydrologic function in Guthrie Creek is good. Generally, the channel's morphology is that of a deep crevice and U-shaped channel, which maintains flow and sufficient water depth to sustain fish (CDFG 1982). The overall stress associated with hydrologic function is considered low.

Adverse Hatchery-Related Effects

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

27.6 Threats

Table 27-3. Severity of threats affecting each life stage of coho salmon in Guthrie Creek. 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	Timber Harvest[1]	High	High	High[1]	High	Medium	High
2	Agricultural Practices[1]	High	High	High[1]	Medium	High	High
3	Roads	High	High	High	Medium	High	High
4	Fishing and Collecting	-	-	Low	Low	Low	Low
5	Channelization/Diking	Low	Low	Low	Low	Low	Low
6	Dams/Diversion	Low	Low	Low	Low	Low	Low
7	High Severity Fire	Low	Low	Low	Low	Low	Low
8	Climate	Low	Low	Low	Low	Low	Low
9	Urban/Residential/Industrial Dev.	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]Key Limiting Threats and limited life stage
[2]Invasive Non-Native/Alien Species, and Mining/Gravel Extraction 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 timber harvest and agricultural practices.

Timber Harvest

The Guthrie Creek population area is made up of nearly 97 percent private land, much of which is used for timber production. Most land is likely on a 30 to 50 year rotation with 25 to 35 percent of a watershed being harvested based on CalFire's Forest Practices GIS data (CalFire 2009). Poor riparian conditions in Guthrie Creek and throughout the population area have been attributed to timber harvest. The lack of mature riparian forest along streams and LWD in streams reflect the outcome of early harvest practices with no riparian buffers. Although some areas of the watershed have likely recovered some of their riparian structure and function, the cessation of timber harvest in riparian areas was too recent for many areas to progress to the late seral stage. Also, because the area is already prone to erosion and high turbidity, additional sediment inputs associated with timber harvest can have major consequences for coho salmon in

this population (see sediment stress section above). The overall threat associated with timber harvests is considered high for all life stages except adults.

Agricultural Practices

The coastal areas of these watersheds are frequently used for cattle grazing. Except in the lowest reaches of Guthrie and Fleener Creeks, which have managed grazing allotments with exclusionary fencing, cattle in most areas have direct access to the creek. Grazing and trampling by livestock typically causes bank destabilization, loss of riparian habitat, sedimentation, and consequent changes in benthic prey, turbidity, and loss of stream connectivity. Because this area is particularly prone to bank destabilization and erosion, grazing is especially harmful to stream habitat and coho salmon. These adverse effects are considered an overall high threat to coho salmon. All life stages are affected.

Roads

These watersheds are predominantly private timberland and contain a network of private, unpaved timber management roads. The overall density of roads in the Guthrie Creek population area is very high (>3 miles road per square mile of watershed). These roads are built on unstable soils and are prone to erosion and washouts. Of particular concern are road-stream crossings, which typically contribute the most to sediment loading. Sediment that originates from roads accretes in stream channels and leads to high levels of turbidity. The shallowing and widening of stream channels, cementation of gravels, and suspended sediment loads lead to decreased survival of eggs and decreased growth and survival of juveniles. Adults are impacted by the lack of suitable spawning habitat. The cumulative threat from roads is considered moderate.

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

Past and current channelization and diking on Guthrie Creek has not significantly affected the Guthrie Creek coho salmon populations. This practice currently poses a low threat to all life stages of coho salmon.

Dams/Diversions

Dams and diversions in the population area have not significantly affected the Guthrie Creek coho salmon population. There is only one documented diversion in the area, on Fleener Creek. Its impact is currently unknown. Based on current information, dams and diversions pose a low threat to all life stages of coho salmon in this watershed.

High Severity Fire

Fire currently poses a low threat to all life stages of coho salmon in this watershed. During the summer months of the California fire season, cool foggy days are common in Humboldt County

and therefore the overall fire hazard for the area is low. Livestock grazing in the area further reduces fire risk by eliminating fuel sources.

Climate Change

Climate change poses a low threat to this population due to its cooler climate, low risk of average temperature increase, and expected precipitation change over the next 50 years (see Appendix B for modeling methods). Overall, the range and degree of variability in temperature and precipitation is likely to increase in all populations. In addition, all populations 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).

Urban/Residential/Industrial Development

This watershed is presently not developed and is not likely to experience any urban, residential, or industrial development in the future. Although most land is privately owned, due to the rugged nature of the terrain, lack of infrastructure, and relative isolation, it will likely continue to be used for timber harvest in the future. Consequently, development poses a low threat to coho salmon in this population.

Road-Stream Crossing Barriers

There are no documented road-stream crossing barriers within the population area. The high density of roads, however, indicates the potential for barriers to exist on private timber land. Without proper upgrades to existing crossing barriers and prevention of future barriers this threat is likely to continue to increase in the future on private lands.

Hatcheries

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

27.7 Recovery Strategy

The Guthrie Creek coho salmon population is either extirpated or has very low population abundance and productivity. For the past 100 years, grazing and timber harvest have been the dominant land uses. As a result, little spawning and rearing habitat remains within these watersheds. The acquisition of the lower portions of Guthrie and Fleener Creeks by the BLM is helping to remove some of the grazing pressure on the landscape; however issues in the remaining 97 percent of the watershed need to be addressed in order to recover this population. Minimizing the impacts from grazing and timber harvest should be a priority in reducing sedimentation and turbidity. Fencing riparian corridors and supplying adequate stock watering facilities away from creeks will prevent trampling and grazing in these areas.

Careful management of timber harvest in conjunction with decommissioning, improving, and maintaining roads will reduce sediment pollution and erosion, and improve riparian conditions.

The highly erodible character of the soils will likely hinder riparian rehabilitation and continue to add to sediment loads even with the absence of grazing and harvest near the stream channel.

Although ultimate recovery of this population will help provide connectivity and refugia for the important nearby populations of the Eel and Mattole rivers, there are many challenges that hinder recovery in this area. Guthrie Creek seems to have the most potential for habitat recovery of all four creeks containing IP habitat. The effects of fishing on this population's ability to meet its viability criteria should be evaluated.

Table 27-4 on the following page lists the recovery actions for the Guthrie Creek population.

Table 27-4 Recovery action implementation schedule for the Guthrie Creek population. Recovery actions for monitoring and research are listed in tables at the end of Chapter 5.

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-GutC.12.1.1	Agricultural Practices	Yes	Improve agricultural practices	Improve grazing practices	All streams where coho salmon would benefit immediately	2c
SONCC-GutC.12.1.1.1	*Assess grazing contribution to sediment delivery, pollutants, and impaired riparian conditions*					
SONCC-GutC.12.1.1.2	*Develop a grazing management strategy that decreases delivery of sediment and pollutants to streams and improves riparian condition*					
SONCC-GutC.12.1.1.3	*Implement the grazing management strategy*					
SONCC-GutC.12.1.20	Agricultural Practices	Yes	Improve agricultural practices	Improve grazing practices	Population wide	2d
SONCC-GutC.12.1.20.1	*Assess grazing contribution to sediment delivery, pollutants, and impaired riparian conditions*					
SONCC-GutC.12.1.20.2	*Develop a grazing management strategy that decreases delivery of sediment and pollutants to streams and improves riparian condition*					
SONCC-GutC.12.1.20.3	*Implement the grazing management strategy*					
SONCC-GutC.2.1.14	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-GutC.2.1.14.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-GutC.2.1.14.2	*Place instream structures, guided by assessment results*					
SONCC-GutC.2.1.21	Floodplain and Channel Structure	Yes	Increase channel complexity	Increase LWD, boulders, or other instream structure	Population wide	2d
SONCC-GutC.2.1.21.1	*Assess habitat to determine beneficial location and amount of instream structure needed*					
SONCC-GutC.2.1.21.2	*Place instream structures, guided by assessment results*					
SONCC-GutC.8.1.3	Sediment	Yes	Reduce delivery of sediment to streams	Reduce stream bank erosion	All streams where coho salmon would benefit immediately	2c
SONCC-GutC.8.1.3.1	*Complete stream bank sediment source inventory and map unstable hillslopes. Develop a plan that prioritizes and locations for treatment*					
SONCC-GutC.8.1.3.2	*Treat priority sediment source sites, guided by the plan*					
SONCC-GutC.8.1.3.3	*Provide educational materials to land owners that describes alternative land management practices that will result in reduced erosion and impacts to riparian forests*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-GutC.8.1.24	Sediment	Yes	Reduce delivery of sediment to streams	Reduce stream bank erosion	Population wide	2d
SONCC-GutC.8.1.24.1	*Complete stream bank sediment source inventory and map unstable hillslopes. Develop a plan that prioritizes locations for treatment*					
SONCC-GutC.8.1.24.2	*Treat priority sediment source sites, guided by the plan*					
SONCC-GutC.8.1.24.3	*Provide educational materials to land owners that describes alternative land management practices that will result in reduced erosion and impacts to riparian forests*					
SONCC-GutC.7.1.11	Riparian	No	Improve wood recruitment, bank stability, shading, and food subsidies	Improve timber harvest practices	Population wide	2c
SONCC-GutC.7.1.11.1	*Modify California Forest Practice Rules to include specific regulations which describe how landowners and CalFire will meet the requirements specified in 898.2(d) to ensure that "take" of federally listed species does not occur on timber harvest plans*					
SONCC-GutC.2.2.13	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	3c
SONCC-GutC.2.2.13.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-GutC.2.2.13.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-GutC.2.2.22	Floodplain and Channel Structure	Yes	Reconnect the channel to the floodplain	Construct off channel habitats, alcoves, backwater habitat, and old stream oxbows	Population wide	3d
SONCC-GutC.2.2.22.1	*Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat*					
SONCC-GutC.2.2.22.2	*Implement restoration projects that improve off channel habitats to create refugia habitat, as guided by assessment results*					
SONCC-GutC.8.1.4	Sediment	Yes	Reduce delivery of sediment to streams	Minimize mass wasting	All streams where coho salmon would benefit immediately	3c
SONCC-GutC.8.1.4.1	*Assess roads and determine feasibility for relocation in priority sites*					
SONCC-GutC.8.1.4.2	*Relocate roads off of unstable land features, based on the assessment*					
SONCC-GutC.8.1.25	Sediment	Yes	Reduce delivery of sediment to streams	Minimize mass wasting	Population wide	3d
SONCC-GutC.8.1.25.1	*Assess roads and determine feasibility for relocation in priority sites*					
SONCC-GutC.8.1.25.2	*Relocate roads off of unstable land features, based on the assessment*					

Action ID	Target	KLS/T	Strategy	Action Description	Area	Priority
Step ID	*Step Description*					
SONCC-GutC.8.1.10	Sediment	Yes	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	All streams where coho salmon would benefit immediately	3c
SONCC-GutC.8.1.10.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-GutC.8.1.10.2	*Decommission roads, guided by assessment*					
SONCC-GutC.8.1.10.3	*Upgrade roads, guided by assessment*					
SONCC-GutC.8.1.10.4	*Maintain roads, guided by assessment*					
SONCC-GutC.8.1.23	Sediment	Yes	Reduce delivery of sediment to streams	Reduce road-stream hydrologic connection	Population wide	3d
SONCC-GutC.8.1.23.1	*Assess and prioritize road-stream connection, and identify appropriate treatments*					
SONCC-GutC.8.1.23.2	*Decommission roads, guided by assessment*					
SONCC-GutC.8.1.23.3	*Upgrade roads, guided by assessment*					
SONCC-GutC.8.1.23.4	*Maintain roads, guided by assessment*					
SONCC-GutC.10.7.18	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	All streams where coho salmon would benefit immediately	3c
SONCC-GutC.10.7.18.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-GutC.10.7.18.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-GutC.10.7.19	Water Quality	No	Restore nutrients	Add marine-derived nutrients to streams	Population wide	3d
SONCC-GutC.10.7.19.1	*Develop a plan to supply appropriate amounts of marine-derived nutrients to streams (e.g. carcass placement, pellet dispersal)*					
SONCC-GutC.10.7.19.2	*Supply marine-derived nutrients to streams guided by the plan*					
SONCC-GutC.7.1.2	Riparian	No	Improve wood recruitment, bank stability, shading, and food subsidies	Increase riparian vegetation	Population wide	3d
SONCC-GutC.7.1.2.1	*Plant native riparian species in denuded areas*					