

43. Middle Fork Eel River Population

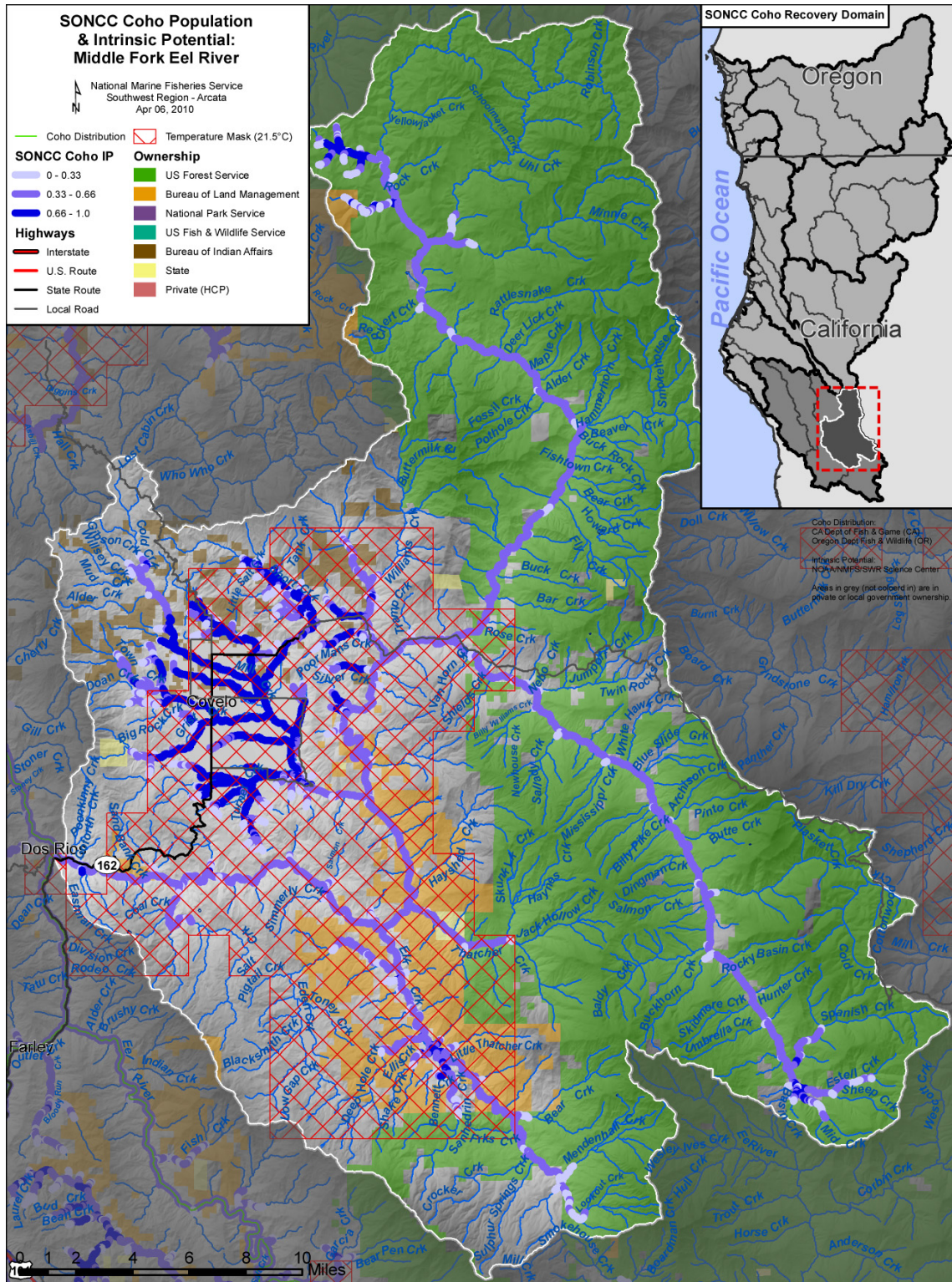
- Interior Eel River Stratum
 - Potentially Independent Population
 - High Extinction Risk
 - 5 • Recovery criteria: 20% of IP habitat must be occupied in years following spawning of brood years with high marine survival
 - 753 mi²
 - 78 IP km (48 mi) (13% High)
 - Dominant Land Uses are Agriculture and Recreation
 - 10 • Principal Stresses are ‘Altered Sediment Supply’ and ‘Degraded Riparian Forest Conditions’
 - Principal Threats are ‘Roads’ and ‘High Intensity Fire’
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43.1 History of Habitat and Land Use

15 Historic land use activities in the Middle Fork Eel River include grazing, timber harvest, recreation, and residential development. Overgrazing in the early 1900s precipitated soil erosion and altered vegetation (California Department of Water Resources (DWR) 1982). Currently, grazing is believed to be moderate in scope. In 1862, small-scale logging began near Covelo and continued until after World War II. An estimated 46 percent of the timbered land in the population area, representing 23 percent of the overall land in the population, was logged by 20 either clear cut or partial cut methods from 1950 to 1981 (DWR 1982).

25 USFS Watershed Analyses for the Middle Fork Eel River and Black Butte River watersheds (“sub-watersheds” in document) concluded that, “human activities contributed to conditions that resulted in increased erosion and sedimentation, direct removal of riparian vegetation, and secondary impacts resulting from bank erosion and decreased vegetation in the watershed.” Past timber harvest practices along intermittent and perennial streams contributed to increases in stream temperatures. Floods in 1955 and 1964, as well as high densities of dirt roads, are responsible for excessive sedimentation that is especially apparent in the Round Valley watershed contained within the Middle Fork Eel River population area

Middle Fork Eel River Population



5 Figure 43-1. The geographic boundaries of the Middle Fork Eel River 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.

43.2 Historic Fish Distribution and Abundance

Middle Fork Eel River historic coho salmon population size estimates are not available. Coho salmon have not been recorded in the Middle Fork Eel River or its tributaries since 1979, despite numerous surveys by CDFG (Jong et al. 2008).

5 Table 43-1. Tributaries with instances of high IP reaches (IP > 0.66). (Williams et al. 2006).

| Subarea | Stream Name | Subbasin | Stream Name |
|--------------|---------------------|-------------------|-----------------------------------------------------------|
| Round Valley | Grist Creek | Black Butte River | Basin Creek |
| | Little Salt Creek | | Estell Creek |
| | Little Valley Creek | | Mid Creek |
| | Mill Creek | | Spanish Creek |
| | Poor Mans Creek | Eden Valley | Bennett Creek |
| | Short Creek | | Elk Creek |
| | Silver Creek | | Ellis Creek |
| | Tank Creek | | Sanhedrin Creek |
| | Town Creek | | Shake Creek |
| | Turner Creek | Wilderness | Willow Creek |
| | Williams Creek | | unnamed tributary of the North Fork Middle Fork Eel River |

43.3 Status of Middle Fork Eel River Coho Salmon

Spatial Structure and Diversity

10 Except for occasional strays, the current distribution of spawners is extremely limited if they are present at all. Because of the extremely low number of individuals, diversity is also extremely low. Because its spatial structure and diversity are limited, the Middle Fork Eel River coho salmon population is at high extinction risk. Population Size and Productivity

15 Williams et al. (2008) determined at least 78 coho salmon must spawn in the Middle Fork Eel River each year to avoid extinction resulting from extremely low population sizes. The Middle Fork Eel River coho salmon population size is unknown and is presumed to be extirpated. Under the current climate, the Middle Fork Eel River may never have supported coho salmon (U.S. Forest Service (USFS) 2009d). Surveys of the Middle Fork Eel River and its tributaries since 1979 have resulted in no observations of coho salmon. Given the extremely low population size and presumed negative population growth rate, the Middle Fork Eel River coho salmon population is at high risk of extinction.

20 **Extinction Risk**

The Middle Fork Eel River coho salmon population is presumed to be functionally extinct, not viable, and at high risk of extinction because the estimated average spawner abundance over the past three years has been less than the depensation threshold (Table ES-1 in Williams et al.

2008). Any remnant coho salmon that still use this population area are at high extinction risk. Areas with the highest intrinsic potential are primarily in the Round Valley; however, most of the tributaries in the Round Valley are dry in the summer (U.S. Environmental Protection Agency (EPA) 2003b).

5 **Role in SONCC Coho Salmon ESU Viability**

The Middle Fork Eel River population is a Potentially Independent non-core population within the ESU 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 (Williams et al. 2006). Sufficient spawner densities are needed to maintain connectivity and diversity within the stratum and continue to represent critical components of the evolutionary legacy of the ESU. The Middle Fork Eel River population recovery target is for the population to recover to at least a moderate risk of extinction (see Chapter 2).

43.4 Plans and Assessments

Environmental Protection Agency

15 *Total Maximum Daily Loads for the Eel River*

In December 2003, the EPA published the final Total Maximum Daily Loads (TMDL) for temperature and sediment for the Middle Fork Eel River. The North Coast Regional Water Quality Control Board is required to develop measures which will result in implementation of the TMDLs in accordance with the requirements of 40 CFR 130.6

20 **State of California**

Eel River Salmon and Steelhead Restoration Action Plan

In 1997, the California Department of Fish and Game completed its assessment of the Eel River basin and provided recommendations for restoration of salmonid stocks. Primary recommendations included removing barriers, reducing sediment inputs, improving riparian forest conditions, reducing water withdrawals, enhancing habitat, and controlling Sacramento pikeminnow.

Recovery Strategy for California Coho Salmon

http://www.dfg.ca.gov/fish/Resources/Coho/SAL_CohoRecoveryRpt.asp

30 The specific restoration recommendations developed by the Coho Recovery Team and CDFG for the Middle Fork Eel River (for Subareas Eden Valley, Round Valley, Black Butte River, and Wilderness) have been considered and incorporated into the table of population-specific recovery actions.

U.S. Forest Service

Watershed Analysis

The U.S. Department of Agriculture Forest Service completed watershed analyses for the Upper Middle Fork Eel River and the Black Butte River in 1994 and 1996, respectively.

43.5 Stresses

5 Table 43-2. Severity of stresses affecting each life stage of coho salmon in the Middle Fork Eel River 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) | | Egg | Fry | Juvenile ¹ | Smolt | Adult | Overall Stress Rank |
|-----------------------------|--------------------------------------------------|-----------|-----------|------------------------|--------|-----------|---------------------|
| 1 | Altered Sediment Supply ¹ | Very High | Very High | Very ¹ High | High | Very High | High |
| 2 | Degraded Riparian Forest Conditions ¹ | Low | High | High ¹ | High | High | High |
| 3 | Increased Disease/Competition/Predation | Low | High | High | High | Low | High |
| 4 | Barriers | - | Medium | Medium | Medium | Medium | Medium |
| 5 | Lack of Floodplain and Channel Structure | Low | Low | High | High | High | Medium |
| 6 | Impaired Estuary/Mainstem Function | - | Low | High | High | Medium | Medium |
| 7 | Impaired Water Quality | Low | Medium | High | High | Medium | Medium |
| 8 | Altered Hydrologic Function | Medium | Medium | Medium | Medium | Medium | Medium |
| 9 | Adverse Fishery-Related Effects | - | - | - | - | Medium | Medium |
| 10 | Adverse Hatchery-Related Effects | Low | Low | Low | Low | Low | Low |

¹ Key limiting factor(s) and limited life stage(s).

Limiting Stresses, Life Stages, and Habitat

10 Based on the type and extent of stresses and threats affecting the population as well as the limiting factors influencing productivity, the juvenile life stage is likely the most limited, and quality summer and winter rearing habitat is lacking. Juvenile summer and winter rearing success is most limited by unsuitable habitat resulting from high water temperatures and excessive sedimentation. Moreover, channel complexity and estuary diversity are important to juvenile coho salmon, increasing their size and fitness prior to ocean entry and their overall marine survival success.

15 Complex stream channels with deep pools and woody structure as well as tidally influenced wetlands with off channel ponds are important refuge areas for juvenile coho. Properly functioning rearing habitat would provide buffers against some of the other stresses affecting the population. Juvenile coho salmon would be more protected against predation, competition, and warm mainstem water temperatures if there were additional refugia areas. Although water

temperatures in this subbasin are elevated, several pools and tributaries have been identified as potential thermal refugia. Although these refugia are not in reaches with high IP values, they could still provide important rearing habitat for juveniles.

Sediment Supply

- 5 Excessive sediment presents a very high stress for most of the life stages of coho salmon. . Increased sediment delivery resulted in a high percentage of embeddedness in the Middle Fork Eel River and a number of its tributaries. Measurements in the upper subbasin show limited sediment deposition in pools, where the median particle size is good to fair. The EPA (2003b) estimated that 95 percent (574 tons/mi²/year) of the sediment load is due to the natural, highly erosive geology of the upper subbasin, and the remaining 5 percent (29 tons/mi²/year) of the sediment load is management related. High sediment loads embed spawning gravel, rendering spawning beds less suitable, bury redds, and fill-in pools.

Riparian Forest Conditions

- 15 Degraded riparian forest conditions are a high stress for all coho salmon life stages. Riparian shade is generally fair in the valley while the upper subbasin has fair to good shade cover. Streamside areas are dominated by the early seral conditions of either open or hardwood canopies. The lack of mature riparian species and an insufficient forest canopy results in inadequate water temperatures for juvenile rearing.

- 20 Sudden oak death (SOD) is an exotic pathogen affecting almost all native species of plants, shrubs, and trees. SOD is in epidemic stages in population areas downstream of the population, in which coho salmon must migrate through. Because the SOD pathogen is water borne and can travel downstream in watercourses, the likelihood of SOD outbreaks in the population area and adjacent populations are high. One of the largest areas infected by SOD occurs near Redway and is growing at a very fast rate.

25 Increased Disease, Competition, and Predation

The non-native Sacramento pikeminnow poses a high threat to coho salmon fry, juveniles, and smolts and also competes with juveniles for limited food and habitat. The pikeminnow is successful in the Middle Fork Eel River because it thrives in severely impacted habitat that is less favorable for salmonids.

30 Barriers

Barriers are a medium stress for all life stages from juveniles to adults. Several tributaries of the Middle Fork Eel River have natural and/or unnatural complete barriers as well as partial barriers. Some dams and natural barriers block access to high IP habitats, such as on Cutfinger Creek. A barrier on Willow Creek may also partially or completely block access to this high IP tributary.

35 Floodplain and Channel Structure

Habitat complexity, including presence of pools, large wood cover, and floodplains, is essential for juvenile coho salmon to optimize forage; avoid predation; and access thermal and velocity

refuges. Inadequate floodplain and channel structure presents a high stress for juveniles, smolts and adults. Pool frequency is poor throughout the population area, and pool depth varies from good to poor. In the early 1900s, Round Valley streams were extensively modified and resulted in significant stream incision throughout the valley that disconnected the streams from their floodplains. Derelict cars were commonly used as riprap to stabilize the streambanks.

Impaired Estuary/Mainstem Function

All salmon and steelhead that originate from the Middle Fork Eel River migrate to and from the ocean through the mainstem Eel River and the Eel River estuary. The Eel River estuary was once a highly complex and extensive habitat area that played a vital role in the health and productivity of all Eel River coho salmon populations. The degraded function of the Eel River estuary and mainstem migratory corridor today constitutes a high stress for this population. The Eel River estuary is severely impaired because of past diking and filling of wetlands for agriculture and flood protection. Approximately 60 percent of the estuary has been lost through the construction of levees and dikes (CDFG 2010b). There is evidence that the estuary once supported a high degree of estuarine habitat and rearing potential, but very little of that historic function still exists. Mainstem conditions contribute to this stress because of water quality issues, predation pressure, and degraded habitat. Juveniles, smolts, and adults suffer from lost opportunities for increased growth and survival in formerly extensive and now degraded estuarine and mainstem rearing and migratory habitats.

Impaired Water Quality

Suitable water quality, especially appropriate temperature, is essential for juvenile coho salmon growth and survival. Impaired water quality acts as a high stress for juveniles and smolts and represents a medium stress for fry and adults. Although benthic macroinvertebrate richness and EPT metrics are rated very good (indicating little to no water quality contamination and good dissolved oxygen levels), summer rearing stream temperature is poor throughout most of the population area. Most of the exposed main channels are close to lethal stream temperatures during the hottest part of the summer (EPA 2003b). However, the headwaters of Black Butte Creek may have thermal refugia, and the upper Middle Fork Eel River has many stratified pools that support other salmonids.

Hydrologic Function

Altered hydrologic function is a medium stress for all life stages when summarized across the subbasin. Water quantities in the upper subbasin are believed to be very good. Flow data for the lower subbasin wherein most of the high IP areas occur does not exist. The EPA (2003b) noted that most of the tributaries in the Round Valley and Elk/Thatcher areas are dry except in their uppermost portions. Beginning in the 1850s, the conversion of wetlands to arable lands resulted in a lower water table and reduced summer flows.

Adverse Fishery-Related Effects

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

managed by the state of California and tribal governments upon the continued existence of the SONCC coho salmon ESU have not been formally evaluated by NMFS (Appendix B).

Adverse Hatchery-Related Effects

5 The effects of hatchery fish on all life stages of coho salmon are described in Chapter 3. There are no operating hatcheries in the Middle Fork Eel River 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 (Appendix B) and there are no hatcheries in the basin.

10 **43.6 Threats**

Table 43-3. Severity of threats affecting each life stage of coho salmon in the Middle Fork Eel River. 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 | Very High | Very High |
| 2 | High Intensity Fire | High | High | Medium | Medium | High | High |
| 3 | Climate Change | Medium | Medium | High | High | High | High |
| 4 | Invasive Non-Native/Alien Species | Low | High | High | High | Low | Medium |
| 5 | Road-Stream Crossing Barriers | - | Medium | Medium | Medium | Medium | Medium |
| 6 | Dams/Diversion | Low | Medium | Medium | Medium | Medium | Medium |
| 7 | Agricultural Practices | Medium | Medium | Low | Low | Medium | Medium |
| 8 | Urban/Residential/Industrial | Low | Medium | Low | Low | Medium | Medium |
| 9 | Fishing and Collecting | - | - | - | - | Medium | Medium |
| 10 | Channelization/Diking | Low | Low | Low | Low | Low | Low |
| 11 | Hatcheries | Low | Low | Low | Low | Low | Low |

¹Gravel Mining/Gravel Extraction, and Timber Harvest are not considered threats to this population.

Roads

15 Roads are a significant threat across all life stages and are the most significant, overall threat for coho salmon in this population. Road density is very high in the Round Valley, where high IP reaches are predominately located. Road-related and harvest-related landsliding rates are highest

in Black Butte, Elk Creek and Round Valley subareas with rates as high as 9 to 13 tons per square mile per year (EPA 2003b). With few road decommissioning and upgrading projects in the population area and the likelihood of more road building, this threat is likely to continue in the future.

5 High Intensity Fire

High intensity fire is a high threat to adults, eggs, and fry and a medium threat to juveniles. Past timber harvest practices coupled with decades-long fire-suppression efforts have rendered understory forest fuel loads excessive. High intensity fires regularly result from these excessive forest fuel loads and are likely to continue in this subbasin. Such high intensity fires threaten coho salmon because they remove vegetation and plant litter that protects or minimizes soil erosion, gullyng, and mass wasting that contributes to high sediment loads within coho salmon habitats. High sediment loads embed spawning gravel, making it less suitable for spawning or burying redds and alevins. Lastly, high intensity fires remove riparian trees, thus increasing solar radiation in the mainstem and tributaries and resulting in elevated water temperatures.

15 Climate Change

Climate change will have the greatest impact upon juveniles, smolts, and adults. The current climate is generally warm and regional average temperature models indicate average temperatures could increase by up to 3 °C in the summer and by up to 1 °C in the winter (see Appendix B for modeling methods). Annual precipitation in this area is predicted to change little over the next century. However, snowpack in upper elevations of the Eel River basin will decrease with changes in temperature and precipitation (California Natural Resources Agency 2009). The vulnerability of the Eel River estuary to sea level rise is very high. Juvenile and smolt rearing and migratory habitats are most at risk to climate change. Increasing temperatures and changes in the amount and timing of precipitation and snowmelt will impact water quality and hydrologic function in the summer and winter. Rising sea level may also impact the quality and extent of wetland rearing habitat in the estuary. Overall, the range and degree of variability in temperature and precipitation is likely to increase in all populations. As with all populations in the ESU, adults will be negatively impacted by ocean acidification, changes in ocean conditions, and prey availability (see Independent Science Advisory Board 2007, Portner and Knust 2007, Feely et al. 2008).

Invasive Non-Native/Alien Species

The non-native Sacramento pikeminnow is a high threat to fry, juveniles, and smolts because they compete with and prey upon young coho salmon. Sacramento pikeminnow were introduced in Lake Pillsbury in 1979 (Brown and Moyle 1997) and have spread throughout the entire Eel River basin. The warm water temperatures in the Eel River and Lake Pillsbury allow this voracious predator to thrive in this system. The Sacramento pikeminnow's presence in Lake Pillsbury makes eradication of this species extremely difficult. Any effort to remove this species in the Eel River without treating the lake will only be temporary because the lake will continue to be the source population for the rest of the Eel River basin.

Road-stream Crossing Barriers

Road-related barriers are a low threat to coho salmon. There are six complete and three partial barriers resulting from road culverts in the population area. However, most of these barriers occur outside of high IP reaches.

5 Dams/Diversions

Diversions pose a medium threat to fry, juveniles, smolts, and adults and a low threat to eggs. Unpermitted agricultural diversions, primarily for remote cultivation practices, significantly reduce or eliminate streamflows during the summer and fall rearing periods and are likely to increase as remote agriculture is expanded in the upper population reaches.

10 Agricultural Practices

Agricultural practices present a medium threat to adults, eggs, and fry and a low threat to the other life history stages. Grazing occurs throughout the lower subbasin, and where exclusionary fencing has not been installed and maintained, contributes to increased bank erosion and riparian vegetation degradation.

15 Urban/Residential/Industrial Development

Urban, residential, and industrial development pose medium threats to adults and fry. The largest developed areas within the population area are located in the valley reaches near Covelo. However, this threat is not expected to change significantly because Covelo is not expected to significantly expand in the near future.

20 Fishing and Collecting

California-managed fisheries for species other than coho salmon occur in estuaries, freshwater, and nearshore marine areas. The Round Valley Tribe's salmonid fishery has the potential to cause injury or death to coho salmon in the Middle Fork Eel River. The effects of the fisheries managed by the State of California and by the Round Valley Tribe upon the continued existence of the SONCC coho salmon ESU have not been formally evaluated by NMFS. As of April 2011, NMFS has not authorized future collection of coho salmon for research purposes in the Middle Fork Eel River.

Channelization/Diking

On-going, un-permitted stream channel manipulations pose a medium threat to all life stages. Tributaries to the Middle Fork Eel River in the Round Valley area have been channelized for residential and agricultural purposes. Channelization significantly degrades juvenile coho salmon rearing habitat by increasing flow velocities, reducing creek meanders, and impeding the creeks' abilities to access floodplains during high flows.

Hatcheries

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

5 43.7 Recovery Strategy

Historic logging, agriculture, urbanization, and associated activities in the Middle Fork Eel River have resulted in severely degraded instream and riparian conditions in the population area. Currently, high road density continues to contribute excessive sediment loads. Improperly managed livestock grazing significantly degrades water quality and quantity and negatively impacts water temperatures in the lower subbasin. Excessively high water temperatures severely limit available juvenile coho salmon summer rearing habitat, especially in high IP reaches. Natural and artificial barriers also limit rearing and spawning access. The non-native Sacramento pikeminnow continues to compete with and prey upon juvenile coho salmon. The highest IP areas within the Middle Fork Eel River subbasin occur in areas exhibiting the highest human impacts.

Coho salmon abundance and distribution in the Middle Fork Eel River are practically nonexistent, making population recovery extremely difficult. Recovery activities in the population area should promote increased spatial distribution as well as increased productivity and abundance. Where possible, activities should focus upon those tributaries with high IP values. Activities that reduce sediment delivery and stream temperatures should be a high priority within the population area. Specific goals for each stressor are listed below and identify activities expected to reduce the stresses currently affecting the Middle Fork Eel River coho salmon population.

Table 43-4 on the following page lists the recovery actions for the Middle Fork Eel River population.

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Table 43-4. Recovery action implementation schedule for the Middle Fork Eel River population.

| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|-----------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-----------------------------------------------------------------------|------------------------------------------|-------------------------------------------------------------------|----------|
| <i>Step ID</i> | <i>Step Description</i> | | | | | |
| SONCC-MFER.7.1.4 | Riparian | Yes | Improve wood recruitment, bank stability, shading, and food subsidies | Improve long-range planning | Population wide | BR |
| <i>SONCC-MFER.7.1.4.1</i> <i>SONCC-MFER.7.1.4.2</i> | <i>Review General Plan or City Ordinances to ensure coho salmon habitat needs are accounted for. Revise if necessary</i> <i>Develop watershed-specific guidance for managing riparian vegetation</i> | | | | | |
| SONCC-MFER.7.1.5 | Riparian | Yes | Improve wood recruitment, bank stability, shading, and food subsidies | Improve grazing practices | Population wide | BR |
| <i>SONCC-MFER.7.1.5.1</i> <i>SONCC-MFER.7.1.5.2</i> <i>SONCC-MFER.7.1.5.3</i> <i>SONCC-MFER.7.1.5.4</i> <i>SONCC-MFER.7.1.5.5</i> | <i>Assess grazing impact on sediment delivery and riparian condition, identifying opportunities for improvement</i> <i>Develop grazing management plan to meet objective</i> <i>Plant vegetation to stabilize stream bank</i> <i>Fence livestock out of riparian zones</i> <i>Remove instream livestock watering sources</i> | | | | | |
| SONCC-MFER.8.1.7 | Sediment | Yes | Reduce delivery of sediment to streams | Reduce risk of catastrophic fire | Population wide | BR |
| <i>SONCC-MFER.8.1.7.1</i> <i>SONCC-MFER.8.1.7.2</i> | <i>Identify forested stands for fire hazard reduction</i> <i>Apply appropriate management techniques (e.g. thinning, burning) to reduce risks of high intensity fire</i> | | | | | |
| SONCC-MFER.8.1.8 | Sediment | Yes | Reduce delivery of sediment to streams | Reduce stream bank erosion | Round Valley, Eden Valley, wilderness, and Black Butte River HSAs | BR |
| <i>SONCC-MFER.8.1.8.1</i> <i>SONCC-MFER.8.1.8.2</i> | <i>Inventory sediment sources, and prioritize for treatment</i> <i>Treat priority sediment source sites, guided by assessment</i> | | | | | |
| SONCC-MFER.8.1.9 | Sediment | Yes | Reduce delivery of sediment to streams | Reduce road-stream hydrologic connection | Population wide | BR |
| <i>SONCC-MFER.8.1.9.1</i> <i>SONCC-MFER.8.1.9.2</i> | <i>Assess and prioritize road-stream connection, and identify appropriate treatment to meet objective</i> <i>Decommission roads, guided by assessment</i> | | | | | |

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| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|-----------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------|
| <i>Step ID</i> | | <i>Step Description</i> | | | | |
| <i>SONCC-MFER.8.1.9.3</i> | | <i>Upgrade roads, guided by assessment</i> | | | | |
| <i>SONCC-MFER.8.1.9.4</i> | | <i>Maintain roads, guided by assessment</i> | | | | |
| SONCC-MFER.14.2.1 | Disease/Predation/ Competition | No | Reduce predation and competition | Reduce abundance of Sacramento pikeminnow | Population wide | 2 |
| <i>SONCC-MFER.14.2.1.1</i> | | <i>Determine the effectiveness of various pikeminnow suppression techniques and develop experimental control methods. Develop a plan that identifies watersheds suitable for experimental pikeminnow control</i> | | | | |
| <i>SONCC-MFER.14.2.1.2</i> | | <i>Control Sacramento pikeminnow, guided by the control plan</i> | | | | |
| SONCC-MFER.1.2.23 | Estuary | No | Improve estuarine habitat | Improve estuary condition | Eel River Estuary | 3 |
| <i>SONCC-MFER.1.2.23.1</i> | | <i>Implement recovery actions to address strategy "Estuary" for Lower Eel/Van Duzen River population</i> | | | | |
| SONCC-MFER.16.1.11 | 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 | 3 |
| <i>SONCC-MFER.16.1.11.1</i> | | <i>Determine impacts of fisheries management on SONCC coho salmon in terms of VSP parameters</i> | | | | |
| <i>SONCC-MFER.16.1.11.2</i> | | <i>Identify fishing impacts expected to be consistent with recovery</i> | | | | |
| SONCC-MFER.16.1.12 | Fishing/Collecting | No | Manage fisheries consistent with recovery of SONCC coho salmon | Limit fishing impacts to levels consistent with recovery | SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon | 2 |
| <i>SONCC-MFER.16.1.12.1</i> | | <i>Determine actual fishing impacts</i> | | | | |
| <i>SONCC-MFER.16.1.12.2</i> | | <i>If actual fishing impacts exceed levels consistent with recovery, modify management so that levels are consistent with recovery</i> | | | | |
| SONCC-MFER.16.2.13 | 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 | 3 |
| <i>SONCC-MFER.16.2.13.1</i> | | <i>Determine impacts of scientific collection on SONCC coho salmon in terms of VSP parameters</i> | | | | |
| <i>SONCC-MFER.16.2.13.2</i> | | <i>Identify scientific collection impacts expected to be consistent with recovery</i> | | | | |

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| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|-----------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------|
| <i>Step ID</i> | | <i>Step Description</i> | | | | |
| SONCC-MFER.16.2.14 | Fishing/Collecting | No | Manage scientific collection consistent with recovery of SONCC coho salmon | Limit impacts of scientific collection to levels consistent with recovery | SONCC recovery domain plus ocean; from shore to 200 miles off coasts of California and Oregon | 3 |
| <i>SONCC-MFER.16.2.14.1</i> | | <i>Determine actual impacts of scientific collection</i> | | | | |
| <i>SONCC-MFER.16.2.14.2</i> | | <i>If actual scientific collection impacts exceed levels consistent with recovery, modify collection so that impacts are consistent with recovery</i> | | | | |
| SONCC-MFER.2.1.2 | Floodplain and Channel Structure | No | Increase channel complexity | Increase LWD, boulders, or other instream structure | Population wide | BR |
| <i>SONCC-MFER.2.1.2.1</i> | | <i>Assess habitat to determine beneficial location and amount of instream structure needed</i> | | | | |
| <i>SONCC-MFER.2.1.2.2</i> | | <i>Place instream structures, guided by assessment results</i> | | | | |
| SONCC-MFER.2.2.3 | Floodplain and Channel Structure | No | Reconnect the channel to the floodplain | Remove, set back, or reconfigure levees and dikes | Population wide | BR |
| <i>SONCC-MFER.2.2.3.1</i> | | <i>Assess feasibility and develop a plan to remove or set back levees and dikes that includes restoring the natural channel form and floodplain connectivity once the levees have been removed</i> | | | | |
| <i>SONCC-MFER.2.2.3.2</i> | | <i>Remove levees and restore channel form and floodplain connectivity</i> | | | | |
| SONCC-MFER.2.2.22 | Floodplain and Channel Structure | No | Reconnect the channel to the floodplain | Construct off channel ponds, alcoves, backwater habitat, and old stream oxbows | Population wide | 3 |
| <i>SONCC-MFER.2.2.22.1</i> | | <i>Identify potential sites to create refugia habitats. Prioritize sites and determine best means to create rearing habitat</i> | | | | |
| <i>SONCC-MFER.2.2.22.2</i> | | <i>Implement restoration projects that improve off channel habitats as guided by assessment results</i> | | | | |
| SONCC-MFER.27.1.15 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Estimate abundance | Population wide | 3 |
| <i>SONCC-MFER.27.1.15.1</i> | | <i>Perform annual spawning surveys</i> | | | | |
| SONCC-MFER.27.1.16 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Estimate juvenile spatial distribution | Population wide | 3 |
| <i>SONCC-MFER.27.1.16.1</i> | | <i>Conduct presence/absence surveys for juveniles (3 years on; 3 years off)</i> | | | | |

Middle Fork Eel River Population

| Action ID | Strategy | Key LF | Objective | Action Description | Area | Priority |
|----------------------|----------|-------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|----------|
| <i>Step ID</i> | | <i>Step Description</i> | | | | |
| 5 | | | | | | |
| SONCC-MFER.27.1.17 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Track indicators related to the stress 'Fishing and Collecting' | Population wide | 2 |
| 10 | | | | | | |
| | | | | | | |
| | | | | | | |
| SONCC-MFER.27.1.17.1 | | | | | | |
| SONCC-MFER.27.1.17.2 | | | | | | |
| 15 | | | | | | |
| SONCC-MFER.27.2.18 | Monitor | No | Track habitat condition | Track habitat indicators related to spawning, rearing, and migration | Population wide | 3 |
| 15 | | | | | | |
| | | | | | | |
| | | | | | | |
| SONCC-MFER.27.2.18.1 | | | | | | |
| SONCC-MFER.27.2.18.2 | | | | | | |
| 20 | | | | | | |
| SONCC-MFER.27.2.19 | Monitor | No | Track habitat condition | Track habitat indicators related to the stress 'Degraded Riparian Forest Condition' | All IP habitat | 3 |
| 20 | | | | | | |
| | | | | | | |
| | | | | | | |
| SONCC-MFER.27.2.19.1 | | | | | | |
| 25 | | | | | | |
| SONCC-MFER.27.2.20 | Monitor | No | Track habitat condition | Track habitat indicators related to the stress 'Altered Sediment Supply' | All IP habitat | 3 |
| 25 | | | | | | |
| | | | | | | |
| | | | | | | |
| SONCC-MFER.27.2.20.1 | | | | | | |
| 30 | | | | | | |
| SONCC-MFER.27.1.21 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Track indicators related to the threat 'Invasive Species' | Population wide | 3 |
| 30 | | | | | | |
| | | | | | | |
| | | | | | | |
| SONCC-MFER.27.1.21.1 | | | | | | |
| SONCC-MFER.27.1.21.2 | | | | | | |
| 35 | | | | | | |
| SONCC-MFER.27.1.24 | Monitor | No | Track population abundance, spatial structure, productivity, or diversity | Refine methods for setting population types and targets | Population wide | 3 |
| 35 | | | | | | |
| | | | | | | |
| | | | | | | |
| SONCC-MFER.27.1.24.1 | | | | | | |
| SONCC-MFER.27.1.24.2 | | | | | | |
| 40 | | | | | | |