Central Coastal Diversity Stratum

This stratum includes populations that spawn in watersheds that tend to be warmer and drier than those to the north. The Navarro and Garcia basins are included in this stratum on the basis of environmental conditions throughout much of the interior basin, save for a narrow band along the coast.

The populations that have been selected for the recovery scenario are listed in the table below and their profiles, maps, results, and recovery actions are in the pages following. Essential populations are listed by alphabetical order within the diversity stratum, followed by the Rapid Assessment of the Supporting populations:

- Garcia River
- Russian River
- Central Coastal Diversity Stratum Rapid Assessment
    - Gualala River
    - Navarro River

CC Chinook Salmon Central Coastal Diversity Stratum, Populations, Historical Status, Population's Role in Recovery, Current IP-km, and Spawner Density and Abundance Targets for Delisting. The Diversity Stratum recovery targets are only comprised of the essential populations because these are the populations that are expected to be viable (See Vol. 1 Chapter 5).

Diversity Stratum	CC Chinook salmon Populations	Historical Population Status	Population's Role In Recovery	Current Weighted IP-km	Spawner Density	Spawner Abundance
Central Coastal	Garcia River	I	Essential	56.2	36.0	2,000
	Gualala River	I	Supporting	175.6	6-12	1,052-2,105
	Navarro River	I	Supporting	131.5	6-12	787-1,576
	Russian River	I	Essential	465.2	20.0	9,300
Diversity Stratum Recovery Target						**11,300**

CC Chinook salmon Central Coastal Diversity Stratum Populations selected for the recovery scenario.

Garcia River Population

CC Chinook Salmon Fall-Run

- Role within ESU: Potentially Independent Population
- Diversity Stratum: Central Coastal
- Spawner Abundance Target: 2,000 adults
- Current Intrinsic Potential: 56.2 IP-km

For information regarding NC steelhead and CCC coho salmon for this watershed, please see the NC steelhead volume of this recovery plan and the CCC coho salmon recovery plan (http://www.westcoast.fisheries.noaa.gov/).

Abundance and Distribution

Quantitative abundance and distribution estimates of fall-run Chinook salmon within the Garcia River watershed are sparse or non-existent. Chinook salmon abundance is severely depleted from historical accounts, and in most years very few individuals are observed or reported (TCF 2006). Anecdotal accounts of Chinook salmon from the early 1920s suggest abundant and sustainable runs within the Garcia River (Warmerdam 2010).

Although degraded from pristine conditions, a substantial amount of high value habitat still exists within the Garcia watershed. The extent of suitable Chinook salmon habitat is primarily limited to the mainstem Garcia River below the confluence with Inman Creek. The North Fork Garcia River may also support Chinook salmon in some years.

History of Land Use

The early period of logging and timber harvest in the Garcia River watershed began in the late 1860s and ended in 1915. In the 1950s, logging resumed in response to the post-World War II housing boom, with intense harvest rate and loggers utilizing more advanced technologies and heavy machinery. This period of intense logging ended in 1961 and left the watershed in a much degraded state. Large amounts of land were again harvested for timber more recently as 52-percent of the basin was harvested between 1987 and 1997 (NCRWQCB 2005). Logging and wood harvest still occur within the watershed; however, timber harvest practices have improved as compared to previous logging areas, and, therefore, logging-related impacts to salmonid habitat may be less likely. Logging the forest in the watershed triggered increased sediment production, and floodplain development in the lower watershed disconnected the river from deposition zones. The consequence of these two land uses was deposition in the estuary, diminishing the habitat in that important area.

Current Resources and Land Management

A large tract (24,000 acres) of the Garcia River was purchased in 2004 by the Conservation Fund, a group that has been in partnership with The Nature Conservancy, State Coastal Conservancy, Wildlife Conservation Board, and the California Department of Fish and Wildlife in developing and implementing an Integrated Resource Management Plan (2006) for the basin. The Conservation Fund is implementing sustainable management practices that include decreasing the intensity of timber harvests, decreasing timber harvest frequency, improving roads, and widening riparian buffers to improve water quality instreams degraded by past land uses. Other land uses occurring within the Garcia watershed include: agriculture, other timber companies, dairies, and cattle grazing and ranching. Conversion of hillside forest stands to vineyards is also occurring. The majority of the watershed is privately owned. Many government, public interest, and tribal groups and agencies are active or have jurisdiction within the watershed as well. The following pertinent documents are available for the Garcia River watershed:

- Garcia River Forest: Integrated Resource Management Plan (TCF 2006);
- Evaluation of the Garcia River Restoration with Recommendations for Future Projects (CDFG 2003);
- Action Plan for the Garcia River Watershed Sediment TMDL (NCRWQCB 2001);
- Garcia River Sediment Total Maximum Daily Load (USEPA 1998);
- Garcia River Estuary Cross Sections (Jackson 1999);
- A Salmon Spawning Survey for Portions of Ten Mile River, Casper, and the Garcia River 1995-96 (Maahs 1996);
- Fisheries Elements of the Garcia River Estuary Enhancement Feasibility Study (Higgins 1995);
- Garcia River Drilling Mud Spill: Damage Assessment and Suggestions for Mitigation, Restoration, and Monitoring (Higgins 1992); and
- The Garcia River Watershed Enhancement Plan (Monschke and Caldon 1992).

Salmonid Viability and Watershed Conditions

The following indicators were rated Poor through the CAP process for Chinook salmon: LWD frequency, shelter rating, streamside road density, staging pools. Other indicators that are identified as impaired to the extent that rehabilitation work is needed include the following: physical barriers, spawner density, and water temperature. Recovery strategies will focus on ameliorating these habitat indicators, although strategies that address other indicators may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed.

Current Conditions

The following discussion focuses on those conditions that rated Fair or Poor as a result of our CAP Viability analysis. The Garcia River CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Floodplain Connectivity: Velocity Refuge

The historic floodplains in the lower Garcia River watershed have been disconnected due to a century of channel management including straightening, embankment, and willow revetment. Floodplains when inundated during winter and spring are the most productive habitats for salmonids because of the vast space and high food production, resulting in high growth rates and subsequently increased viability of the juvenile life stage**.**

Sediment Transport: Road Density

High road densities within the Garcia River watershed are primarily associated with past timber harvest. While road building standards have improved greatly in recent years, old road networks and landing still pose a high erosion risk (Higgins 1992). Common problems with existing roads within the Garcia River include perched or raveling fills on the outside road edge; fill gullying at watercourse crossings; shot-gunned culverts, or short culverts; inadequate or missing downspouts; and plugged ditches (TCF 2006). A major challenge for the future will be identifying and remediating these problem roads (TCF 2006). High sediment yields from failing roads have greatly affected watershed sediment transport processes and gravel quality in the past, and if continued, will impair habitat conditions for salmonids.

Sediment: Gravel Quality and Distribution of Spawning Gravels

The Garcia River watershed is comprised of very unstable soil types and has a history of intensive logging and associated logging road networks (Higgins 1992). The Garcia Watershed Enhancement Plan (Monschke and Caldon 1992) found that excessive fine sediment exists in the coarse spawning gravels within the lower river and tributaries. Other habitat inventories suggest that quality gravel exists within many watershed tributaries and can provided suitable spawning gravels for salmonids (CDFG 2002; 2003a; 2003c; 2004; 2005). Undoubtedly, suitable spawning gravel exists in some areas within the watershed and other areas still are impaired from past land use. If Chinook salmon are to be recovered, clean and stable spawning gravel must be available in the mainstem for egg incubation and survival.

Passage/Migration: Mouth or Confluence and Physical Barriers

A high percentage of the historic Chinook salmon habitat within the Garcia River watershed is currently accessible, although some fish passage impairments do exist within the watershed (see CalFish Passage Assessment Database online). Most identified passage impairments are partial barriers at stream crossings that may preclude Chinook salmon from reaching spawning destinations in the upper mainstem and adjacent tributaries under certain flow conditions. Some logjams from past logging have also been identified (Bell 2003).

Habitat Complexity: Large Wood and Shelter and Altered Pool Complexity and/or Pool/Riffle Ratios

Extensive CDFW stream surveys (CDFG 2002; 2003a; 2003c; 2004; 2005) indicate that many streams lack pool shelter complexity and desirable riffle/pool ratios. These habitat complexity features have been impaired primarily due to a large wood deficit within the stream channel. Past logging and degraded riparian zones have severely limited the natural recruitment of large wood in many historically productive streams within the watershed. The Conservation Fund and their partners have embarked on many instream large wood placement projects that have improved habitat complexity in some areas (TCF 2006). However, many other stream reaches will require similar supplementation of LWD, boulders, and other channel forming features to encourage more desirable pool/riffle ratios (including primary pools) and increase mean shelter ratings.

Habitat Complexity: Large Wood and Shelter and Staging Pools

The lower seven miles of the mainstem Garcia River flows through an alluvial valley where large amounts of sediment would naturally deposit. Following intensive timber harvest and poor land management, sediment deposition increased substantially during the previous several decades. Additionally, large wood recruitment was lost as riparian habitat was destroyed, limiting the amount of channel forming features (LWD) that encourage sediment sorting and scouring of large pools. Currently, few large, deep pools suitable for early migrating and staging adult Chinook salmon exist within the lower mainstem.

Viability: Density, Abundance & Spatial Structure

The severely limited remnant or stray population of Chinook salmon entering the Garcia River watershed is most likely not abundant enough to recover a viable run. However, habitat conditions have greatly improved and are currently adequate for Chinook salmon to successfully complete their freshwater life history. Population enhancement (supplementation and /or broodstock program) could play an important role in restoring Chinook salmon to the Garcia River. Whether the few returning adult Chinook salmon are of Garcia River origin and are suitable for population enhancement is currently unknown. Scientific investigations need to be

conducted regarding population genetics and the potential importation of out-of-basin stock. To ensure success of population enhancement efforts, long-term habitat protection and continuing rehabilitation efforts need to occur.

Threats

The following discussion focuses on those threats that rate as High or Very High (See Garcia River CAP Results). Recovery strategies will likely focus on ameliorating High rating threats; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in the Garcia River CAP Results.

Logging and Wood Harvesting

Logging and wood harvesting remains a threat to salmonid habitat quantity and quality within the Garcia River watershed. Timber harvest practices have improved greatly within the bounds of the Conservation Fund property and subsequent implementation of the Integrated Resource Management Plan (TCF 2006). However, other portions of the watershed still face accelerated timber harvest rates and high impact harvest techniques. Additionally, habitat degradation (gravel quality, water temperature, instream wood recruitment) associated with past timber harvest persists throughout the watershed, although some processes are currently in a state of recovery. Future management and recovery actions need to protect all salmonid high value habitat from degraded water quality conditions (turbidity and increased temperature) associated with timber harvest, and ensure the continuation of watershed rehabilitation efforts.

Roads and Railroads

Even with current logging road improvements and standards (rolling dips, rock surfaces, and road widths), legacy logging roads remain a threat to salmonid habitat quantity and quality throughout the Garcia River watershed. Impaired passage and migration at road crossings will continue to limit access to suitable habitat, and fine sediment inputs from poorly built, improperly maintained, and abandoned roads will continue. More efficient road networks, removal and replacement of impassable and undersized culverts, and radical decommissioning efforts on problem roads will prevent further salmonid habitat degradation within the watershed.

Water Diversions and Impoundments

Currently, there are no large long standing dams within the Garcia River watershed. Watershed hydrology is relatively unimpaired and free from major water diversions when compared to most watersheds within the NCCC Recovery Domain. However, concerns regarding future land uses, increasing agriculture, and increasing illegal marijuana cultivation pressure could increase water

demand and further reduce spring and summer streamflows. Additionally, future streamflow alterations could alter the hydrodynamics of the estuary during the summer months. Provisions need to be made that ensure future residential and agricultural development do not adversely impact summer and spring baseflows or groundwater recharge.

Livestock Farming and Ranching

Livestock farming and ranching have been reduced around the lower Garcia River/estuary, which has rehabilitated some stream riparian areas and significantly reduced erosion of adjoining properties (see KRIS Garcia[1]). However, the historic quality and extent of the Garcia River estuary is still impaired, as some tidal sloughs continue to be disturbed by cattle activities.

Fishing and Collecting

Poaching within the Garcia River continues to be a major concern within the Garcia River for fisheries managers and restoration practitioners (Joshua Fuller, NMFS, personal communication, 2016). In March 2012, law enforcement from CDFW and the Mendocino County Sheriff's Department seized 18 (17 females, 1 male) wild steelhead from a local non-tribal resident. In response, Congressman Jared Huffman, state, federal, and tribal entities and conservation groups worked together in developing an agreement that made combating poaching a shared responsibility, and outlined a common strategy to protect critically low populations of steelhead, coho and Chinook salmon of the Garcia River. The Manchester-Point Arena Band of Pomo Indians developed *A Resolution of the Business Committee of the Manchester-Point Arena Band of Pomo Indians for the Protection of Garcia River Endangered Species* (Resolution No. #327-11-07-2014). Implementation of this Resolution has made significant progress; however, reports of illegal poaching activities still occur during periods of low-flow. This threat to ESA-listed salmonids of the Garcia River will continue until all poaching has seized.

Limiting Stresses, Lifestages, and Habitats

With few adult Chinook salmon returning to the Garcia River watershed, it is unlikely a self-sustaining population will re-establish independently, and implementing a population enhancement plan will be needed.

General Recovery Strategy

Improve Habitat Complexity and LWD Recruitment

Pool shelter ratings and primary pool frequencies are limited in most tributaries in the Garcia River watershed. Strategically placing channel forming features in high priority reaches of the

[1] http://krisweb.com/krisgarcia/krisdb/html/krisweb/index.htm

Blue Waterhole, North Fork, Inman Creek, Signal Creek, and Graphite Creek sub-basins will increase surface water hydrologic connectivity in highly aggraded reaches and increase summer rearing production. Additionally, establishing appropriate size riparian buffer zones throughout the watershed will increase stream shading and promote natural LWD recruitment.

Protect Natural Hydrologic Conditions

With physical habitat features improving and slowly recovering in many portions of the watershed, protecting spring and summer hydrologic conditions will be essential toward recovering all salmonids within the Garcia River watershed. Any alternatives to the natural watershed hydrology will present a future threat to the recovery of Chinook salmon due to potential reductions in groundwater and subsequently surface flows.

Protect, Enhance, and Rehabilitate the Quality and Extent of the Garcia River Estuary

Efforts should be implemented to reclaim tidal sloughs from cattle grazing and agriculture within some areas of the Garcia River estuary. Integrating Hathaway Creek into future estuary rehabilitation efforts should be investigated.

Investigate Potential Population Augmentation for Chinook Salmon

Scientific investigations need to be conducted regarding population genetics, dynamics, and the potential importation of out-of-basin stock if a viable Chinook salmon run is to be restored to the Garcia River watershed.

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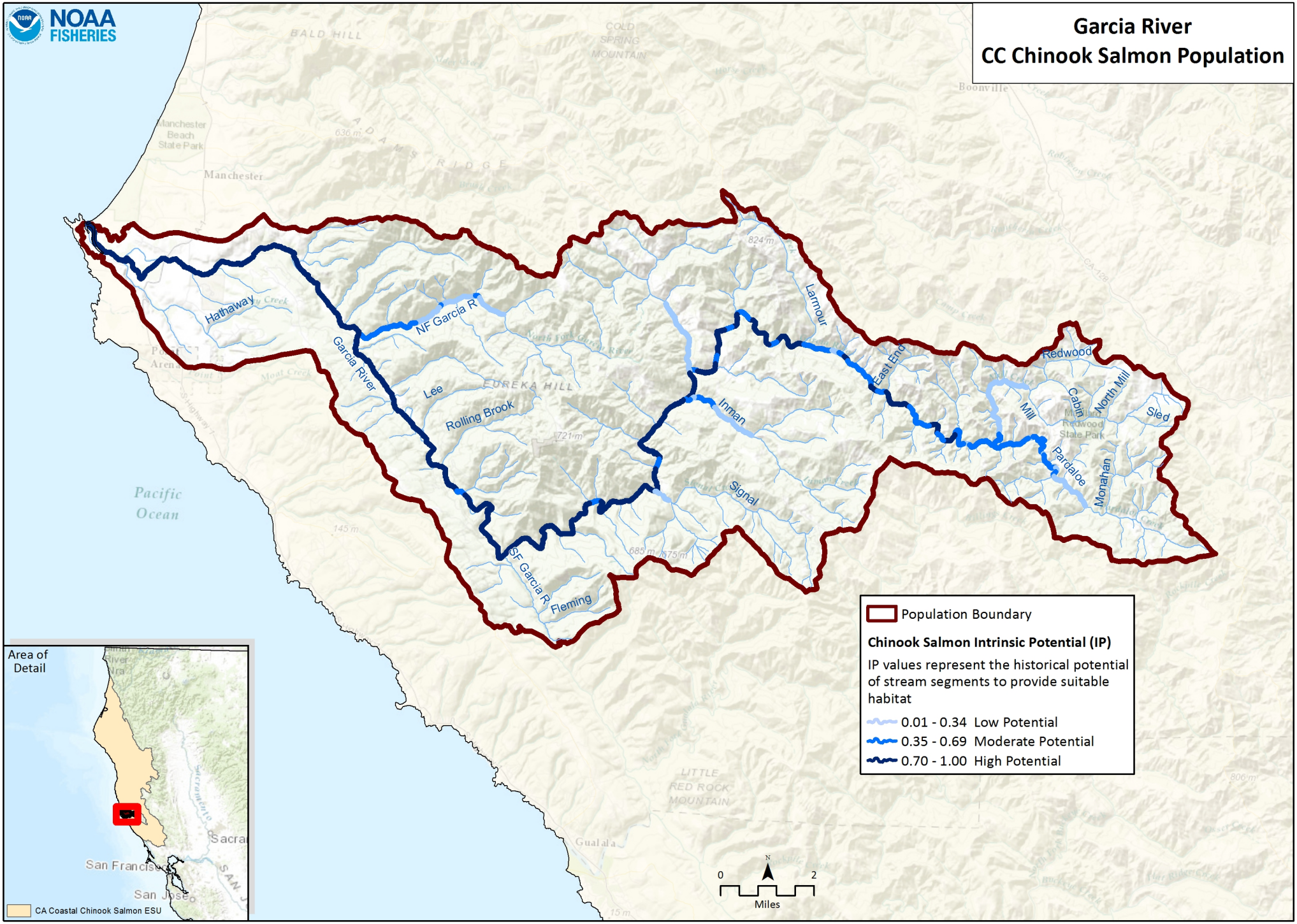
NOAA FISHERIES
Garcia River
CC Chinook Salmon Population
Hathaway
Garcia River
NF Garcia R
Lee
Rolling Brook
Larmour
East End
Inman
Signal
SF Garcia R
Fleming
Redwood
Mill
Cabin
North Mill
Sled
Pardaloe
Monahan
Pacific Ocean
BALD HILL
COLD SPRING MOUNTAIN
EUREKA HILL
LITTLE RED ROCK MOUNTAIN
Manchester
Manchester Beach State Park
Boonville
Redwood State Park
Gualala
Area of Detail
San Francisco
San Jose
CA Coastal Chinook Salmon ESU
Population Boundary
Chinook Salmon Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
N
0
2
Miles

CC Chinook Salmon Garcia River CAP Viability Results

#	Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired but functioning	Fair
			Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-km (>6 Key Pieces/100 meters)	Good
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-km (>1.3 Key Pieces/100 meters)	Fair
			Habitat Complexity	Percent Staging Pools	<50% of streams/ IP-Km (>49% average primary pool frequency)	50% to 74% of streams/ IP-Km (>49% average primary pool frequency)	75% to 89% of streams/ IP-Km (>49% average primary pool frequency)	>90% of streams/ IP-Km (>49% average primary pool frequency)	67% streams/ 98% IP-km (>49% average primary pool frequency)	Very Good
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	67% streams 98% IP-km (>30% Pools; >20% Riffles)	Very Good
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	100% of IP-km	Very Good
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	39% Class 5 & 6 across IP-km	Fair

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	No Acute or Chronic	Good
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-km maintains severity score of 3 or lower	Good
		Size	Viability	Density	<1 spawners per IP-Km	1-20 Spawners per IP-Km	20-40 Spawners per IP-Km (e.g., Low Risk Extinction Criteria)		<1 spawners per IP-km	Poor
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	<50% of Historical Range	Poor
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	Fair
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	100% of streams/ IP-km (>50% stream average scores of 1 & 2)	Very Good

3	Pre Smolt	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Properly Functioning Condition	Good
			Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>49% average primary pool frequency)	50% to 74% of streams/ IP-Km (>49% average primary pool frequency)	75% to 89% of streams/ IP-Km (>49% average primary pool frequency)	>90% of streams/ IP-Km (>49% average primary pool frequency)	67% streams/ 98% IP-km (>49% average primary pool frequency)	Very Good
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	67% streams 98% IP-km (>30% Pools; >20% Riffles)	Very Good
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	0.18 Diversions/10 IP-km	Good
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	39% Class 5 & 6 across IP-km	Fair

			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	100% of streams/ IP-km (>50% stream average scores of 1 & 2)	Very Good
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Good
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	No Acute or Chronic	Good
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-km maintains severity score of 3 or lower	Good
		Size	Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	<50% of Historical Range	Poor
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired but functioning	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	<50% of streams/ IP-km (>80 stream average)	Poor
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	0.18 Diversions/10 IP-km	Good

			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	100% of IP-km	Very Good
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	100% of streams/ IP-km (>50% stream average scores of 1 & 2)	Very Good
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	50-74% IP-km (>6 and <14 C)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	No Acute or Chronic	Good
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-km maintains severity score of 3 or lower	Good
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces high risk spawner density per Spence (2008)	Poor
6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	0.147% of Watershed in Impervious Surfaces	Very Good

			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	1.134% of Watershed in Agriculture	Very Good
			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	15% of Watershed in Timber Harvest	Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	1% of watershed >1 unit/20 acres	Very Good
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	51-74% Intact Historical Species Composition	Good
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	2.2 Miles/Square Mile	Good
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	2.8 Miles/Square Mile	Poor

CC Chinook Salmon Garcia River CAP Threat Results

Threats Across Targets		Adults	Eggs	Pre Smolt	Smolts	Watershed Processes	Overall Threat Rank
Project-specific-threats		1	2	3	5	6	
1	Agriculture	Medium	Low	Medium	Medium	Medium	Medium
2	Channel Modification	Medium	Low	Medium	Medium	Low	Medium
3	Disease, Predation and Competition	Medium		Medium	Medium	Low	Medium
4	Fire, Fuel Management and Fire Suppression	Low	Low	Low	Low	Low	Low
5	Fishing and Collecting	High			Medium		High
6	Hatcheries and Aquaculture						
7	Livestock Farming and Ranching	Medium	Low	Medium	Medium	Medium	Medium
8	Logging and Wood Harvesting	Medium	High	Medium	Medium	High	High
9	Mining	Low	Low	Low	Medium	Low	Low
10	Recreational Areas and Activities	Low	Low	Low	Low	Low	Low
11	Residential and Commercial Development	Medium	Low	Low	Medium	Low	Medium
12	Roads and Railroads	Medium	Medium	Medium	Medium	High	Medium
13	Severe Weather Patterns	Medium	Medium	Medium	Medium	Low	Medium
14	Water Diversion and Impoundments	Medium	Medium	Medium	Medium	Low	Medium

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-1.1.1	Recovery Action	Estuary	Rehabilitate natural river mouth dynamics				
GarR-CCCh-1.1.1.1	Action Step	Estuary	Investigate and determine if the river/estuary mouth dynamics have changed from historical conditions (i.e. opening/closing patterns). Evaluate passage conditions relative to adult salmonid run timing.	2	10	BLM, CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB	
GarR-CCCh-1.1.1.2	Action Step	Estuary	If determined necessary, develop and implement strategies that address adverse passage conditions for adult salmonids caused by altered river mouth dynamics.	3	20	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	The alternatives to address adverse passage conditions will be determined from the above action steps, if necessary.
GarR-CCCh-1.1.2	Recovery Action	Estuary	Rehabilitate inner estuarine hydrodynamics				
GarR-CCCh-1.1.2.1	Action Step	Estuary	Investigate the value of re-aligning the lower estuary channel from Minor Hole to the mouth in efforts to increase estuary depth and improve tidal wetlands.	2	10	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.2.2	Action Step	Estuary	If determined beneficial to estuary health and function, develop and implement a lower estuary channel re-alignment project.	2	10	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.3	Recovery Action	Estuary	Increase the physical extent of estuarine habitat				
GarR-CCCh-1.1.3.1	Action Step	Estuary	Investigate the extent of sedimentation within the estuary associated watershed legacy impacts (e.g. logging). Evaluate sediment transport within the estuary and determine if the estuary is "filling" with sediment or "flushing" sediment (i.e., recovering).	2	10	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.3.2	Action Step	Estuary	Investigate and determine the current vs. historical extent of the Garcia estuary. Include tracts of salt and freshwater marshes, sloughs, tidal channels, etc.	1	10	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.3.3	Action Step	Estuary	Evaluate, design, and implement strategies to enhance habitat conditions within Hathaway Creek and near its confluence with the Garcia River main stem. Consider thinning vegetation within lower Hathaway to increase hydrologic circulation. Optimize winter rearing habitat/refuge while considering upstream migration to upper Hathaway Creek if determined beneficial.	1	10	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.3.4	Action Step	Estuary	Evaluate, design, and implement rehabilitation projects targeting tidal sloughs and off-channel habitats impaired by cattle located within the historical extent of the Garcia River estuary.	1	5	BLM, CDFW, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.3.5	Action Step	Estuary	Continue estuary rehabilitation efforts (public acquisition and easements, Bell 2003).	1	10	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.4	Recovery Action	Estuary	Increase and enhance estuarine habitat complexity features				
GarR-CCCh-1.1.4.1	Action Step	Estuary	Increase the percentage of area containing high value habitat complexity elements and features (SAV, LWD, boulders, marshes, vegetation, pools > 2 meters).	1	10	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.4.2	Action Step	Estuary	Identify key locations to install LWD structures targeting increased pool depth and habitat conditions within the Garcia estuary.	1	10	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC	
GarR-CCCh-1.1.4.3	Action Step	Estuary	Continue working with landowners and rehabilitating riparian conditions within the Garcia estuary.	1	50	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.5	Recovery Action	Estuary	Improve estuarine freshwater inflow				
GarR-CCCh-1.1.5.1	Action Step	Estuary	Install a stream gauge immediately upstream of the estuary to monitor inflow conditions during the dry season.	1		CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, SWRCB, The Nature Conservancy	
GarR-CCCh-1.1.5.2	Action Step	Estuary	Investigate the hydrodynamics of freshwater inflow and estuary water quality conditions relative to juvenile salmonid estuarine summer rearing (acclimated and non-acclimated saltwater tolerant juveniles).	2	10	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-1.1.5.3	Action Step	Estuary	Identify and implement a minimum freshwater inflow threshold to ensure optimal estuary health and function for rearing salmonids.	1	10	CDFW, Friends of the Garcia River, NMFS, NRCS, RCD, RWQCB, SWRCB, The Nature Conservancy	
GarR-CCCh-1.1.6	Recovery Action	Estuary	Improve estuarine water quality				
GarR-CCCh-1.1.6.1	Action Step	Estuary	Install continuous water quality monitoring stations throughout the Garcia estuary.	2	5	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-1.1.6.2	Action Step	Estuary	Identify and implement strategies to address point pollutant sources causing impairment to estuarine water quality conditions.	1	20	BLM, CDFW, Friends of the Garcia River, NMFS, NRCS, Private Landowners, RCD, The Nature Conservancy	
GarR-CCCh-1.1.7	Recovery Action	Estuary	Enhance macro-invertebrate abundance and taxa richness				
GarR-CCCh-1.1.7.1	Action Step	Estuary	Investigate and identify prey items/availability for rearing salmonids and the associated water quality conditions in which they reside.	2	15	CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Consultants, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity				
GarR-CCCh-2.1.1.1	Action Step	Floodplain Connectivity	Conduct a Lower Garcia River off-channel low gradient habitat assessment targeting juvenile salmonid rearing requirements (biological performance criteria, i.e. reduced velocity targets relative to juvenile salmonids). Identify potential off-channel rehabilitation sites.	2	5	BLM, CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-2.1.1.2	Action Step	Floodplain Connectivity	Work with landowners and encourage rehabilitation activities within the lower Hathaway Creek area in efforts to enhance backwater/off-channel and floodplain habitat for winter rearing salmonids.	2	100	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-2.1.1.3	Action Step	Floodplain Connectivity	Identify, design, and implement rehabilitation projects that target winter rearing floodplain habitat within the lower reaches of the Garcia River.	2	5	CDFW, Mendocino Redwood Company, The Nature Conservancy	
GarR-CCCh-3.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-3.1.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)				
GarR-CCCh-3.1.1.1	Action Step	Hydrology	Map all water diversions (including illegal and legal) and upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.	2	10	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GarR-CCCh-3.1.1.2	Action Step	Hydrology	Install and maintain stream gauges within the following tributaries that provide cold water to the Garcia River main stem: Hathaway, North Fork, Rolling Brook, Mill Creek (lower Garcia River), South Fork, Signal, Mill Creek (upper Garcia River).	2	10	CDFW, NMFS, Private Landowners, SWRCB, The Nature Conservancy	
GarR-CCCh-3.1.1.3	Action Step	Hydrology	Identify strategic locations to install off-channel storage facilities to reduce impacts associated with water diversions (e.g. storage tanks for rural residential users).	2	30	CDFW, NMFS, NRCS, Private Landowners, RCD, SWRCB	
GarR-CCCh-3.1.1.4	Action Step	Hydrology	CDFW, SWRCB, RWQCB, CalFire, Caltrans, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact salmonids. These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality (CDFG 2004).	2	60	CalFire, CalTrans, CDFW, Mendocino County Department of Public Works, Private Landowners, RWQCB	Most diversions in the Garcia for dust control are for timber management actions. Most of these diversion have a streambed alteration agreement with the Department of Fish and Wildlife and are likely incorporated into existing operations.
GarR-CCCh-4.1	**Objective**	**Landscape Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-4.1.1	Recovery Action	Landscape Patterns	Prevent or minimize increased landscape disturbance				

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-4.1.1.1	Action Step	Landscape Patterns	Consider developing and/or identifying Salmonid Preserves. Consider the Garcia River watershed as a Salmonid Preserve.	2	100	CDFW, Conservation Fund, NMFS, NOAA RC, Private Landowners, State Parks, The Nature Conservancy, Trout Unlimited	
GarR-CCCh-4.1.1.2	Action Step	Landscape Patterns	Should large tracts of forestlands within the Garcia River watershed become available for purchase, the State of California and/or the Federal Government should consider purchasing the area as a Demonstration Forest, State Park, or Salmonid Preserve.	2	100	CDFW, Conservation Fund, NMFS, NOAA RC, Private Landowners, State Parks, The Nature Conservancy, Trout Unlimited	
GarR-CCCh-4.1.1.3	Action Step	Landscape Patterns	Discourage counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	2	100	CDFW, Mendocino County, NMFS, Sonoma County	
GarR-CCCh-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers				
GarR-CCCh-5.1.1.1	Action Step	Passage	Evaluate, design, and implement strategies to address potential impairment to passage due to vegetation encroachment or "choking" in Hathaway Creek. Ensure that winter rearing refuge for juvenile salmonids is optimize. Investigate habitat quality in upper Hathaway Creek.	2	5	BLM, CDFW, Friends of the Garcia River, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-5.1.1.2	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at Bridge at Highway 1 on Hathaway Creek (Gasker Slough) (See CALFISH: PAD_ID 716762; Passage ID 26883).	3	5	CalTrans, CDFW, NMFS, USACE	
GarR-CCCh-5.1.1.3	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Mill Creek (See CALFISH: PAD_ID 705892; Passage ID 7210)	3	5	CDFW, Mendocino County, NMFS, NOAA RC, Private Landowners, USACE	
GarR-CCCh-5.1.1.4	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Mill Creek (See CALFISH: PAD_ID 705893; Passage ID 7211).	3	5	CDFW, Mendocino County, NMFS, USACE	
GarR-CCCh-5.1.1.5	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at private road crossing on Mill Creek (See CALFISH: PAD_ID 713212; Passage ID 16600).	3	5	CDFW, Mendocino County, NMFS, Private Landowners, USACE	
GarR-CCCh-5.1.1.6	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at private road crossing on Mill Creek (See CALFISH: PAD_ID 713213; Passage ID 16601).	3	5	CDFW, Mendocino County, NMFS, Private Landowners, USACE	
GarR-CCCh-5.1.1.7	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at Fish Rock Road on Sled Creek (See CALFISH: PAD_ID 713211; Passage ID 16599)	3	5	CDFW, Mendocino County, USACE	
GarR-CCCh-5.1.1.8	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at private road crossing on Hathaway Creek (See CALFISH: PAD_ID 716763; Passage ID 26884).	2	5	CDFW, Mendocino County, NMFS, Private Landowners, USACE	
GarR-CCCh-5.1.1.9	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at culvert at mouth on SF Garcia River (See CALFISH: PAD_ID 712859; Passage ID 16063).	3	5	CalTrans, CDFW, Mendocino County, NMFS, NOAA RC, USACE	
GarR-CCCh-5.1.1.10	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at culvert on Flemming Creek (See CALFISH: PAD_ID 723443; Passage ID 9525)	3	5	CDFW, Mendocino County, NMFS, Private Landowners, USACE	
GarR-CCCh-5.1.1.11	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at unnamed tributary to SF Garcia River (See CALFISH: PAD_ID 723441; Passage ID 9523).	3	5	CDFW, Mendocino County, NMFS, Private Landowners, USACE	
GarR-CCCh-5.1.1.12	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at culvert on unnamed tributary to main stem Garcia River (See CALFISH: PAD_ID 723440; Passage ID 9522).	3	5	CDFW, Mendocino County, Private Landowners, USACE	
GarR-CCCh-5.1.1.13	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at identified logjams throughout the Garcia watershed (only if necessary).	3	20	CDFW, Mendocino County, Mendocino County Fish and Wildlife Advisory Board, Mendocino Redwood Company, NMFS, Private Landowners, USACE	
GarR-CCCh-5.1.1.14	Action Step	Passage	Identify and prioritize all logjams that are complete or partial barriers and indicate passage impairment to specific life stage (Bell 2006, as cited by KrisWeb 2011).	3	20		
GarR-CCCh-5.1.1.15	Action Step	Passage	Ensure that all logjams are carefully modified and that all LWD remains in the active stream channel (Monschke and Caldon 1992).	3	30		
GarR-CCCh-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-6.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency (BFW 0-10 meters)				

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-6.1.1.1	Action Step	Habitat Complexity	Increase wood frequency in spawning and rearing areas to the extent that a minimum of six key LWD pieces exists every 100 meters in 0-10 meters BFW streams.	2	10	CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.1.2	Action Step	Habitat Complexity	Identify and install key LWD pieces in Rolling Brook to the extent that LWD frequency is optimized.	3	10	CDFW, NMFS, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.2	Recovery Action	Habitat Complexity	Increase large wood frequency (BFW 10-100 meters)				
GarR-CCCh-6.1.2.1	Action Step	Habitat Complexity	Increase wood frequency in seasonal habitat and migratory reaches to the extent that a minimum of 1.3 to 4 key LWD pieces exists every 100 meters in 10-100 meter BFW streams.	2	10	Board of Forestry, CalFire, CDFW, Conservation Fund, Friends of the Gualala River Watershed, Mendocino Redwood Company, NMFS, NOAA RC, Private Landowners, Public, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.2.2	Action Step	Habitat Complexity	Target Signal Creek, North Fork Garcia, Rolling Brook, lower Mill Creek, Pardaloe, Blue Waterhole, Lanmour, and upper Mill Creek sub-basins as high priorities for LWD placement and rehabilitation work.	2	20	CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.2.3	Action Step	Habitat Complexity	Evaluate and implement strategies to rehabilitate LWD frequency and natural recruitment within the Garcia River main stem.	2	20	CDFW, Conservation Fund, Friends of the Garcia River, NMFS, NOAA RC, Private Landowners, Public, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.2.4	Action Step	Habitat Complexity	Identify strategic locations to install key LWD features in the SF Garcia main stem to the extent that habitat complexity is optimized.	2	20	CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, Public, Railroad, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.2.5	Action Step	Habitat Complexity	Encourage coordination of LWD placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort (CDFG 2004).	2	100	CalFire, CDFW, Private Landowners	
GarR-CCCh-6.1.3	Recovery Action	Habitat Complexity	Increase primary pools frequency				
GarR-CCCh-6.1.3.1	Action Step	Habitat Complexity	Increase the number of primary pools to the extent that more than 40% of summer rearing pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams.)	2	10	CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.3.2	Action Step	Habitat Complexity	Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches within the following tributaries: Fleming Creek, Little SF Garcia, Signal Creek (and tribs).	2	20	CDFW, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.4	Recovery Action	Habitat Complexity	Improve shelter				
GarR-CCCh-6.1.4.1	Action Step	Habitat Complexity	Increase the number of pools that have a minimum shelter of 80 (See NMFS/CDFG criteria).	2	10	CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, The Nature Conservancy	
GarR-CCCh-6.1.4.2	Action Step	Habitat Complexity	Evaluate, identify, and improve shelters in pools within the main stem Garcia River and the following tributaries: Blue Waterhole, Fleming Creek, Graphite Creek, Inman Creek, Little SF Garcia, NF Garcia, and Signal Creek (and tribs).	2	10	CDFW, Conservation Fund, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-6.1.5	Recovery Action	Habitat Complexity	Increase frequency of staging pools				

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-6.1.5.1	Action Step	Habitat Complexity	Increase the number of staging pools (primary pool as segregate) to the extent that more than 40% of summer residual pool depth meets criteria in third or higher order streams (>3 feet depth).	2	5	NOAA RC, NOAA/NMFS, Pomo Tribe, The Nature Conservancy	
GarR-CCCh-6.1.5.2	Action Step	Habitat Complexity	Evaluate, develop, and implement strategies to increase staging pool frequency in high priority Chinook reaches (Garcia & SF Garcia main stem).	2	5	NOAA RC, NOAA/NMFS, Pomo Tribe, The Nature Conservancy	
GarR-CCCh-7.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-7.1.1	Recovery Action	Riparian	Improve canopy cover				
GarR-CCCh-7.1.1.1	Action Step	Riparian	Increase the average stream canopy cover within all current and potential salmonid spawning and rearing reaches to a minimum of 80%.	2	20	Board of Forestry, CalFire, Conservation Fund, Mendocino Redwood Company, NMFS, RWQCB, The Nature Conservancy	
GarR-CCCh-7.1.1.2	Action Step	Riparian	Plant and protect riparian vegetation, including redwood, on the lower 7 mile reach (Eureka Hill Road Bridge and Windy Hollow Road) or where necessary to provide the following: shade and lower water temperatures, cover, protection for fish, bank protection from erosion, and large organic debris in the future for habitat (Bell 2003).	2	10	Board of Forestry, CalFire, CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-7.1.1.3	Action Step	Riparian	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy within the Blue Waterhole sub-basin.	2	20	Board of Forestry, CalFire, Conservation Fund, Mendocino Redwood Company, NMFS, RWQCB, The Nature Conservancy	
GarR-CCCh-7.1.1.4	Action Step	Riparian	Retain all existing native riparian vegetation where stream cover is provided.	2	20	Board of Forestry, CalFire, CDFW, Conservation Fund, NMFS, RWQCB, The Nature Conservancy	
GarR-CCCh-7.1.2	Recovery Action	Riparian	Improve tree diameter				
GarR-CCCh-7.1.2.1	Action Step	Riparian	Increase tree diameter to a minimum of 80% CWHR density rating "D" across all current and potential spawning and juvenile rearing areas.	2	20	Board of Forestry, CalFire, Conservation Fund, NMFS, RWQCB, The Nature Conservancy	
GarR-CCCh-7.1.2.2	Action Step	Riparian	Conduct conifer release to promote growth of larger diameter trees where appropriate.	2	10	Board of Forestry, CDFW, Conservation Fund, NMFS, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-7.1.2.3	Action Step	Riparian	Develop a Large Wood Recruitment Plan that assesses in stream wood needs, and sites potentially responsive to wood recruitment or placement, and develop a riparian strategy to ensure long term natural recruitment of wood via large tree retention.	3	2	AC Alliance, Board of Forestry, Napa CFCWCD, NOAA RC, NOAA/NMFS, NRCS, The Nature Conservancy	
GarR-CCCh-7.1.2.4	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (CDFG 2004). Focus on partnerships with railroad and timber industry, as well as large private landowners.	3	20	CA Coastal Commission, California Coastal Conservancy, CDFW, Mendocino County, NMFS, NRCS, Private Landowners, RCD, Redwood Forest Foundation	
GarR-CCCh-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-8.1.1	Recovery Action	Sediment	Improve and expand instream gravel quantity				
GarR-CCCh-8.1.1.1	Action Step	Sediment	Increase the percentage of gravel quality embeddedness to values of 1s and 2s (See NMFS Conservation Action Planning Attribute Table Report) in all current and potential juvenile salmonid summer and seasonal (fall/winter/spring) rearing areas.	2	20	CDFW, Conservation Fund, Friends of the Garcia River, NMFS, NOAA RC, RWQCB, The Nature Conservancy	A habitat survey assessment needs to be conducted to determine extent of embeddedness.
GarR-CCCh-8.1.1.2	Action Step	Sediment	Identify and implement strategies to treat landslides and old features such as stream side landings (Bell 2003).	3	10	CDFW, Conservation Fund, Friends of the Garcia River, NMFS, NOAA RC, Private Landowners, RWQCB, The Nature Conservancy	
GarR-CCCh-8.1.1.3	Action Step	Sediment	Complete the remaining 25% of erosion control sites identified in the South Fork Garcia River by the Trout Unlimited North Coast Coho Project.	2	5	Mendocino Redwood Company, Trout Unlimited	
GarR-CCCh-8.1.1.4	Action Step	Sediment	Treat high and medium priority sites that are identified in the MRC Garcia River Watershed Analysis, Garcia River Forest Integrated Resource Management Plan and other credible landowner assessments.	1	10	CDFW, NOAA RC, Private Consultants, Private Landowners, SWRCB	

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-8.1.1.5	Action Step	Sediment	Acquire funding for assessment and implementation of sediment reduction measures associated with the 2008 Jacks Fire which occurred in the North Fork Garcia River subbasin.	2	2	CalFire, NRCS, Private Landowners, RCD	
GarR-CCCh-8.1.1.6	Action Step	Sediment	Continue the implementation of the Garcia River TMDL and associated sediment reduction efforts.	1	20	Board of Forestry, CalFire, CDFW, NMFS, NOAA RC, RWQCB, The Nature Conservancy	
GarR-CCCh-8.1.1.7	Action Step	Sediment	Develop and implement bank erosion prevention and riparian planting in Pardaloe Creek (Monschke and Caldon 1992).	2	10	CDFW, Conservation Fund, NMFS, NOAA RC, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-10.1.1	Recovery Action	Water Quality	Improve stream temperature conditions				
GarR-CCCh-10.1.1.1	Action Step	Water Quality	Work with TNC and Stillwater Sciences to develop a Basin Temperature model to aid in efforts to reduce stream temperatures between Signal and the Pardaloe/Mill creeks confluence.	2	10	CDFW, Conservation Fund, NMFS, NOAA RC, Private Landowners, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-10.1.1.2	Action Step	Water Quality	Work with landowners to plant riparian zones of Blue Waterhole, Inman Creek, and Pardaloe Creek with the goal of reducing instream water temperatures of the Garcia River main stem during the dry season.	2	10	CDFW, NOAA RC, Private Landowners	
GarR-CCCh-10.1.1.3	Action Step	Water Quality	Identify and Implement actions to maintain and restore water temperatures to meet habitat requirements for salmonids in specific streams (CDFG 2004).	2	10	CDFW, CDFW Law Enforcement, NMFS OLE, NOAA RC, NOAA/NMFS, Private Landowners, RCD	
GarR-CCCh-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure and diversity				
GarR-CCCh-11.1.1.1	Action Step	Viability	Identify if the population is at short-term or immediate risk of extinction.	2	10	NOAA RC, NOAA SWFSC, NOAA/NMFS, Pomo Tribe	
GarR-CCCh-11.1.1.2	Action Step	Viability	Identify the biological or DPS significance of the subject population.	2	10	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GarR-CCCh-11.1.1.3	Action Step	Viability	Investigate the current population dynamics and viability status..	1	20	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GarR-CCCh-11.1.1.4	Action Step	Viability	Investigate the current status of the population genetic diversity.	1	20	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GarR-CCCh-11.1.1.5	Action Step	Viability	Identify population viability goals and the expectations of a conservation hatchery/supplementation/augmentation program.	2	20	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GarR-CCCh-11.1.1.6	Action Step	Viability	Identify where a conservation hatchery/supplementation/ augmentation program will complement the overall recovery effort.	2	20	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GarR-CCCh-11.1.1.7	Action Step	Viability	If determined necessary, identify an out-of-basin source population that could be used to start a population augmentation/supplementation/broodstock program.	2	30	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GarR-CCCh-16.1	**Objective**	**Fishing/Collecting**	**Address the inadequacy of existing regulatory mechanisms**				
GarR-CCCh-16.1.1	Recovery Action	Fishing/Collecting	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
GarR-CCCh-16.1.1.1	Action Step	Fishing/Collecting	Reduce poaching of adult salmonids by increasing law enforcement.	1	100	CDFW, NOAA/NMFS	
GarR-CCCh-16.1.1.2	Action Step	Fishing/Collecting	Promote CalTip to discourage poaching (CDFG 2004).	2	100	CDFW, NOAA/NMFS	
GarR-CCCh-16.2	**Objective**	**Fishing/Collecting**	**Address other natural or manmade factors affecting the species' continued existence**				
GarR-CCCh-16.2.1	Recovery Action	Fishing/Collecting	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
GarR-CCCh-16.2.1.1	Action Step	Fishing/Collecting	Investigate and consult with local tribal officials in efforts to stop gill-netting in the Garcia River watershed.	1	30	CDFW, CDFW Law Enforcement, NMFS OLE, NOAA/NMFS, Pomo Tribe	
GarR-CCCh-18.1	**Objective**	**Livestock**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-18.1.1	Recovery Action	Livestock	Prevent or minimize impairment to estuary quality and extent				

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-18.1.1.1	Action Step	Livestock	Work with BLM to ensure that future cattle leasing agreements do not reduce potential rehabilitation of high value summer and winter juvenile salmonid rearing habitat within the lower Garcia River and estuary.	2	20	BLM, CDFW, NOAA RC, NOAA/NMFS	
GarR-CCCh-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-19.1.1	Recovery Action	Logging	Prevent or minimize impairment to water quality (instream water temperature)				
GarR-CCCh-19.1.1.1	Action Step	Logging	Protect current riparian zones in all summer salmonid rearing areas to the extent that they are able to mature, provide, and maintain a minimum of 80% canopy cover.	2	50	Board of Forestry, CalFire, CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, NOAA RC, Private Landowners, RWQCB, The Nature Conservancy	
GarR-CCCh-19.1.2	Recovery Action	Logging	Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)				
GarR-CCCh-19.1.2.1	Action Step	Logging	Ensure future forest management allows for optimal levels of natural LWD recruitment of larger older trees into stream channels	2	100	CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, RWQCB, The Nature Conservancy	
GarR-CCCh-19.1.3	Recovery Action	Logging	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)				
GarR-CCCh-19.1.3.1	Action Step	Logging	Develop and implement low impact timber and wood harvest techniques (e.g., full-suspension cable yarding) in efforts to reduce turbidity impacts in streams. Example: Parker Ranch in the Ten Mile River Basin (Bell 2003).	2	100	Board of Forestry, CDFW, Conservation Fund, Mendocino Redwood Company, Private Landowners, RWQCB, The Nature Conservancy	
GarR-CCCh-19.1.3.2	Action Step	Logging	Extend the monitoring period and upgrade THP road maintenance after harvest.	2	60	CalFire	
GarR-CCCh-19.1.3.3	Action Step	Logging	New THPs should identify problematic legacy roads within WLPZ's, decommission them, and revegetate the area with appropriate native species.	2	20	CalFire, Mendocino Redwood Company, NOAA RC, Private Landowners	
GarR-CCCh-19.1.4	Recovery Action	Logging	Prevent or minimize increased landscape disturbance				
GarR-CCCh-19.1.4.1	Action Step	Logging	Areas adjacent to currently owned State parks or forestlands supporting high priority areas should be considered for purchase (if feasible within the next 5 years).	2	50	CDFW, NMFS, Private Landowners, Redwood Forest Foundation, The Nature Conservancy, Trout Unlimited	
GarR-CCCh-19.1.4.2	Action Step	Logging	Should large tracts of forestlands within the Garcia River watershed become available for purchase, the State of California and/or the Federal Government should consider purchasing the area as a Demonstration Forest, State Park, or Salmonid Preserve.	2	50	CDFW, NMFS, Redwood Forest Foundation, RWQCB, The Nature Conservancy	
GarR-CCCh-19.1.4.3	Action Step	Logging	Continue the activities of the North Coast Watershed Assessment /Coastal Watershed Program.	2	20	CDFW, NMFS, Private Landowners	
GarR-CCCh-19.1.4.4	Action Step	Logging	Maintain and expand working forestlands and forestlands held by the State.	2	20	Board of Forestry, CalFire, CDFW, NMFS, RWQCB	
GarR-CCCh-19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms**				
GarR-CCCh-19.2.1	Recovery Action	Logging	Prevent or minimize increased landscape disturbance				
GarR-CCCh-19.2.1.1	Action Step	Logging	Discourage Counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	2	20	Board of Forestry, CA Coastal Commission, CDFW, NMFS	
GarR-CCCh-19.2.1.2	Action Step	Logging	Work with the California Board of Forestry to design and implement a program of BMPs for logging areas that meets the approval of NMFS and CDFW.	3	20	Board of Forestry, CDFW, NMFS, RWQCB	
GarR-CCCh-19.2.1.3	Action Step	Logging	Conduct an assessment of the mechanisms driving forestland conversion and develop strategies to protect forestlands.	3	10	Board of Forestry, Mendocino County, NMFS	
GarR-CCCh-19.2.1.4	Action Step	Logging	Consider the development of a Watershed Database (similar to the CDFW Northern Spotted Owl database) for salmonids that provides watershed data and information in a consistent fashion to all foresters for consideration in their harvest plans.	2	20	Board of Forestry, CDFW, NMFS	
GarR-CCCh-19.2.1.5	Action Step	Logging	Develop a framework similar to Washington State that establishes a scientific framework for monitoring the effectiveness of practices in meeting watershed process goals and a decision-making process that is adaptive to the new information.	2	30	Board of Forestry, CalFire, CDFW, Conservation Fund, Mendocino Redwood Company, NMFS, Private Landowners	

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-19.2.1.6	Action Step	Logging	Provide information to BOF regarding salmonid priorities and recommend upgrading relevant forest practices.	2	2	CDFW, NMFS	
GarR-CCCh-19.2.1.7	Action Step	Logging	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	2	100	CA Coastal Commission, CDFW, Mendocino County, NMFS	
GarR-CCCh-19.2.1.8	Action Step	Logging	Assign NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004).	3	5	Board of Forestry, CalFire, CDFW, NMFS	
GarR-CCCh-19.2.1.9	Action Step	Logging	Develop a California Forest Practice monitoring protocol to determine whether specific practices are effectively meeting intended objectives and are providing for the protection of salmonids.	3	20	Board of Forestry, CalFire, NMFS, NRCS, RCD, RWQCB, The Nature Conservancy	
GarR-CCCh-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)				
GarR-CCCh-23.1.1.1	Action Step	Roads/Railroads	Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in historical habitats.	2	10	Board of Forestry, CalFire, Mendocino County, NMFS, NOAA RC, RWQCB	
GarR-CCCh-23.1.1.2	Action Step	Roads/Railroads	Map and identify stream crossings with the intention of replacement or removal if they cannot pass the 100 year flow. Designs should include fail safe measures to accommodate culvert overflow without causing massive road fill failures.	2	10	CDFW, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners, RCD	
GarR-CCCh-23.1.1.3	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3	10	CalFire, CDFW, Mendocino County Department of Public Works, NRCS, Private Landowners	Ten year duration to accommodate changes in BMPs.
GarR-CCCh-23.1.1.4	Action Step	Roads/Railroads	Restoration projects that upgrade or decommission high risk roads should be considered an extremely high priority for funding (e.g., PCSRF).	2	20	CDFW, NOAA RC, NRCS	
GarR-CCCh-23.1.1.5	Action Step	Roads/Railroads	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).	2	20	CalFire, CDFW, NOAA RC, NRCS, Private Landowners, RCD	
GarR-CCCh-23.1.1.6	Action Step	Roads/Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.	2	20	CalFire, CDFW, NOAA RC, NRCS, Private Landowners, RCD	
GarR-CCCh-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)				
GarR-CCCh-23.1.2.1	Action Step	Roads/Railroads	Develop a private road database using standardized methods. The methods should document all road features, apply erosion rates, and compile information into a GIS database.	3	5	CalFire, Mendocino County Department of Public Works, NMFS, Private Consultants, Private Landowners	
GarR-CCCh-23.1.2.2	Action Step	Roads/Railroads	Develop a Salmon Certification Program for road maintenance staff.	2	10	CDFW, Mendocino County, NOAA RC, NRCS, Private Landowners	
GarR-CCCh-23.1.2.3	Action Step	Roads/Railroads	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) should accommodate 100-year flood flows and associated bedload and debris.	3	20	Mendocino County, NMFS, NRCS, Private Landowners, RCD	
GarR-CCCh-23.1.2.4	Action Step	Roads/Railroads	Evaluate existing and future stream crossings that impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.	3	10	Board of Forestry, CalFire, CDFW, Friends of the Garcia River, Mendocino Redwood Company, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GarR-CCCh-23.1.2.5	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.	2	5	CalFire, CalTrans, CDFW, NMFS, NRCS, Private Landowners	
GarR-CCCh-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration				
GarR-CCCh-23.1.3.1	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	2	100	CalTrans, Mendocino County Department of Public Works	
GarR-CCCh-23.1.3.2	Action Step	Roads/Railroads	Ensure that all future road or bridge repairs at stream crossing provide unimpaired fish passage for all salmonid life stages.	2	20	Mendocino County	

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-24.1	**Objective**	**Severe Weather Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-24.1.1	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to stream hydrology (stream flow)				
GarR-CCCh-24.1.1.1	Action Step	Severe Weather Patterns	Implement water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	2	20	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, RWQCB, SWRCB	
GarR-CCCh-25.1	**Objective**	**Water Diversion/ Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GarR-CCCh-25.1.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (stream flow)				
GarR-CCCh-25.1.1.1	Action Step	Water Diversion/ Impoundment	Work with landowners, the tribe, CDFW, RWQCB, DWR, and SWRCB to ensure that water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.	2	20	DWR, CDFW, NMFS, RWQCB, SWRCB, Tribes	
GarR-CCCh-25.1.1.2	Action Step	Water Diversion/ Impoundment	Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and California Water Code §1707 (CDFG 2004).	2	20	CDFW, NOAA RC, Private Landowners, SWRCB	
GarR-CCCh-25.1.2	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to passage and migration				
GarR-CCCh-25.1.2.1	Action Step	Water Diversion/ Impoundment	Establish flow related adult and smolt migration thresholds prior to authorizing future water diversions.	1	20	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GarR-CCCh-25.1.3	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to the estuary (quality and extent)				
GarR-CCCh-25.1.3.1	Action Step	Water Diversion/ Impoundment	Discourage the development of any surface water diversions in the watershed that independently or cumulatively have significant impact on reducing inflow to the estuary during spring/summer/fall months (ECORP and Kamman Hydrology & Engineering 2005).	1	20	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GarR-CCCh-25.1.4	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to water quality (instream temperature)				
GarR-CCCh-25.1.4.1	Action Step	Water Diversion/ Impoundment	Work with partners to ensure future water diversions do not impair instream water temperatures during the dry season.	1	50	CA Coastal Commission, CWQCB, NMFS OLE, NOAA/NMFS, Pomo Tribe, Private Landowners, RCD, WCB	
GarR-CCCh-25.2	**Objective**	**Water Diversion/ Impoundment**	**Address the inadequacy of existing regulatory mechanisms**				
GarR-CCCh-25.2.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (stream flow)				
GarR-CCCh-25.2.1.1	Action Step	Water Diversion/ Impoundment	Work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams.	1	10	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GarR-CCCh-25.2.1.2	Action Step	Water Diversion/ Impoundment	Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.	2	100	CDFW, NMFS, NRCS, SWRCB	
GarR-CCCh-25.2.1.3	Action Step	Water Diversion/ Impoundment	Ensure all water diversions and impoundments are complaint with AB2121 or other appropriate protective measures.	2	50	CDFW, NMFS, SWRCB	
GarR-CCCh-25.2.1.4	Action Step	Water Diversion/ Impoundment	Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.	3	30	SWRCB	

Garcia River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GarR-CCCh-25.2.1.5	Action Step	Water Diversion/ Impoundment	Improve compliance with existing water resource regulations via monitoring and enforcement.	2	20	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GarR-CCCh-25.2.1.6	Action Step	Water Diversion/ Impoundment	Support the SWRCB in regulating groundwater.	3	20	CDFW, NMFS, RWQCB	
GarR-CCCh-25.2.1.7	Action Step	Water Diversion/ Impoundment	Request that SWRCB review and/or modify water use based on the needs of salmonids and authorized diverters (CDFG 2004).	2	20	CDFW, NMFS, SWRCB	

Russian River Population

CC Chinook Salmon Fall-Run

- Role within ESU: Functionally Independent Population
- Diversity Stratum: Central Coastal
- Spawner Abundance Target: 9,300 adults
- Current Intrinsic Potential: 465.2 IP-km

For information regarding CCC steelhead and CCC coho salmon for this watershed, please see the CCC steelhead volume of this recovery plan and the CCC coho salmon recovery plan (http://www.westcoast.fisheries.noaa.gov/).

Abundance and Distribution

The historical abundance and distribution of Chinook salmon within the Russian River are poorly understood. Prior to the first recorded stocking of Chinook salmon within the basin in 1881, there were no records of the fish's presence or absence within the Russian River (Chase *et al.* 2007). Spawning was likely focused in the mainstem, and larger lower tributaries, and access to spawning habitat was likely dependent on fall rains to restore adequate flow for migration and spawning (See map, following the profile). Though early reports of a modest Chinook salmon fishery in the Russian River estuary prior to the turn of the century suggests a pre-existing population within the watershed prior to the 1881 stocking, since the likelihood of a single stocking event establishing a harvestable population is low (Chase *et al.* 2007). Documentation of detailed catches in the estuary ended in 1922, and few comprehensive surveys were conducted during the following decades; most literature detailing fish presence and abundance within the Russian River during most of the twentieth century were generally qualitative in nature, and typically suggested either the absence of a Chinook salmon run, or at most the presence of a small, ephemeral population (Chase *et al.* 2007). CDFW accelerated the efforts to establish a spawning population of Chinook salmon within the basin by stocking 2.25 million fry between 1956 and 1960. During the early stocking years, broodstock fish were mainly transfers from the Klamath, Sacramento, and Eel river systems; Russian River broodstock were not used until the 1980s and 1990s (Chase *et al.* 2007).

In 1981, the Department of the Army, Corps of Engineers constructed the Don Clausen Fish Hatchery (DCFH) on Dry Creek to compensate for spawning and nursery areas blocked by the Warm Springs Dam—Lake Sonoma Project. The established mitigation goals included 1,000,000 released smolts and 1,750 returning adults. Juvenile Chinook salmon production peaked in winter 1985-86 with the release of 884,520 juveniles from the DCFH (CDFG 2011a). Between 1982

and 1999 adult Chinook salmon returns ranged from 0 to 304, peaking in 1988 (CDFG 2011b) (Figure 1). Though no mitigation goals for Chinook salmon were established for the Coyote Valley Fish Facility (CVFF) on the upper river, adult Chinook salmon returns to

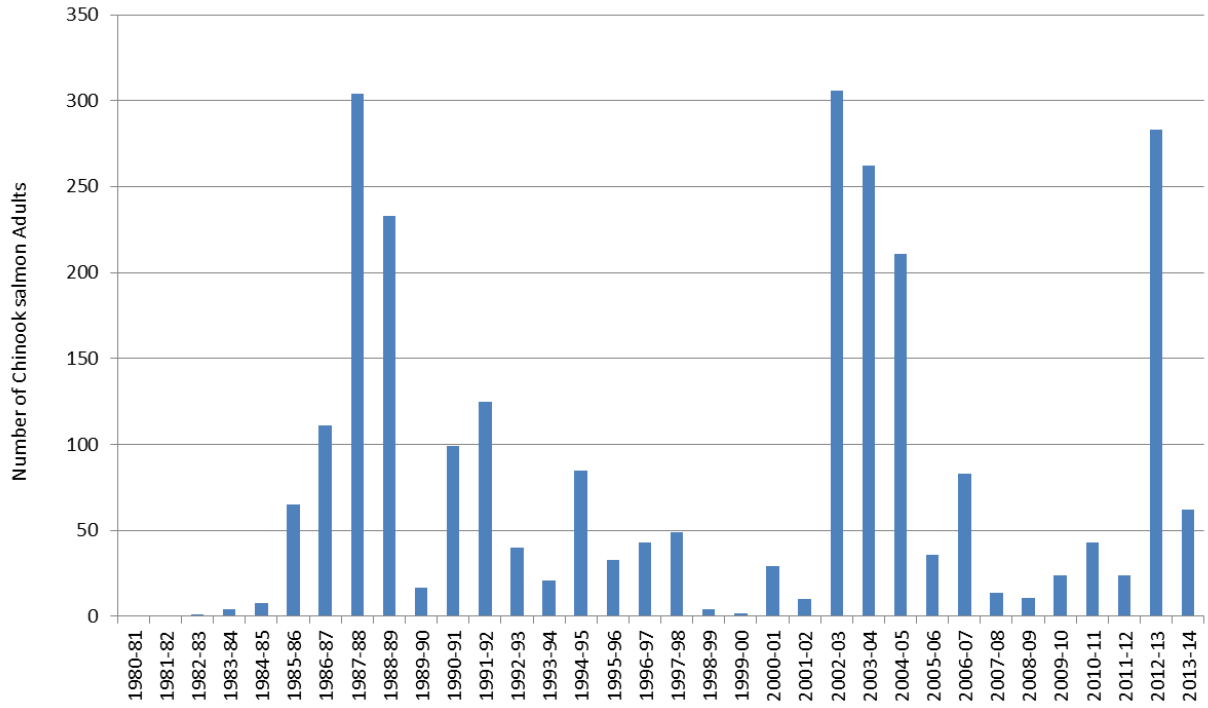

Figure 1: Adult chinook returns counted at the Warm Spring Fish Hatchery on Dry Creek, 1980-81 through 2013-2014.

CVFF have ranged from 1 to 23, with a peak year in 2003 (Figure 2). Stocking continued at both Russian River facilities until 1999 when stocking was discontinued due to concerns regarding the small broodstock population size and inbreeding depression. No Chinook salmon have been spawned or released at DCFH since 1999, though wild adult Chinook salmon still return to the facility. All adult Chinook salmon that enter the DCFH are returned to Dry Creek tributaries per NMFS direction.

Prior to the completion of Warm Springs Dam, Dry Creek likely provided spawning habitat only during years with sufficient early rains allowed for suitable migration and spawning conditions (Winzler & Kelly Consulting Engineers 1978). Current water supply operations provide a stable release of cold water down Dry Creek. Spawner surveys and downstream migrant trapping conducted by Sonoma County Water Agency (SCWA) has documented large numbers of Chinook salmon successfully spawning and rearing in Dry Creek, and the upper mainstem.

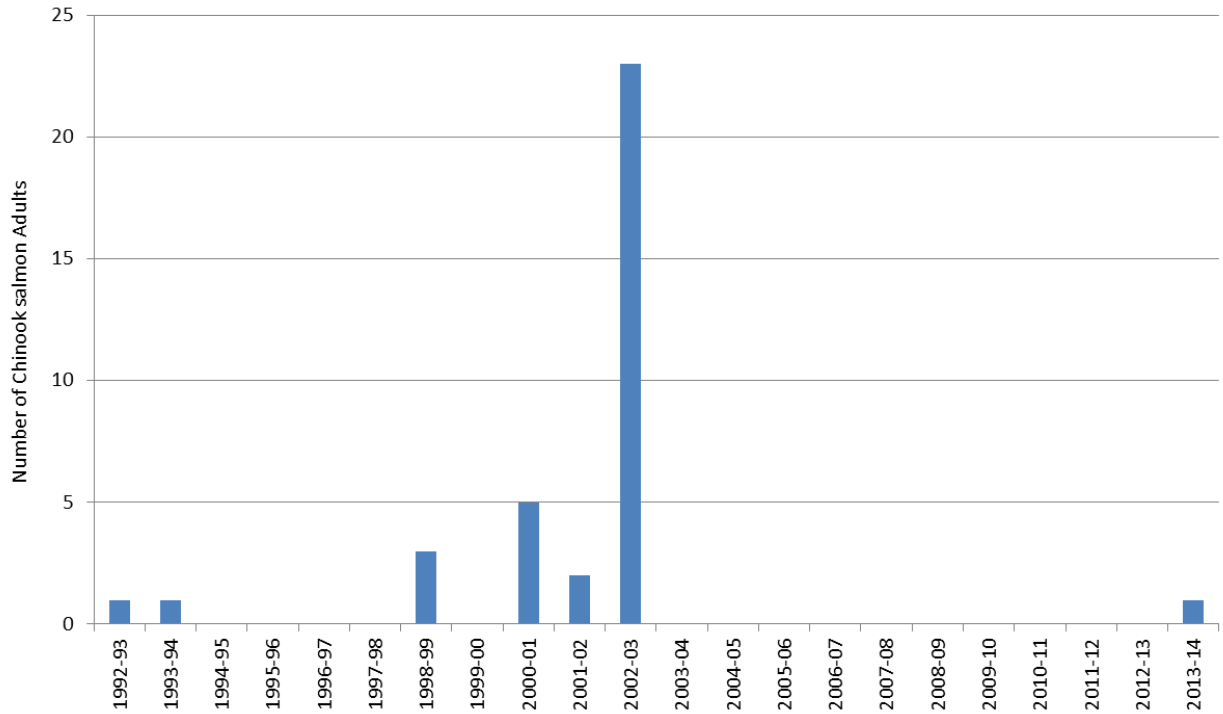

Figure 2: Adult chinook returns counted at the Coyote Valley Fish Facility on the East Branch Russian River, 1992-93 through 2013-14.

SCWA conducts video monitoring at a fish ladder associated with their Mirabel Diversion Dam, and recent minimum counts of adult Chinook salmon ranged from 1,138 to 6,969 between 2000 and 2013 (Figure 3).

SCWA redd surveys have documented Chinook salmon spawning over an extensive area of the Russian River mainstem, although most spawning occurred between the town of Cloverdale (river kilometer 101) and the confluence of the East and West branches of the Russian River (river kilometer 150). Chinook salmon spawning has also been documented within five Russian River sub-basins and their tributaries (Dry, Santa Rosa, Austin, Green Valley and Forsythe creeks), although most Russian River tributaries are only accessible to Chinook salmon during years with substantial and sustained early fall rains (See map, following profile). While the larger tributaries are utilized opportunistically, their contribution to spawning and rearing habitat in the basin is relatively low compared to the mainstem and Dry Creek (*e.g.*, SCWA counted 342 redds in 2004).

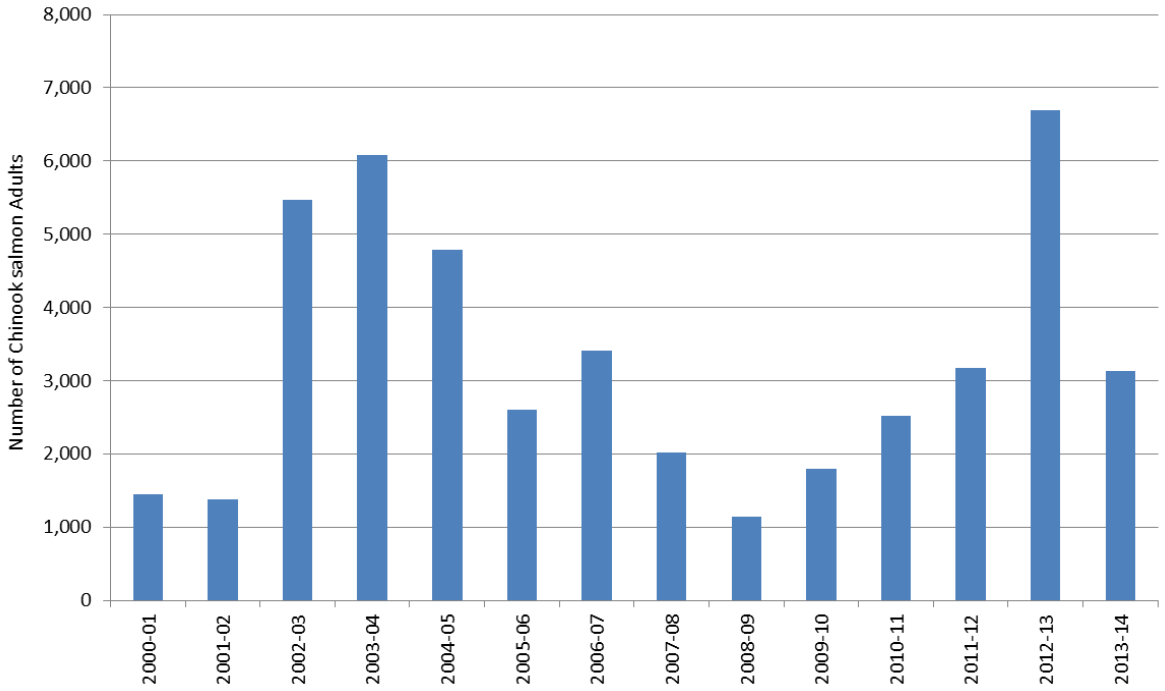

Figure 3. Minimum counts of Chinook salmon (2000-01 to 2013-14) which pass video counting station at the SCWA Mirabel water diversion facility (source, SCWA).

History of Land Use

The Russian River Watershed is centrally located in California, with a drainage area of approximately 1,485 square miles (approximating 1 million acres). The basin's fog-influenced coastal region, which extends 10 miles inland, typically has cool summers and abundant summer fog moisture. The drier interior region, on the other hand, experiences hot, dry summers with temperatures increasing to upwards of 100º F in the northeastern valleys most isolated from coastal influence (Coey *et al.* 2002). Winter temperatures can reach the low 20ºs F, though snowfall is uncommon, and rainfall in the basin ranges from 22-80 inches, with a basin-wide average of 41 inches (SEC 1996). The Franciscan lithology is very unstable and landslides are common throughout most mountain regions within the basin.

The history of resource use in the Russian River area began with the Pomo Indians, who occupied the river basin for as long as 5,000 years prior to European settlement, living in numerous settlements of up to 1,000 people (Wilson 1990). These tribes altered their environment with the regular burning of oak woodlands and grasslands as a means of promoting new growth of their food sources and increasing wildlife habitat. In the late 1700's, the Spanish landed at Bodega Bay to find the river basin a virtual paradise, followed by the Russians who established colonies at Fort Ross and Bodega Bay in the 1800's (Ferguson 1931).

The arrival of many land-hungry "American" settlers soon decimated the Native Americans living in villages throughout the river valley (Wilson 1990), and at that time, the sheer size and density of the old growth redwood forests were almost unfathomable. In 1865 intensive logging in the lower watershed began with the outside markets, dramatically boosting the production of the timber industry (Stindt 1974). Salmon (chinook, coho and pink) and steelhead were once so prevalent in the Russian River that they supported a commercial fishery (USBFF 1888). Cannery records give no mention of species, but fish weighed between eight and 20 pounds, suggesting salmonids were a large part of the catch. In 1888, 183,597 pounds of fish were caught near Duncan Mills for cannery and personal use (USBFF 1888). Assuming a range of fish weight from 12 to 20 pounds, between 9,200 and 15,300 fish were taken (Coey et al 2002).

Although logging and fishing continued through the early 20th Century, three of the more significant anthropogenic changes to the watershed during this period were the construction of the two dams as discussed previously, which were constructed without fish ladders, and the advent of gravel mining in the 1940's to supply a burgeoning population and hunger for aggregate in the SF Bay Area.

Most of the land along the Russian River was already under cultivation by 1900 (SEC 1996) and this early agriculture focused mainly on the production of grapes, apples, hops and prunes. Farmers removed riparian vegetation and filled in sloughs and side channels in order to maximize their usable agricultural lands. These practices continued until the late 1940's when very few wetlands remained (SEC 1996). At that time, the river valley was leveled, creeks were channelized and, in an attempt at flood control, agricultural operations began removing small in-channel islands and gravel bars. In the 1940's in-channel gravel extraction began and, in the years to follow, the production of sand and gravel was the principal industry from Healdsburg through Ukiah. The removal of Russian River gravels from in-channel was used for concrete construction and roads from Santa Rosa to Ukiah and throughout the entire Bay Area. In the 1950s, bank stabilization measures began in response to headcutting, with the river bottom dropping as much as 22' in the middle reach (Martin Griffin, personal communication). Ultimately, these practices resulted in mass channelization of the mainstem.

In the 1970's, in-channel gravel mining slowed and operations moved to the adjacent terraces where floodplain pits are constructed amidst agricultural operations. Agriculture is still the dominant land use within the basin, with the recent trend being conversion of historic crop lands, livestock, dairy lands, and forest lands to vineyards. Today, the upper reaches of the Russian River flow south through southern Mendocino County and the towns of Redwood Valley, Calpella, Ukiah, and Hopland south to Sonoma County, and the towns of Healdsburg, Windsor

and Santa Rosa, which support a highly productive and successful wine growing region which is supported by a healthy and economically valuable tourism industry.

Throughout the 20th Century, both coho and Chinook salmon and steelhead were propagated and released into the Russian River. In 2001 NMFS recommended ceasing chinook spawning at WSH and CVFF due to concerns over genetic bottlenecking from too few returning adult fish (NMFS 2008). Today, both steelhead and coho salmon are reared and released at the facilities according to a Hatchery and Genetic Management Plan.

For more information, please refer to the Russian River Overview chapter and individual CCC steelhead population profiles for detailed discussions concerning the history of land use.

Current Resources and Land Management

Approximately 92% of the Russian River Watershed is privately owned, with the remaining managed as federal, state and county lands. A majority of the federally managed lands are within the jurisdiction of BLM and USCOE dam recreation areas.

Nearly 38% of the watershed is forested with montane hardwoods, annual grasslands (18%), shrub (95) and Douglass fir (7%) being the most common forest communities. Urban areas represent less than 7% of the watershed area with the largest developments located inland in developed floodplain areas of the Santa Rosa plain. Agriculture, which comprises 13 percent of the land acreage within the Russian River watershed, is predominantly located in low-lying, flat landscapes adjacent to and within the historic floodplain of the Russian River mainstem.

For more information please refer to the Russian River Overview chapter and individual Russian River CCC steelhead population profiles for detailed discussions concerning the current resource and land management.

Salmonid Viability and Watershed Conditions

The following indicators were rated Poor through the CAP process for Chinook salmon: habitat complexity, riparian vegetation, passage/migration, estuary/lagoon, velocity refugia, sediment transport, and water quality (turbidity). Other indicators that are identified as impaired include sediment, temperature, and viability. Recovery strategies will focus on improving these poor conditions as well as those needed to ensure population viability and functioning watershed processes.

Current Conditions

The following discussion focuses on those conditions that rated Fair or Poor as a result of our CAP viability analysis. The Russian River CAP Viability Table results are provided below. Recovery strategies will focus on improving these conditions.

Sediment Transport: Road Density

Sediment Transport, road density conditions have a rating of Poor. Altered sediment transport limits spawning gravel recruitment and impacts spawning gravel quality to properly functioning watershed processes. Sediment transport is especially compromised within the upper tributary watersheds where road densities are high; in many streams, flows are inadequate to flush accumulated fine sediment. With the high potential for increased urban development and forest conversion (*i.e.,* tree removal to allow agriculture) within the basin, altered sediment transport is a stress that will likely impair adult habitat into the future.

Estuary: Quality and Extent

Estuary rearing is considered a critical life-history pattern for Chinook salmon within coastal watersheds of the central coast of California. Russian River Chinook salmon rear for a short time in the mainstem or tributaries where they are spawned, prior to migrating downstream, spending a short time in fresh and brackish waters where they undergo smolt transformation. Migration through the Russian River estuary to the Pacific Ocean peaks in May and June. Historic data indicate the Russian River estuary often existed in a perched or closed lagoon state through the summer. Following dam construction, for several decades the estuary was managed during the summer as an open, tidally-influenced estuary in order to alleviate flooding risks (NMFS 2008). A NMFS 2008 Biological Opinion has improved estuary management, which attempts to balance risks of flooding with an increase in habitat volume to improve rearing habit for juvenile salmonids prior to ocean entry. The quantity and quality of rearing conditions vary by lifestage, depending upon the frequency and timing of barrier bar development, which highly influences tidal, perched or closed conditions (NMFS 2008).

Velocity Refuge: Floodplain Connectivity

Floodplain habitat, which provides velocity refugia and foraging opportunity for juvenile salmonids, is lacking in sections of the upper Russian River. Significant lengths of mainstem and tributary streambanks have been levied and diked, or had floodplain vegetation removed for agricultural and residential/commercial development. The floodplain connectivity condition has a Poor rating for adult and pre-smolt lifestages.

Passage/Migration: Mouth or Confluence and Physical Barriers

Although few physical barriers exist, the mouths of many tributaries, particularly in the Alexander Valley reach, can become perched in the late fall or early spring due to aggraded sediment at the mainstem/tributary confluence in drier years. This condition can impede both adult migration and smolt emigration into tributaries and can limit spawner abundance and subsequent juvenile recruitment to the mainstem reaches. Passage to the upper sections of Dry Creek and the East Branch Russian River are blocked by Lake Sonoma and Lake Mendocino respectively.

Habitat Complexity: Large Wood and Shelter and Habitat Complexity: Percent Primary/Staging Pools and Pool/Riffle/Flatwater Ratios

Habitat Complexity: Large Wood and Shelter conditions rates Poor for most life stages of Chinook salmon throughout much of the watershed. Deep pools with submerged LWD where adults migrating Chinook salmon could hold and spawn, and where juveniles could rear prior to estuary residency are lacking in the Russian River mainstem and lower portions of tributaries where they migrate and spawn. Staging pools that adult Chinook salmon historically utilized during migration have been filled in with sediment by historic flood control and gravel mining practices.

Water Quality: Turbidity or Toxicity

Turbidity is an issue within the mainstem Russian River where turbid discharges from Coyote Valley Dam can extend well past Hopland during summer months (McKeon 2010). Turbidity likely impairs juvenile and smolt feeding in the mainstem during their migration to the estuary, which is an important period when juvenile fish must feed to grow and undergo smolt transformation. NMFS has identified the need for the USACE to fund and begin a feasibility study to re-design the dam outlet or otherwise solve/address this issue, which affects all Chinook salmon emigrating from the upper and middle basin (NMFS 2008). Additionally, research into the potential level of impacts from and solutions to environmental estrogens associated with wastewater discharge and domestic septic leakage are needed.

Other Current Conditions

Additionally, riparian habitat has been impacted in many sections of the watershed, often by streambank armoring and flood control, clearing for agriculture, invasive species establishment, or riparian grazing (CDFW stream habitat reports). The conditions of excessive gravel scouring and impaired watershed hydrology also rated as Fair.

Threats

The following discussion focuses on those threats that rate as High or Very High (see Russian River CAP results). Recovery strategies will likely focus on ameliorating High rating threats; however, some strategies may address Medium and Low threats when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in Russian River CAP results.

Agriculture

Agriculture, which comprises 13 percent of the land acreage within the Russian River watershed, is predominantly located in low-lying, flat landscapes adjacent to and within the historic floodplain of the Russian River mainstem. Historic agriculture practices have removed trees and vegetation along the channel, reducing the potential for LWD input, and contributing sediment into stream channels that can smother spawning gravels.

Channel Modification

Streams flowing through agricultural and urban areas have often been channelized, straightened, or simplified to prevent flooding and erosion of adjacent land. This has led to channel bed scouring in degrading portions (Middle Reach and Ukiah reaches) and deposition in the aggrading portions (Alexander Valley reaches) of the river. This effect, combined with agricultural water diversion and groundwater pumping, can contribute to hydrologic disconnection of tributaries from the mainstem during the fall and late spring.

Fishing and Collecting

Although no official fishing season for adult Chinook salmon exists due to their protected status, currently the summer trout and winter steelhead recreational sports fishing seasons overlap with the adult Chinook salmon migration seasons respectively; thus, incidental bycatch of Chinook salmon occurs. Poaching incidents have been documented in the past, and as a result, enforcement and education efforts have been increased.

Hatcheries and Aquaculture

Though modern stocking efforts of Chinook salmon have occurred since the 1950's, a substantial run of Chinook salmon was not established. The Healdsburg fish ladder installed in 2001 improved passage over the dam foundation during periods of low flow, and likely expanded the window of spawning opportunity on the upper river. Hatcheries were rated as a Low threat, as hatchery supplementation of Chinook salmon from the DCFH was discontinued in 1999, when NMFS determined that the genetic concerns of inter-breeding associated with the small broodstock population outweighed the risks of impaired demographics in the small wild

population. Mitigation release goals are currently zero until adult returns reach 500 at either hatchery facility.

Mining

Historic gravel mining practices had a major effect on Chinook salmon habitat in the Russian River mainstem and tributaries by removing stable riffle and LWD habitat, and widening and simplifying channel morphology. These practices resulted in long stretches of flattened channel characterized by shallow, wide pools with little resting cover. Through recent improvements to gravel mining practices (*e.g.,* involvement by NMFS in implementing BMPs that maintain bar height, promote deeper pools, and encourage channel alcove development), have mitigated these adverse effects to a large degree, and have resulted in more sustainably managed aggregate resources.

Residential and Commercial Development

Although much of the Upper Russian watershed is rural and sparsely populated, the most heavily populated areas along the mainstem (*i.e.*, Santa Rosa, Healdsburg, Geyserville, Cloverdale and Ukiah) and tributaries (*e.g.,* Mark West Creek, Santa Rosa Creek, Dry Creek, and the Geyserville and Ukiah sub-basins) are co-located adjacent to Chinook salmon spawning habitat. Early urban development in the Russian River transformed river and lower tributary spawning and rearing habitat in the valley floors that were likely dominated by oak-savannah ecotypes, with high quality habitat and flow.

Roads and Railroads

Stream side road density is Very High in the Russian River watershed, and is a significant threat to the egg lifestage and impacts watershed processes. Impervious surfaces increase run-off and channel velocities, road culverts decrease gravel transport and cause channel incision, while unpaved surfaces and ditches can increase surface erosion and instream sediment deposition that can diminish spawning gravel quality. Numerous unpaved roads exist in the Mendocino County portion of the watershed, and though the roads have been programmatically assessed with CDFW grant funding, to date much of the recommendations have not been implemented. With increasing development pressures in the rural portions of Sonoma and Mendocino counties, and associated road building to support future agricultural and urban development, this high threat is likely to continue in the future.

Severe Weather Patterns

The Upper Russian watershed is characterized by a Mediterranean-type climate, with dry, hot summers and moderate rainfall occurring primarily between November and March (Coey *et al.* 2002). Though this hydrologic regime favors Chinook salmon, simplified tributary stream

channels and river confluences no longer support connectivity under dry or drought conditions. Since much of the river is artificially disconnected from floodplain habitat by man-made dikes and levees, high river flows no longer inundate floodplain habitat along much of the Russian River mainstem. Aggradation has occurred in some mainstem and lower tributary reaches, diminishing the amount and spatial extent of staging pools for holding during low flow periods.

Water Diversion and Impoundments

Two large impoundments block Chinook salmon migration within the middle and upper portions of the Russian River population; Warm Springs Dam and Coyote Valley Dam. Ramping rates from the two dams, had been identified as a potential source of stranding emerging or juvenile Chinook salmon (NMFS 2008). The elevated and regulated flow structure in the mainstem and Dry Creek also affects the estuary's ability to function naturally. Finally, water diversions associated with agricultural summer pumping or spring frost protection, from the mainstem and tributaries can impact rearing Chinook salmon by lowering baseflows, de-watering redds, or stranding fish in isolated pool habitats.

Limiting Stresses, Life Stages, and Habitats

Pre-smolt and smolt lifestages are impact by several stresses, most notably the limited amount and poor quality of habitat encountered while emigrating downstream. Restoration efforts should focus on ameliorating these impacts, which is reflected in the recovery strategy below.

General Recovery Strategy

Improve Habitat Complexity: Pool Depth, Shelter value and LWD Volume

Restoration efforts that place wood in streams are needed to improve shelter ratings and pool volumes. Where appropriate, wood/boulder structures have been and should continue to be constructed or set within simplified stream reaches of the mainstem and larger tributaries to scour pool habitat, sort spawning gravel, and create complex habitat for adult and smolt migration. To improve long-term LWD loading rates, riparian restoration plans should be developed that focus on restoring both native riparian habitat and the hydrologic/fluvial processes that regulate natural wood loading dynamics.

Improve Lower Tributary Flows

NOAA's coordination efforts have fostered restoration actions between landowners during low flow conditions to minimize acute dewatering episodes, and encouraged the use of alternative frost protection strategies (*e.g.,* wind fans, off-channel reservoirs, *etc.*), many of which have already been successfully employed throughout the basin. USACE and NMFS jointly evaluated

the effects of ramping on juvenile salmonids, and modified ramping schedule criteria in 2016 to diminish and avoid stranding.

Improve Flow Connectivity and Passage

As noted, sediment aggradation at mainstem/tributary confluences can delay or inhibit adult and smolt migration. Aggraded sections can also force streamflow subsurface, dewatering stream habitat that would otherwise have consistent flow. Gravel extraction strategies in these areas could improve passage over the short term. Improving sediment transport in low gradient reaches, and eliminating sediment sources in higher gradient and headwater reaches, would improve fish passage over the longer term. Improving connectivity to floodplain habitat, enhancements to flood control channels and upgrading upslope road networks will be necessary to accomplish this. Habitat potential, and a conceptual plan for passage above Lake Mendocino should be evaluated.

Evaluate and Improve the Regulated Flow Structure

Current efforts between NMFS, and the NWS California / Nevada River Forecasting Center (CNRFC), Monterey Weather Forecasting Office (WFO – Monterey (MTR) and Eureka (EKA)), and the Office of Hydrologic Development (OHD), seek to balance and sustain fisheries flows while maximizing reservoir capture of watershed runoff. These efforts involving forecast-based reservoir operations for flood control and conservation, modeling watershed runoff, and improvement of atmospheric rainfall and river forecasts to identify opportunistic periods for diversion and bypass should be supported. Further work is needed to evaluate storage and flow releases from Coyote Dam to improve flows to the needs of listed salmonids. Changes to mainstem river flows are expected to occur via the 2008 Biological Opinion which should improve rearing habitat on the upper mainstem and improve estuary flow and flooding management. Dedicated "blockwater" flows are recommended to be incorporate into future flow structures for the two dams to improve migration cues or temperatures for fall/winter adult migration, or spring smolt emigration. Meanwhile, large scale habitat restoration efforts required by the 2008 Biological Opinion for coho salmon and steelhead continue and are expected to improve rearing and spawning habitat for Chinook salmon as well.

Increase Abundance and Distribution

DCFH enhancement goals for Chinook salmon smolt releases on Dry Creek were revised to zero in 1999, until such time that adult returns to DCFH reach 500 adults. A Hatchery and Genetic Management Plan (HGMP) would be required by NMFS to re-initiate artificial propagation. Few Chinook salmon still return to the hatchery; to date adult escapement goals at the facility have not beens reached. Hatchery supplementation could be a tool to expand population size, although improvements to genetic management and rearing practices would need to be

implemented through the HGMP that would evaluate the need for stocking and protect the wild spawning population in the context of both recovery and enhancement goals. If Chinook salmon rearing and stocking was re-initiated, smolt releases from CVFF should be increased to expand the number of upper river spawners, given that the bulk of spawning habitat occurs on the mainstem upstream of Dry Creek. Recent addition of a low flow closure in the state fishing regulations should decrease the seasonal overlap of the steelhead sport fishing run with the Chinook salmon run, which should significantly reduce incidental bycatch and mortality of Chinook salmon.

Improve Water Quality: Turbidity or Toxicity

A feasibility study to address turbidity issues in the upper Russian River from Coyote Dam should be completed and solutions implemented by the USACE. One alternative could include installation of a multi-level outlet structure to minimize the discharge of suspended sediment during critical periods of the Chinook salmon lifecycle.

Address Upslope Sediment Sources

Problem roads and active erosion sites already identified from existing road sediment surveys should be prioritized and restoration actions implemented by Mendocino County Department of Transportation. Additionally, remaining roads (city and private) within Sonoma and Mendocino counties should be addressed as part of a comprehensive sediment reduction and transportation plan for the entire basin. Future road construction should utilize BMPs to prevent altering watershed hydrologic processes, sediment transport and fish passage, and avoid construction of roads within riparian zones.

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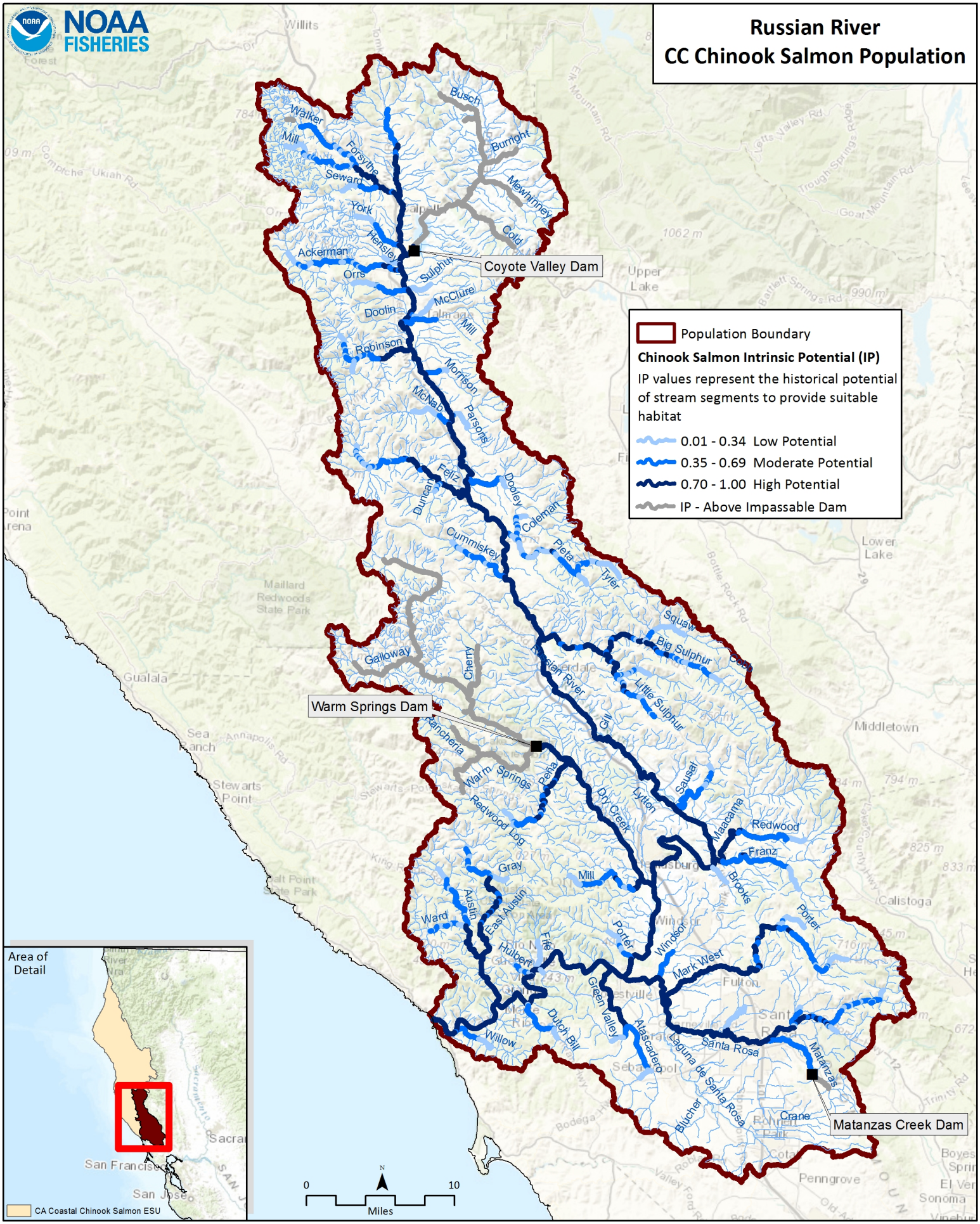
NOAA FISHERIES
Russian River
CC Chinook Salmon Population
Population Boundary
Chinook Salmon Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
IP - Above Impassable Dam
Coyote Valley Dam
Warm Springs Dam
Matanzas Creek Dam
Area of Detail
CA Coastal Chinook Salmon ESU
0
10
Miles
Willits
Ukiah
Upper Lake
Lower Lake
Middletown
Calistoga
Santa Rosa
Penngrove
Petaluma
Sonoma
Maillard Redwoods State Park
Gualala
Sea Ranch
Stewarts Point
Annapolis
Fulton
Windsor
Healdsburg
Geyserville
Cloverdale
Boyes Hot Springs
El Verano
Vineburg
Busch
Walker
Mill
Forsythe
Seward
York
Hensley
Ackerman
Orrs
Sulphur
McClure
Doolin
Robinson
Mill
Morrison
McNab
Parsons
Dooley
Coleman
Pieta
Tyler
Squaw
Big Sulphur
Little Sulphur
Russian River
Cummiskey
Feliz
Duncan
Galloway
Cherry
Rancheria
Warm Springs
Dry Creek
Lytton
Sausal
Maacama
Redwood
Franz
Brooks
Porter
Mark West
Green Valley
Atascadero
Laguna de Santa Rosa
Matanzas
Crane
Blucher
Willow
Dutch Bill
Hulbert
Fife
Porter
Windsor
Ward
Austin
East Austin
Gray
Mill
Redwood Log
Perha
Warm Springs
Rancheria
Cherry
Galloway
Duncan
Feliz
Dooley
Coleman
Pieta
Tyler
Squaw
Big Sulphur
Little Sulphur
Russian River
Cummiskey
Morrison
McNab
Parsons
Robinson
Doolin
McClure
Sulphur
Orrs
Ackerman
Hensley
York
Seward
Forsythe
Mill
Walker
Busch
Burright
Mewhinney
Cold

CC Chinook Salmon Russian River CAP Viability Results

#	Conservation Target	Category	Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Indicator Measurement	Current Rating
1	Adults	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired but functioning	Fair
			Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<50% of streams/ IP-Km (>6 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>6 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>6 Key Pieces/100 meters)	>90% of streams/ IP-Km (>6 Key Pieces/100 meters)	<50% of streams/ IP-km (>6 Key Pieces/100 meters)	Poor
			Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	50% to 74% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	75% to 90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	>90% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	<50% of streams/ IP-Km (>1.3 Key Pieces/100 meters)	Poor
			Habitat Complexity	Percent Staging Pools	<50% of streams/ IP-Km (>49% average primary pool frequency)	50% to 74% of streams/ IP-Km (>49% average primary pool frequency)	75% to 89% of streams/ IP-Km (>49% average primary pool frequency)	>90% of streams/ IP-Km (>49% average primary pool frequency)	29% streams/ 51% IP-km (>49% average primary pool frequency)	Fair
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 35-50	Good
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-Km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	99.28 of IP-km	Good
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	7% Class 5 & 6 across IP-km	Poor

			Sediment	Quantity & Distribution of Spawning Gravels	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-km to 90% of IP-km	Good
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Sublethal or Chronic	Fair
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50 to 75% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Density	<7 spawners per IP-Km	7-20 Spawners per IP-Km	20-40 Spawners per IP-Km (e.g., Low Risk Extinction Criteria)		7-20 spawners per IP-km: low risk spawner density per Spence (2008)	Fair
			Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	50-74% of Historical Range	Fair
2	Eggs	Condition	Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Redd Scour	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	15-17% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	<12% (0.85mm) and <30% (6.4mm)	12-14% (0.85mm) and <30% (6.4mm)	Good
			Sediment	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	52% streams/ 35% IP-km (>50% stream average scores of 1 & 2)	Fair

3	Pre Smolt	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired but functioning	Fair
			Habitat Complexity	Percent Primary Pools	<50% of streams/ IP-Km (>49% average primary pool frequency)	50% to 74% of streams/ IP-Km (>49% average primary pool frequency)	75% to 89% of streams/ IP-Km (>49% average primary pool frequency)	>90% of streams/ IP-Km (>49% average primary pool frequency)	29% streams/ 51% IP-km (>49% average primary pool frequency)	Fair
			Habitat Complexity	Pool/Riffle/Flatwater Ratio	<50% of streams/ IP-Km (>30% Pools; >20% Riffles)	50% to 74% of streams/ IP-Km (>30% Pools; >20% Riffles)	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)	>90% of streams/ IP-Km (>30% Pools; >20% Riffles)	33% streams/ 40% IP-km (>30% Pools; >20% Riffles)	Poor
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	6% streams/ 7% IP-km (>80 stream average)	Poor
			Hydrology	Flow Conditions (Baseflow)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	4.94 Diversions/10 IP-km	Fair
			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 35-50	Good
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	<50% of IP-km	Poor
			Riparian Vegetation	Tree Diameter (North of SF Bay)	≤39% Class 5 & 6 across IP-km	40 - 54% Class 5 & 6 across IP-km	55 - 69% Class 5 & 6 across IP-km	>69% Class 5 & 6 across IP-km	7% Class 5 & 6 across IP-km	Poor

			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	52% streams/ 35% IP-km (>50% stream average scores of 1 & 2)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	<50% Response Reach Connectivity	Poor
			Water Quality	Temperature (MWMT)	<50% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	75 to 89% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	>90% IP km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	50 to 74% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Sublethal or Chronic	Fair
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	<50% of streams/ IP-km maintains severity score of 3 or lower	Poor
		Size	Viability	Spatial Structure	<50% of Historical Range	50-74% of Historical Range	75-90% of Historical Range	>90% of Historical Range	50-74% of Historical Range	Fair
5	Smolts	Condition	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Impaired but functioning	Properly Functioning Condition	Unimpaired Condition	Impaired but functioning	Fair
			Habitat Complexity	Shelter Rating	<50% of streams/ IP-Km (>80 stream average)	50% to 74% of streams/ IP-Km (>80 stream average)	75% to 90% of streams/ IP-Km (>80 stream average)	>90% of streams/ IP-Km (>80 stream average)	6% streams/ 7% IP-km (>80 stream average)	Poor
			Hydrology	Flow Conditions (Instantaneous Condition)	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 51-75	Fair
			Hydrology	Number, Condition and/or Magnitude of Diversions	>5 Diversions/10 IP km	1.1 - 5 Diversions/10 IP km	0.01 - 1 Diversions/10 IP km	0 Diversions	4.94 Diversions/10 IP-km	Fair

			Hydrology	Passage Flows	NMFS Flow Protocol: Risk Factor Score >75	NMFS Flow Protocol: Risk Factor Score 51-75	NMFS Flow Protocol: Risk Factor Score 35-50	NMFS Flow Protocol: Risk Factor Score <35	NMFS Flow Protocol: Risk Factor Score 35-50	Good
			Passage/Migration	Passage at Mouth or Confluence	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	50% of IP-km to 74% of IP-km	Fair
			Passage/Migration	Physical Barriers	<50% of IP-Km or <16 IP-Km accessible*	50% of IP-Km to 74% of IP-km	75% of IP-Km to 90% of IP-km	>90% of IP-km	75% of IP-Km to 90% of IP-km	Good
			Sediment (Food Productivity)	Gravel Quality (Embeddedness)	<50% of streams/ IP-Km (>50% stream average scores of 1 & 2)	50% to 74% of streams/ IP-Km (>50% stream average scores of 1 & 2)	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	>90% of streams/ IP-Km (>50% stream average scores of 1 & 2)	52% streams/ 35% IP-km (>50% stream average scores of 1 & 2)	Fair
			Smoltification	Temperature	<50% IP-Km (>6 and <14 C)	50-74% IP-Km (>6 and <14 C)	75-90% IP-Km (>6 and <14 C)	>90% IP-Km (>6 and <14 C)	50-74% IP-km (>6 and <14 C)	Fair
			Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	50-80% Response Reach Connectivity	>80% Response Reach Connectivity	Not Defined	50-80% Response Reach Connectivity	Fair
			Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No Evidence of Toxins or Contaminants	Sublethal or Chronic	Fair
			Water Quality	Turbidity	<50% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-Km maintains severity score of 3 or lower	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower	>90% of streams/ IP-Km maintains severity score of 3 or lower	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair
		Size	Viability	Abundance	Smolt abundance which produces high risk spawner density per Spence (2008)	Smolt abundance which produces moderate risk spawner density per Spence (2008)	Smolt abundance to produce low risk spawner density per Spence (2008)		Smolt abundance which produces moderate risk spawner density per Spence (2008)	Fair
6	Watershed Processes	Landscape Context	Hydrology	Impervious Surfaces	>10% of Watershed in Impervious Surfaces	7-10% of Watershed in Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	<3% of Watershed in Impervious Surfaces	2.271% of Watershed in Impervious Surfaces	Good

			Landscape Patterns	Agriculture	>30% of Watershed in Agriculture	20-30% of Watershed in Agriculture	10-19% of Watershed in Agriculture	<10% of Watershed in Agriculture	8.653% of Watershed in Agriculture	Good
			Landscape Patterns	Timber Harvest	>35% of Watershed in Timber Harvest	26-35% of Watershed in Timber Harvest	25-15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	<15% of Watershed in Timber Harvest	Very Good
			Landscape Patterns	Urbanization	>20% of watershed >1 unit/20 acres	12-20% of watershed >1 unit/20 acres	8-11% of watershed >1 unit/20 acres	<8% of watershed >1 unit/20 acres	19% of Watershed >1 unit/20 acres	Fair
			Riparian Vegetation	Species Composition	<25% Intact Historical Species Composition	25-50% Intact Historical Species Composition	51-74% Intact Historical Species Composition	>75% Intact Historical Species Composition	25-50% Intact Historical Species Composition	Fair
			Sediment Transport	Road Density	>3 Miles/Square Mile	2.5 to 3 Miles/Square Mile	1.6 to 2.4 Miles/Square Mile	<1.6 Miles/Square Mile	3 Miles/Square Mile	Fair
			Sediment Transport	Streamside Road Density (100 m)	>1 Miles/Square Mile	0.5 to 1 Miles/Square Mile	0.1 to 0.4 Miles/Square Mile	<0.1 Miles/Square Mile	3 Miles/Square Mile	Poor

CC Chinook Salmon Russian River CAP Threat Results

	Threats Across Targets	Adults	Eggs	Pre Smolt	Smolts	Watershed Processes	Overall Threat Rank
	Project-specific-threats	1	2	3	5	6	
1	Agriculture	High	Low	Medium	Medium	Medium	Medium
2	Channel Modification	High	Medium	High	High	Medium	High
3	Disease, Predation and Competition	Low		Medium	Medium	Low	Medium
4	Fire, Fuel Management and Fire Suppression					Low	Low
5	Fishing and Collecting	Medium			Low		Medium
6	Hatcheries and Aquaculture						
7	Livestock Farming and Ranching	Low	Low	Medium	Low	Low	Low
8	Logging and Wood Harvesting	Low	Low	Medium	Low	Low	Low
9	Mining	Medium	Low	Medium	Medium	Medium	Medium
10	Recreational Areas and Activities					Low	Low
11	Residential and Commercial Development	High	Low	High	High	Medium	High
12	Roads and Railroads	Medium	Medium	High	High	Medium	High
13	Severe Weather Patterns	Medium	Low	Medium	Medium	Low	Medium
14	Water Diversion and Impoundments	Medium	Medium	Very High	Medium	Medium	High

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-1.1.1	Recovery Action	Estuary	Increase extent of estuarine habitat				
RR-CCCh-1.1.1.1	Action Step	Estuary	Develop and implement Estuary Protection and Enhancement projects to improve estuary function and habitat for juveniles and smolts.	2	5	California Coastal Conservancy, CDFW, MCRRFCD, Mendocino County, NMFS, NOAA NOS, NOAA RC, Private Landowners, Public Works, RWQCB, Sonoma County, Sonoma County Water Agency, State Parks, USACE	
RR-CCCh-1.1.1.2	Action Step	Estuary	Continue implementation of the Russian River estuary management program, as described within NMFS' Russian River Biological Opinion (NMFS 2008).	2	12	CDFW, MCRRFCD, Mendocino County, NMFS, Sonoma County Water Agency, USACE	
RR-CCCh-1.1.2	Recovery Action	Estuary	Improve estuarine water inflow				
RR-CCCh-1.1.2.1	Action Step	Estuary	Manage dam releases to minimize the influence on lagoon formation as described in the Russian River Biological Opinion (NMFS 2008).	2	12	CDFW, MCRRFCD, Mendocino County, NMFS, Sonoma County Water Agency, USACE	
RR-CCCh-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-2.1.1	Recovery Action	Floodplain Connectivity	Increase and enhance velocity refuge				
RR-CCCh-2.1.1.1	Action Step	Floodplain Connectivity	Reestablish the hydrologic connection between the stream channel and adjacent floodplain habitat.	2	25	CDFW, FEMA, Mendocino County, NMFS, Private Landowners, USACE	
RR-CCCh-2.1.1.2	Action Step	Floodplain Connectivity	Create flood refuge habitat, such as by: 1) hydrologically connecting floodplains with riparian forest; 2) removing or setting back levees; or 3) using the streamway concept where appropriate. Installing shelter components (LWD, boulders, etc.) appropriate to the channel type.	2	10	County Planning, FEMA, Private Landowners, USACE	
RR-CCCh-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers				
RR-CCCh-5.1.1.1	Action Step	Passage	Barriers on mainstem Russian River (memorial beach and Willow Water District Dam) should be assessed by a fish passage specialist and modified if needed.	1	10	CDFW, Mendocino County, NMFS, Sonoma County	
RR-CCCh-5.1.1.2	Action Step	Passage	Barriers on Big Sulphur, Little Sulphur, Mill, Pena, Dry, and Santa Rosa Creeks should be assessed by a fish passage specialist and modified if needed.	1	10	CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD	
RR-CCCh-5.1.1.3	Action Step	Passage	Evaluate railroad stream crossing on McNabb Creek.	1	2	CDFW, NMFS, NOAA RC	
RR-CCCh-5.1.1.4	Action Step	Passage	Modify railroad crossing as prescribed by evaluation to allow for fish passage at all lifestages	1	2	CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD	
RR-CCCh-5.1.1.5	Action Step	Passage	Habitat potential, and a conceptual plan for passage above Lake Mendocino should be evaluated.	1	20	CDFW, NMFS, NOAA RC, NRCS, Private Landowners, USACE	
RR-CCCh-5.1.2	Recovery Action	Passage	Rehabilitate and enhance passage into tributaries (aggradation/degradation)				
RR-CCCh-5.1.2.1	Action Step	Passage	Investigate the need for fish ladders and resting pools/cover for migrating fish within tributaries near and within the City of Ukiah (CDFG 2002).	1	2	CDFW, NMFS, NOAA RC	
RR-CCCh-5.1.2.2	Action Step	Passage	Pending investigation of the need for fish ladders and resting pools/cover for migrating fish within tributaries near and within the City of Ukiah, fund projects to add these structures where needed.	1	2	CDFW, Mendocino County, NMFS, Sonoma County, Water Agencies	
RR-CCCh-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-6.1.1	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD, and shelters				
RR-CCCh-6.1.1.1	Action Step	Habitat Complexity	Complete habitat surveys within the West Fork Russian River watershed (CDFG 2002).	2	5	CDFW	
RR-CCCh-6.1.1.2	Action Step	Habitat Complexity	Develop tributary pool and shelter projects with cooperative landowners to enhance presmolt and smolt survival	2	100	CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD	
RR-CCCh-6.1.1.3	Action Step	Habitat Complexity	Encourage bio-engineering projects to address erosion issues on private lands.	2	3	CDFW, NOAA RC, NRCS, RCD	

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-6.1.2	Recovery Action	Habitat Complexity	Increase frequency of primary or staging pools				
RR-CCCh-6.1.2.1	Action Step	Habitat Complexity	Enhance east branch and mainstem migration and resting habitats with LWD, boulders, and other instream features to increase habitat complexity and improve staging pool frequency and depth.	2	10	CDFW, NMFS, NOAA RC, NRCS, RCD	
RR-CCCh-6.1.2.2	Action Step	Habitat Complexity	Improve instream habitat complexity such that target criteria for primary and staging pool depths and shelter value is achieved within mainstem and tributary habitats utilized by chinook. Priority streams would include Austin, Maacmama, Mark West, Santa Rosa, Ackerman, Feliz, Robinson, and Pieta Creeks, and the East and West Branches and upper Mainstem Russian River.	2	2	California Conservations Corps, CDFW, Private Landowners, Russian River Wild Steelhead Society, Trout Unlimited	
RR-CCCh-6.1.2.3	Action Step	Habitat Complexity	Maintain current LWD, boulders, and other structure-providing features which provide stream complexity, pool frequency, and depth when evaluating permits for stream or bank modification.	3	100	CDFW, NOAA RC, Private Consultants, Private Landowners	
RR-CCCh-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-10.1.1	Recovery Action	Water Quality	Reduce turbidity and suspended sediment				
RR-CCCh-10.1.1.1	Action Step	Water Quality	Develop and fund a feasibility study to address the significant turbidity issues from Lake Mendocino outlet	1	10	USACE	
RR-CCCh-10.1.1.2	Action Step	Water Quality	Fund and implement recommendations from proposed feasibility study to address significant turbidity issues from the Lake Mendocino outlet	1	20	Mendocino County, USACE, Water Agencies	
RR-CCCh-10.1.1.3	Action Step	Water Quality	Research into the potential level of impacts from and solutions to environmental estrogens associated with wastewater discharge and domestic septic leakage are needed.	2	10	RWQCB, Cities, Water Agencies	
RR-CCCh-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity				
RR-CCCh-11.1.1.1	Action Step	Viability	Develop standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas.	3	20	CDFW, NMFS, NRCS, Private Consultants, Private Landowners, RCD	
RR-CCCh-11.1.1.2	Action Step	Viability	Measure or estimate the condition of key habitat attributes across the watershed.	2	20	CDFW, NMFS, NRCS, Private Consultants, Private Landowners, RCD	
RR-CCCh-11.1.1.3	Action Step	Viability	Utilize CDFW approved implementation, effectiveness, and validation monitoring protocols when assessing efficacy of restoration efforts.	2	100	CDFW, NOAA RC, NRCS, Private Consultants, Private Landowners, RCD	
RR-CCCh-11.1.1.4	Action Step	Viability	Continue funding Life Cycle Monitoring Station	1	10	CDFW, NMFS, Sonoma County Water Agency	
RR-CCCh-12.1	**Objective**	**Agriculture**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-12.1.1	Recovery Action	Agriculture	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
RR-CCCh-12.1.1.1	Action Step	Agriculture	Solicit cooperation from NRCS, RCDs, Farm Bureau, and others to devise incentive programs and incentive-based approaches to encourage increased involvement and support existing landowners who conduct operations in a manner compatible with CCC steelhead and CC Chinook salmon recovery priorities.	3	10	CDFW, Farm Bureau, NMFS, NRCS, Private Landowners, RCD	
RR-CCCh-12.1.1.2	Action Step	Agriculture	Streamline permit processing where landowners are conducting actions aligned with recovery priorities.	3	5	CDFW, NMFS, NRCS, RCD, SWRCB, USACE	
RR-CCCh-12.1.2	Recovery Action	Agriculture	Prevent or minimize increased landscape disturbance				
RR-CCCh-12.1.2.1	Action Step	Agriculture	Support and implement Best Management Practices such as those in the Fish Friendly Farming program (California Land Stewardship Institute), or other cooperative conservation programs.	3	10	CDFW, Farm Bureau, NMFS, Private Landowners, RCD	
RR-CCCh-12.1.2.2	Action Step	Agriculture	Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.	3	25	CalFire, CDFW, NMFS	
RR-CCCh-12.1.3	Recovery Action	Agriculture	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)				

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-12.1.3.1	Action Step	Agriculture	Encourage the NRCS, RCDs, and other appropriate organizations to increase the number of landowners participating in sediment reduction planning and implementation.	3	10	CDFW, NMFS, NRCS, Private Landowners, RCD	
RR-CCCh-12.1.3.2	Action Step	Agriculture	Complete Farm Conservation Plans (through the RCD, NRCS, Fish Friendly Farming program or other cooperative conservation programs) to address sediment source reduction, riparian habitat, forest health, and restoration.	3	10	CDFW, Farm Bureau, NMFS, NRCS, Private Landowners, RCD	
RR-CCCh-13.1	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-13.1.1	Recovery Action	Channel Modification	Prevent or minimize impairment to watershed hydrology				
RR-CCCh-13.1.1.1	Action Step	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Identify and target remediation of watershed process disruption as an overall priority.	2	100	CDFW, Mendocino County, NMFS, Private Consultants, Private Landowners, Sonoma County, Sonoma County Water Agency	
RR-CCCh-13.1.1.2	Action Step	Channel Modification	Discourage stabilization projects which will lead to additional instability either up- or downstream.	2	100	CDFW, Mendocino County, NMFS, Sonoma County, USACE	
RR-CCCh-13.1.1.3	Action Step	Channel Modification	Eliminate the use of gabion baskets and undersized rock within the bankfull channel and use bioengineering techniques.	3	100	CDFW, Mendocino County, NMFS, NRCS, Private Landowners, RCD, Sonoma County, USACE	
RR-CCCh-13.2	**Objective**	**Channel Modification**	**Address the inadequacy of existing regulatory mechanisms**				
RR-CCCh-13.2.1	Recovery Action	Channel Modification	Prevent or minimize impairment to watershed hydrology				
RR-CCCh-13.2.1.1	Action Step	Channel Modification	Where new levees or similar flood control projects are planned, develop setbacks to allow the river to respond to natural hydrologic process and remain in equilibrium. At a minimum, setbacks should accommodate a 100 year event.	3	100	CDFW, Farm Bureau, Mendocino County, NMFS, Private Landowners, Sonoma County	
RR-CCCh-13.2.1.2	Action Step	Channel Modification	Flood control projects or other modifications facilitating new development (as opposed to protecting existing infrastructure) should be avoided.	3	100	CDFW, FEMA, Mendocino County, NMFS, Private Landowners, Sonoma County	
RR-CCCh-13.2.1.3	Action Step	Channel Modification	Modify Federal, State, city and county regulatory and planning processes to minimize to the extent feasible provisions allowing new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all historic CCC steelhead and CC Chinook salmon watersheds.	3	10	CDFW, County of Mendocino, NMFS, Public, Sonoma County	
RR-CCCh-13.2.1.4	Action Step	Channel Modification	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	3	2	CDFW, NMFS	
RR-CCCh-13.2.2	Recovery Action	Channel Modification	Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)				
RR-CCCh-13.2.2.1	Action Step	Channel Modification	Agencies should develop large woody debris retention programs and move away from the practice of removing instream large woody debris under high flow "emergencies".	1	100	CDFW, Land Trusts, Mendocino County, NMFS, NRCS, Private Landowners, RCD, Sonoma County, USACE	
RR-CCCh-13.2.2.2	Action Step	Channel Modification	Develop a mitigation policy that requires In-Kind replacement of removed large woody debris at a 3:1 ratio.	3	100	CDFW, NMFS, USACE	
RR-CCCh-13.2.3	Recovery Action	Channel Modification	Prevent or minimize adverse alterations to riparian species composition and structure				
RR-CCCh-13.2.3.1	Action Step	Channel Modification	All proposed levees should be designed to account for minimal maintenance associated with an intact and functioning riparian zone.	2	100	FEMA, Mendocino County, NMFS, Private Landowners, Sonoma County, USACE	
RR-CCCh-13.2.3.2	Action Step	Channel Modification	Counties and municipalities should adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	100	Mendocino County, Sonoma County	
RR-CCCh-16.1	**Objective**	**Fishing/Collecting**	**Address the inadequacy of existing regulatory mechanisms**				
RR-CCCh-16.1.1	Recovery Action	Fishing/Collecting	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
RR-CCCh-16.1.1.1	Action Step	Fishing/Collecting	Work with CDFW to modify existing sport fishing regulations. Develop adequate low flow closures and angling season to minimize impacts to chinook salmon.	2	5	CDFW, NMFS, Public	

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-16.1.1.2	Action Step	Fishing/Collecting	Increase enforcement and patrol during the steelhead and general fishing seasons in the upper and middle river area to reduce poaching and unintentional catch of Chinook salmon.	2	5	CDFW, NMFS, Public	
RR-CCCh-17.1	**Objective**	**Hatcheries**	**Address other natural or manmade factors affecting the species' continued existence**				
RR-CCCh-17.1.1	Recovery Action	Hatcheries	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
RR-CCCh-17.1.1.1	Action Step	Hatcheries	Evaluate hatchery utilization in the context of reaching recovery targets both within the Russian River and elsewhere within the Central Coast ESU, in terms of increasing abundance and spatial distribution of Russian River and CC Chinook salmon.	1	5	CDFW, NMFS, USACE	
RR-CCCh-17.1.1.2	Action Step	Hatcheries	If stocking is re-initiated, implement changes identified in Hatchery and Genetic Management Plans to improve genetic and rearing management	1	5	CDFW, NMFS, USACE	
RR-CCCh-17.1.1.3	Action Step	Hatcheries	If stocking is reinitiated, conduct or increase the proportion of releases from Coyote Valley Fish Facility to expand and increase the numbers of upper river spawners	1	20	CDFW, NMFS, USACE	
RR-CCCh-17.1.1.4	Action Step	Hatcheries	Evaluate the need for revising release numbers, release sizes, release locations and strategies in the context of meeting recovery goals and mitigation requirements of both Russian River Hatcheries (DCFH and CVFF). Update and revise the HGMP according to proposed changes and recommendations	1	5	CDFW, NMFS, USACE	
RR-CCCh-17.1.1.5	Action Step	Hatcheries	Manage Russian River Hatcheries following a Hatchery and Genetic Management Plan (HGMP) which is regularly updated to include adaptive management strategies and recommendations.	1	5	CDFW, NMFS, USACE	
RR-CCCh-20.1	**Objective**	**Mining**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-20.1.1	Recovery Action	Mining	Prevent or minimize impairment to instream habitat complexity (altered pool complexity and/or pool riffle ratio)				
RR-CCCh-20.1.1.1	Action Step	Mining	Continue to implement and support BMP's which improve, maintain or prevent impacts to habitat complexity when reviewing new mining plans.	2	5	CDFW, Counties, NMFS, Private Landowners, USACE	
RR-CCCh-20.1.1.2	Action Step	Mining	Develop and enhance staging pool habitats and thalweg depth where geomorphic conditions dictate and allow	2	10	CDFW, Counties, NMFS, Private Landowners, USACE	
RR-CCCh-20.1.1.3	Action Step	Mining	Remove dikes/levees separating river channel from available areas of off-channel habitat restoration in former terrace gravel mining pit locations.	2	10	CDFW, Counties, NMFS, Private Landowners, USACE	
RR-CCCh-20.1.2	Recovery Action	Mining	Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)				
RR-CCCh-20.1.2.1	Action Step	Mining	Retain LWD, boulders and vegetation on riffles where structure is beneficial to migration and resting cover	2	20	CDFW, Counties, NMFS, Private Landowners, USACE	
RR-CCCh-20.1.2.2	Action Step	Mining	Develop and enhance offchannel habitats such as alcoves, seasonal wetlands, ponds and secondary channels to promote presmolt rearing habitat	2	20	CDFW, Counties, NMFS, Private Landowners, USACE	
RR-CCCh-22.1	**Objective**	**Residential/ Commercial Development**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-22.1.1	Recovery Action	Residential/ Commercial Development	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
RR-CCCh-22.1.1.1	Action Step	Residential/ Commercial Development	Improve education and awareness of agencies, landowners and the public regarding salmonid protection and habitat requirements.	3	10	CDFW, Cities, Counties, NMFS, Private Landowners, Water Agencies	
RR-CCCh-22.1.1.2	Action Step	Residential/ Commercial Development	Educate county and city public works departments, flood control districts, and planning departments, etc., on the critical importance of maintaining riparian vegetation, instream LWD, and LWD recruitment.	3	20	CDFW, Cities, Counties, NMFS	
RR-CCCh-22.1.1.3	Action Step	Residential/ Commercial Development	Design and implement education programs to promote public awareness of salmon and steelhead habitat within urban creek settings.	3	5	CDFW, Cities, Counties, NMFS, Public	
RR-CCCh-22.1.1.4	Action Step	Residential/ Commercial Development	Assess efficacy and necessity of ongoing stream maintenance practices and evaluate, avoid, minimize and/or mitigate their impacts to rearing and migrating steelhead and Chinook salmon.	2	5	CDFW, Cities, Counties, NMFS, NOAA RC, Water Agencies	
RR-CCCh-22.1.2	Recovery Action	Residential/ Commercial Development	Prevent or minimize increased landscape disturbance				

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-22.1.2.1	Action Step	Residential/ Commercial Development	As mitigation for hydrograph consequences, municipalities and counties should investigate funding of larger detention devices in key watersheds with ongoing channel degradation or in sub-watersheds where impervious surface area > 10 percent.	3	5	CDFW, Cities, Counties, NMFS	
RR-CCCh-22.1.2.2	Action Step	Residential/ Commercial Development	Create flood refuge habitat, such as hydrologically connected floodplains with riparian forest, and use streamway concept where appropriate.	2	25	CDFW, Cities, Counties, NMFS, Private Landowners	
RR-CCCh-22.1.2.3	Action Step	Residential/ Commercial Development	Where existing infrastructure exists within historical floodplains or offchannel habitats in any historical steelhead or chinook watersheds, and restoration is found feasible, encourage willing landowners to restore these areas through conservation easements, etc.	3	25	CDFW, Counties, Land Trusts, NMFS, Private Landowners	
RR-CCCh-22.1.2.4	Action Step	Residential/ Commercial Development	Purchase conservation easements from landowners that currently have grazing or agricultural operations along the estuary.	2	10	California Coastal Conservancy, CDFW, Counties, NMFS, Private Landowners, RCD	
RR-CCCh-22.1.2.5	Action Step	Residential/ Commercial Development	Identify areas at high risk of conversion, and develop incentives and alternatives for landowners that discourage conversion.	3	25	CDFW, Counties, NMFS, Private Landowners, RCD	
RR-CCCh-22.1.2.6	Action Step	Residential/ Commercial Development	Design new developments to avoid unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to a CCC steelhead or CC Chinook salmon watercourse.	3	100	CDFW, Cities, Counties, NMFS	
RR-CCCh-22.1.2.7	Action Step	Residential/ Commercial Development	Counties and municipalities should adopt a policy of “managed retreat” (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	50	CDFW, Cities, Counties, NMFS	
RR-CCCh-22.1.2.8	Action Step	Residential/ Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential in undeveloped areas.	3	100	CDFW, Cities, Counties, NMFS	
RR-CCCh-22.1.3	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
RR-CCCh-22.1.3.1	Action Step	Residential/ Commercial Development	Disperse discharge from new or upgraded commercial and residential areas into a spatially distributed network rather than a few point discharges, which can result in locally severe erosion and disruption of riparian vegetation and instream habitat.	2	100	Cities, Counties	
RR-CCCh-22.2	**Objective**	**Residential/ Commercial Development**	**Address the inadequacy of existing regulatory mechanisms**				
RR-CCCh-22.2.1	Recovery Action	Residential/ Commercial Development	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
RR-CCCh-22.2.1.1	Action Step	Residential/ Commercial Development	Implement performance standards in Stormwater Management Plans.	3	100	Mendocino County, Private Landowners, Sonoma County	
RR-CCCh-22.2.2	Recovery Action	Residential/ Commercial Development	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
RR-CCCh-22.2.2.1	Action Step	Residential/ Commercial Development	Avoid, or minimize the use of commercial and industrial products (e.g. pesticides) with high potential for contamination of local waterways.	2	100	Cities, Mendocino County, Sonoma County	
RR-CCCh-22.2.2.2	Action Step	Residential/ Commercial Development	Toxic waste products from urban activities should receive the appropriate treatment before being discharged into any body of water that may enter any steelhead or Chinook salmon waters.	2	100	Cities, Counties, Public	
RR-CCCh-22.2.3	Recovery Action	Residential/ Commercial Development	Prevent or minimize increased landscape disturbance				
RR-CCCh-22.2.3.1	Action Step	Residential/ Commercial Development	Institutionalize programs to purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities.	3	25	CDFW, Farm Bureau, Land Trusts, NMFS, NRCS, RCD, Sonoma County	
RR-CCCh-22.2.3.2	Action Step	Residential/ Commercial Development	Discourage Sonoma County from rezoning forestlands to rural residential or other land uses.	3	20	CDFW, NMFS, Sonoma County	

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-22.2.3.3	Action Step	Residential/ Commercial Development	Enforce existing building permit programs to minimize unpermitted construction.	3	100	CDFW, Cities, Counties	
RR-CCCh-22.2.3.4	Action Step	Residential/ Commercial Development	Develop legislation that will fund county planning for environmentally sound growth and water supply and work in coordination with California Dept. of Housing, Association of Bay Area Governments and other government associations (CDFG 2004).	3	10	CDFW, Cities, Counties, NMFS, Private Landowners, Public	
RR-CCCh-22.2.3.5	Action Step	Residential/ Commercial Development	Modify County General Plan to eliminate provisions allowing new construction in undeveloped areas within the 100-year flood prone zones in all historic CCC steelhead and CC Chinook salmon watersheds.	3	5	CDFW, NMFS, Sonoma County	
RR-CCCh-22.2.3.6	Action Step	Residential/ Commercial Development	Work with Mendocino County to develop more protective regulations in regard to exurban development (vineyard and rural residential).	3	10	CDFW, NMFS, RWQCB, SWRCB	
RR-CCCh-22.2.3.7	Action Step	Residential/ Commercial Development	Encourage Sonoma and Mendocino County to develop and implement ordinances (e.g., Santa Cruz) to restrict subdivisions by requiring a minimum acreage limit for parcelization and in concert with limits on water supply and groundwater recharge areas.	3	5	CDFW, Mendocino County, NMFS, Sonoma County	
RR-CCCh-24.1	**Objective**	**Severe Weather Patterns**	**Address other natural or manmade factors affecting the species continued existence**				
RR-CCCh-24.1.1	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to stream hydrology (impaired water flow)				
RR-CCCh-24.1.1.1	Action Step	Severe Weather Patterns	Establish an emergency drought operations center (EDOC), (e.g., Washington Department of Fish and Wildlife, 2001), comprised of the SWRCB, CDFW, NMFS, and others to develop emergency rules for augmenting water supplies and mitigating the effects of drought on fish.	2	100	CDFW, NMFS, Sonoma County Water Agency, SWRCB	
RR-CCCh-24.1.1.2	Action Step	Severe Weather Patterns	Work with water managers on regulated streams to assure adequate and proper consideration is given to fish needs. Develop agreements that will minimize water-use conflicts and impacts on fish and wildlife resources during drought conditions.	2	20	CDFW, NMFS, Private Landowners, SWRCB	
RR-CCCh-24.1.1.3	Action Step	Severe Weather Patterns	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.	2	100	CDFW, NMFS, Private Landowners, SWRCB, Water Agencies	
RR-CCCh-24.1.1.4	Action Step	Severe Weather Patterns	Implement water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	2	100	CDFW, NMFS, Private Landowners, SWRCB, USACE, Water Agencies	
RR-CCCh-24.1.1.5	Action Step	Severe Weather Patterns	Manage reservoirs and dam releases to maintain suitable rearing temperatures and migratory flows in downstream habitats (e.g., pulse flow programs for adult upstream migration and smolt outmigration).	2	100	CDFW, NMFS, Private Landowners, SWRCB, Water Agencies	
RR-CCCh-24.1.1.6	Action Step	Severe Weather Patterns	Identify and work with water users to minimize depletion of summer base flows from unauthorized water uses.	2	10	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
RR-CCCh-25.1	**Objective**	**Water Diversion/Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
RR-CCCh-25.1.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)				
RR-CCCh-25.1.1.1	Action Step	Water Diversion/ Impoundment	Implement changes to minimum flow requirements permitted by SWRCB Decision 1610 as specified within the Russian River Biological Opinion (NMFS 2008).	1	15	CDFW, MCRRFCD, Mendocino County, NMFS, Sonoma County Water Agency	
RR-CCCh-25.1.1.2	Action Step	Water Diversion/ Impoundment	Support current efforts to balance and sustain fisheries flows while maximizing reservoir capture of watershed runoff. These efforts involving forecast-based reservoir operations for flood control and conservation, modeling watershed runoff, and improvement of atmospheric rainfall and river forecasts to identify opportunistic periods for diversion and bypass should be supported.	1	5	CDFW, MCRRFCD, NMFS, NOAA NWS, Private Landowners, Sonoma County Water Agency, SWRCB, USACE	
RR-CCCh-25.1.1.3	Action Step	Water Diversion/ Impoundment	Promote the use of reclaimed water for agricultural or other uses.	2	5	CDFW, Farm Bureau, Mendocino County, NMFS, RWQCB	

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-25.1.1.4	Action Step	Water Diversion/ Impoundment	Promote water conservation best practices such as drip irrigation for vineyards.	2	5	CDFW, Farm Bureau, Mendocino County, NMFS, Private Landowners	
RR-CCCh-25.1.2	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to estuary (impaired quality and extent)				
RR-CCCh-25.1.2.1	Action Step	Water Diversion/ Impoundment	Manage dam releases to minimize the influence on lagoon formation as described in the Russian River Biological Opinion (NMFS 2008).	2	5	CDFW, NMFS, USACE, Water Agencies	
RR-CCCh-25.1.2.2	Action Step	Water Diversion/ Impoundment	Landowners along Upper mainstem and East Fork Russian River should coordinate water withdrawals with SCWA and the MCRRFC & WCID, in the interest of providing reliable releases from Lake Mendocino, and managing spring flow releases in support of efforts to maintain a freshwater lagoon in the estuary.	1	5	CDFW, MCRRFCD, NMFS, Sonoma County Water Agency, SWRCB	
RR-CCCh-25.1.2.3	Action Step	Water Diversion/ Impoundment	Landowners along Dry Creek should coordinate water withdrawals with SCWA, in the interest of providing reliable releases from Lake Sonoma, and managing spring flow releases in support of efforts to maintain a freshwater lagoon in the estuary.	1	10	CDFW, NMFS, Sonoma County Water Agency, SWRCB	
RR-CCCh-25.1.3	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to passage and migration				
RR-CCCh-25.1.3.1	Action Step	Water Diversion/ Impoundment	Implement instream habitat restoration along six miles of mainstem Dry Creek as specified within the Russian River Biological Opinion (NMFS 2008).	2	10	CDFW, NMFS, Sonoma County Water Agency, USACE	
RR-CCCh-25.1.3.2	Action Step	Water Diversion/ Impoundment	Work with project proponents and landowners to implement instream habitat enhancement work along Dry Creek in addition to the 6 miles required by the NMFS 2008 Biological opinion, utilizing the Current Conditions Inventory and Conceptual Design work by Interfluve.	2	25	CDFW, MCRRFCD, NMFS, NRCS, Private Landowners, RCD, Sonoma County	
RR-CCCh-25.1.3.3	Action Step	Water Diversion/ Impoundment	Continue to support the Safe Harbor Agreements for Dry Creek landowners participating in habitat enhancement along Dry Creek.	3	5	NMFS, Private Landowners, Sonoma County Water Agency	
RR-CCCh-25.1.4	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
RR-CCCh-25.1.4.1	Action Step	Water Diversion/ Impoundment	Ramp all reservoir releases (flood maintenance releases, fisheries passage releases, summer baseflow, and other planned releases) as necessary to minimize deleterious effects of flow increases/decreases.	1	5	CDFW, NMFS, USACE, Water Agencies	
RR-CCCh-25.2	**Objective**	**Water Diversion/ Impoundment**	**Address the inadequacy of existing regulatory mechanisms**				
RR-CCCh-25.2.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (impaired water flow)				
RR-CCCh-25.2.1.1	Action Step	Water Diversion/ Impoundment	Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and California Water Code §1707 (CDFG 2004).	2	25	CDFW, NMFS, SWRCB	
RR-CCCh-25.2.1.2	Action Step	Water Diversion/ Impoundment	Support efforts to provide improved localized weather prediction capabilities in support of finer scale frost protection capabilities for the benefit of grape growers and fisheries flows.	2	5	CDFW, County Planning, Farm Bureau, NMFS, NOAA NWS, NOAA RC, NRCS, Private Landowners, RCD, Water Agencies	
RR-CCCh-25.2.1.3	Action Step	Water Diversion/ Impoundment	To resolve frost protection/fisheries conflicts over spring baseflows evaluate alternatives such as: develop information about prioritizing tributaries and locations for offstream storage; develop criteria for sizing offstream storage; develop criteria making compensatory releases from large dams; provide policy and funding for the above actions to maximize benefits for fisheries and agriculture.	2	5	CDFW, County Planning, Farm Bureau, NMFS, NOAA NWS, NOAA RC, NRCS, Private Landowners, RCD, Water Agencies	

Russian River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
RR-CCCh-25.2.1.4	Action Step	Water Diversion/ Impoundment	Develop and apply a distributed hydrologic water budget model to characterize surface stream flows within Russian River tributaries, to allow for comparisons between impaired and unimpaired conditions, with an emphasis on summer base flow conditions relative to rearing juvenile salmonids. These data will reduce uncertainty, provide greater temporal and spatial focus on impaired reaches and greater certainty for reaches that have water available for consumptive uses and be useful as a decision-support tool for other programs.	2	5	CDFW, County Planning, Farm Bureau, MCRRFCD, NMFS, NOAA NWS, NOAA RC, NRCS, Private Landowners, RCD	
RR-CCCh-25.2.1.5	Action Step	Water Diversion/ Impoundment	Request that SWRCB review and/or modify water use based on the needs of Chinook salmon/steelhead and authorized diverters (CDFG 2004).	3	5	CDFW, NMFS, SWRCB	
RR-CCCh-25.2.1.6	Action Step	Water Diversion/ Impoundment	Avoid and/or minimize the adverse effects of water diversion on salmonid habitat by establishing a more natural hydrograph, by-passing adequate downstream flows, regulating season of diversion, and promoting and implementing off-stream storage solutions (CDFG 2004).	3	25	CDFW, Mendocino County, NMFS, Sonoma County	
RR-CCCh-25.2.1.7	Action Step	Water Diversion/ Impoundment	Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.	3	5	CDFW, NMFS, SWRCB	
RR-CCCh-25.2.1.8	Action Step	Water Diversion/ Impoundment	Evaluate requests for on-stream dams above migratory reaches for effects on the natural hydrograph and spawning gravel recruitment downstream (CDFG 2004).	3	100	CDFW, NMFS, SWRCB	
RR-CCCh-25.2.1.9	Action Step	Water Diversion/ Impoundment	Improve compliance with existing water resource regulations via monitoring and enforcement.	3	100	CDFW, CDFW Law Enforcement, Mendocino County, NMFS, NMFS OLE, Sonoma County	
RR-CCCh-25.2.1.10	Action Step	Water Diversion/ Impoundment	Improve coordination between agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of salmon and their habitats, and avoidance of adverse impacts caused by water diversion (CDFG 2004).	3	5	CDFW, MCRRFCD, NMFS, Private Landowners, Public, Sonoma County Water Agency, SWRCB	
RR-CCCh-25.2.1.11	Action Step	Water Diversion/ Impoundment	Support the Development and implementation of groundwater use regulations.	3	25	CDFW, Mendocino County, NMFS, Sonoma County, SWRCB	

CC Chinook Salmon ESU Rapid Assessment Profile: Central Coastal Diversity Stratum Populations

Navarro River

- Role within ESU: Functionally Independent Population
- Spawner Abundance Target: 787-1,576 adults
- Current Intrinsic Potential: 131.5 IP-km

Gualala River

- Role within DPS: Independent Population
- Spawner Abundance Target: 1,052-2,105 adults
- Current Intrinsic Potential: 175.6 IP-km

For information regarding NC steelhead and CCC coho salmon for this watershed, please see the NC steelhead volume of this recovery plan and the CCC coho salmon recovery plan (http://www.westcoast.fisheries.noaa.gov/).

Abundance and Distribution

The status of Chinook salmon in the Navarro and Gualala Rivers and populations that make up the Central Coastal diversity stratum are highly uncertain (Spence *et al*. 2008). The only known observation of Chinook salmon in the Navarro was made by a CDFW biologist during carcass surveys on the North Fork Navarro where one adult fish was found (S. Harris, CDFW personal communication, as cited in Spence *et al.* 2008). There are no recent accounts of Chinook salmon in the Gualala River (Spence *et al*. 2008).

History of Land Use, Land Management and Current Resources

Navarro River

The present-day Navarro River watershed is in multiple land use with timber harvest, agriculture (largely vineyards), and grazing as the principal uses. Historically, timber harvest was the primary land use, with harvest activities beginning in the mid-1800s and a second logging boom occurring from the 1930s to the early 1950s. Industrial and private timberlands have been harvested consistently since the 1950s, with a spike from the late 1980s to about 1998. Agricultural and grazing development began as early as the 1850s in Anderson Valley, with apple production and sheep grazing in the watershed. Italian immigrants built the first commercial winery in the valley during the early 1910s, but viticulture did not expand until the late 1970s. Current wine grape production in the Anderson Valley has increased to approximately 3,000 acres, or about 2

percent of the watershed area (NMFS GIS, CDFF FRAP GIS). The current population is approximately 3,500 people, which is largely centered around the town of Boonville in Anderson Valley. Highway 128 spans the length of the watershed, eventually meeting Highway 1 at the Navarro River estuary.

Past timber harvest, agricultural, and grazing impacts have resulted in the establishment of a TMDL for impaired temperature and sediment conditions by the EPA in 2000. Water diversion is an issue in this basin due to agricultural diversions; the CSWRCB (1998) concluded the Navarro be listed as fully appropriated between April 1 and December 14. The SWRCB DWR subsequently formally recognized the Navarro as fully allocated during the summer.

The Navarro River watershed is predominately in private ownership, with forestland as the major land use (70 percent of watershed area). Rangeland makes up 25 percent of the current land use, agriculture about 2 percent, and a small percentage in rural residential development. There are also state parks, which include Hendy Woods, Paul M. Demmick, and Navarro River Redwoods State Park. The Navarro River Redwoods State Park stretches along an 11-mile corridor of the mainstem Navarro River from the North Fork to the estuary.

The Anderson Valley Land Trust, Mendocino County Water Agency, and the California State Coastal Conservancy jointly sponsored a Navarro Watershed Restoration Plan, focusing on restoration opportunities related to sediment and temperature, and their impacts on salmonid species in the watershed.

Gualala River

The first documented accounts of logging of old growth redwoods date back to 1862 in lower portions of the watershed (Klamt *et al.* 2003). By 1965, aerial photos of the watershed show large areas denuded of trees and scarred by roads and skid trails. Logging and clearing of dense conifer and woodland areas was frequently followed by prolonged cattle grazing. Following slowed periods of logging in the 1970 and 1980, timber harvest activity again increased in the 1990s. During the 1990s, smaller but numerous clear-cut blocks appeared in the redwood lowland areas under Gualala Redwoods, Inc. ownership (Klamt *et al.* 2003). There is also a history of instream gravel mining that has been conducted in the South and Wheatfield Forks of the Gualala River.

Currently, greater than 99 percent of the Gualala River watershed is privately owned. Of that, approximately 34 percent is owned by four timber companies: The Conservation Fund, Gualala Redwoods, Soper Wheeler Company, and Mendocino Redwood Company. Over the past 20 years, 54 percent of the watershed has been under a Timber Harvest Plan. As such timber production remains the primary land use in the Gualala River watershed today, along with

grazing and rural residential development (USEPA 2001). Vineyards are also present within the watershed, and more recently, large forestland-to-vineyard land conversions have been proposed. Instream gravel mining is also conducted in the watershed.

A TMDL aimed at addressing sediment impairments, water temperatures, and water quality was developed by the USEPA in 2001 and adopted by the North Coast Regional Water Quality Control Board in 2004. Other stakeholders within the watershed include the Gualala River Watershed Council and Friends of the Gualala River, who are both very active in grassroots watershed protection. These grass-root groups are successful in working with landowners in reducing excessive fine sediment into adjacent waterways, placing LWD instreams, and conducting natural resource-type research in many areas of the Gualala River watershed. In 2003, the North Coast Watershed Assessment Program completed the Gualala River Watershed Assessment. The following pertinent documents are available for the Gualala River watershed:

- Draft North Fork Gualala River Reconnaissance Assessment and Study Plan (Stillwater Sciences 2012);
- Gualala Estuary and Lower River Enhancement Plan: Results of 2002 and 2003 Physical and Biological Surveys (ECORP and Kamman Hydrology & Engineering 2005);
- North Coast Watershed Assessment Program (Bleier *et al.* 2003);
- Gualala River Watershed Technical Support Document For Sediment (CRWQCB 2001) ;
- Gualala River Total Maximum Daily Load (USEPA, 2001); and
- Preservation Ranch Limiting Factors Analysis. Final Report (Stillwater Sciences 2008).

Diversity Stratum Population and Habitat Conditions

Poor Conditions are current impairments resulting directly or indirectly from human activities, and are expected to continue until restored and/or the threat acting on the condition is abated. The majority of conditions evaluated for the two watersheds rated as Good or Fair for most lifestages. Overall, the Navarro and Gualala watersheds are subject to fewer stresses than many other watersheds.

The following discussion focuses on those conditions that rate as Poor or Fair for the Chinook salmon life history stages (see "Central Coastal Diversity Stratum" Rapid Assessment). These were: Estuary: Quality & Extent; Hydrology: Redd Scour; Habitat Complexity: Percent Primary Pools and Pool/Riffle Ratios; Habitat Complexity: Large Wood and Shelter; Sediment: Gravel Quality and Distribution of Spawning Gravels and Viability: Density, Abundance & Spatial Structure. Recovery strategies will focus on improving these conditions as well as those needed to ensure population viability and functioning watershed processes.

Estuary: Quality and Extent

Estuary conditions are rated as Fair for adults, due in large part to the altered conditions of the estuary and generally unsuitable summer rearing conditions due to poor water quality.

Navarro

The Navarro river estuary is impaired due to poor water quality. The reduction in poor water quality is likely caused from reduced freshwater inflow to the estuary/lagoon in the summer and fall months. Cannata (1998) reports that maintaining adequate freshwater inflow to the lagoon is a critical component in maintaining water quality within the Navarro River estuary. The USEPA (1999) reports data records from the Division of Water Rights (DWR) that show permitted summer diversions from the Navarro mainstem are approximately 9.0 cubic feet per second. Given the analysis of Jackson (1991) illustrating a trend of lower summer flows on the mainstem just above the estuary, it appears that water diversions occurring in throughout the basin are reducing the quality of habitat in the estuary. During drier water years this impact is much more evident than in water years with higher runoff.

Gualala

How much of the historic extent of the estuary has been lost or filled due to excessive sediments loads resulting from past and current logging and agricultural activities is unclear. Designing and implementing habitat complexity features (*e.g.*, LWD, boulder, *etc.*) that encourage deeper pools and provide shelter may significantly improve the estuary.

Hydrology: Redd Scour

Redd scour was rated as Fair and has moderate effects to all lifestages, primarily due to impaired instream sediment conditions from ongoing timber and agricultural activities in these watersheds.

Habitat Complexity: Percent Primary/Staging Pools & Pool/Riffle/Flatwater Ratios

This condition was rated as Fair for adults, pre-smolts and smolts primarily due to impaired sediment conditions from ongoing timber and agricultural activities in these watersheds.

Habitat Complexity: Large Wood and Shelter

Lack of habitat complexity in the form of wood and high levels of instream sediment resulted in a Fair rating and is having a moderate adverse effect on the adult, pre-smolt and smolt lifestages. Lack of instream complexity is likely the result of long term land uses related to timber harvest, agriculture and vineyard development in the two watersheds, particularly impacts associated with mechanized logging practices prior to the California Forest Practice Rules and removal of wood during the 1960s-1980s.

Navarro

Data from CDFW habitat inventories indicate shelter ratings throughout the Navarro River watershed are poor within 90 percent of all sampled reaches. Poor to Fair LWD ratings were also documented during habitat surveys, which are due largely to a lack of functional riparian corridors and poor recruitment of large conifer species from adjacent upslope areas. The general lack of wood within the Navarro River watershed is from timber harvesting, and stream cleaning efforts that occurred in the 1970s through the 1980s. The multiple timber harvesting regimes since the 1850s have shifted forest size, and to some extent the composition, of riparian forest from historical conifer/redwood stands characteristic of late seral forests to smaller conifer and hardwood dominated stands that have been maintained due to the Forest Practices Act of 1973. This shift in forest-type has resulted in lower wood volumes available for recruitment into the streams. Reduced shelter ratings across the basin reduce habitat suitability for juvenile rearing during critical low-flow summer periods and high-flow conditions in the winter.

Gualala

CDFW habitat surveys conducted in 2002 and 2004 indicated lacking pool shelter, habitat complexity, and less than desirable riffle/pool/flatwater ratios in many tributaries. Habitat complexity has been lost in many streams due to poor abundance of channel forming features (*e.g.,* LWD, boulders, *etc*.), channel simplification, and sediment aggradation, which are all associated with past logging and wood harvest activities. In addition, riparian zones degraded by past logging have severely limited the natural recruitment of LWD in many historically productive streams within watershed, limiting the quality of juvenile rearing habitat in many areas of the watershed. Gualala Redwoods, Inc. and their partners have embarked on many instream large wood placement projects, which have improved habitat complexity in some areas. However, many other stream reaches will require similar supplementation of LWD, boulders and other channel forming features to encourage more desirable pool/riffle ratios (including primary pools) and increase pool shelter ratings. Rehabilitating these streams will greatly improve the quality of available spawning and seasonal rearing habitat potential for Chinook.

Sediment: Gravel Quality and Distribution of Spawning Gravels

Gravel quality was rated as Fair for the egg lifestage due to lack of wood and impaired gravel quality.

Viability: Density, Abundance and Spatial Structure

Viability: Density, Abundance and Spatial Structure is rated as Poor. Chinook populations are believed to be extirpated in both watersheds.

Threats

The following discussion focuses on those threats that rate as Fair (see "Central Coastal Diversity Stratum" Rapid Assessment). Recovery strategies focus on ameliorating primary threats; however, some strategies may address other threat categories when the strategy is essential to recovery efforts. The figures and tables that display data used in this analysis are provided in "Central Coastal Diversity Stratum" Rapid Assessment.

Logging and Wood Harvesting

Logging and Wood Harvesting was rated as a low future threat. However, early logging activities left a legacy of impacts, some of which persist today (Klamt *et al.* 2003). Splash dams and log drives tended to flatten and simplify stream channels. Watercourses were frequently used as skid paths to move logs downslope including the use of splash dams (Klamt *et al.* 2003). More recent data (CRWQCB 2001) showed that timber harvest rates between 1991 and 2001 were Very High (>30-percent of a watershed area in less than 10-years) in some areas of the Gualala River watershed. Other reports indicate that 50 percent of the combined area of Annapolis, Little and Grasshopper creeks was disturbed by timber harvest between 1991 and 2008 (Higgins 2009). Past and present impacts associated with logging include: reduced canopy cover resulting in increased stream water temperatures, increased sediment load into adjacent waterways impairing gravel quality in downstream reaches, and significant loss of LWD recruitment, which is an essential component of habitat complexity, form and function. Although logging has improved compared to historical practices, habitat degradation from past logging and potential impacts associated with future logging will continue to threaten the recovery of Chinook and their habitat.

Severe Weather Patterns

This threat is rated as Good or Fair to ten conditions. Because of the potential for severe weather to affect flows, it is rated as Poor and considered a major threat to Hydrology: Baseflow and Passage Flows. The impacts of a severe drought (in conjunction with ongoing diversions in the Albion River of surface flows) could adversely affect the summer rearing lifestage of Chinook in the watershed, particularly during the summer months.

Water Diversion and Impoundments

Navarro River

The vast majority of water diversions and impoundments in this basin are associated with the relatively (1980s) recent increase in viticulture in the Anderson Valley and other non-timber areas of the basin. Agriculture is focused mainly within the southern portion of the basin, affecting the mainstem Navarro River and smaller mainstem tributaries, as well as Indian, Anderson, and Rancheria creeks. Water diversions supporting viticulture and rural residential homes in these

areas reduce summer baseflows, disconnecting aquatic habitat and elevating instream temperatures (USEPA 2000). Many stream reaches in the Anderson Valley have reportedly gone dry with increasing frequency. As stated earlier, the Navarro River watershed has been listed as fully appropriated during the summer months. Therefore, any future diversions will likely be illegal if conducted in the summer months, and, as a result, any additional water diversions are expected to be sought during the winter and spring months. However, uncoordinated diversion practices designed to limit frost damage may increase stranding potential in some tributaries. In addition, rearing habitat in the estuary/lagoon will likely be further impaired, as rural residential and illegal summer diversions withdraw in excess of the estimated 9 cfs currently diverted.

Gualala River

Currently, there are no large long standing dams within the Gualala River watershed. Based on existing water rights, land use data, and observations reported by CDFW during instream field surveys conducted in 2001, water diversions within the watershed do not appear to significantly affect streamflows. However, most active diversions within the watershed are not monitored and the resulting impacts on streamflow have not been evaluated or recorded (Klamt *et al.* 2003). DeHaven (2008; 2010) reported severe dewatering in some years within the Wheatfield Fork sub-basin and near its confluence with the SF Gualala River. It is likely that current low-flow constraints in the Gualala River will prohibit future California State Water Resources Control Board appropriative water allocations; however, higher use of current water rights allocated to Sea Ranch and the North Gualala Water Company are expected in the future (NCWAP 2003). The North Fork Gualala River has been identified as an important source of baseflow to the lower Gualala River and estuary during late season periods (ECORP and Kamman Hydrology & Engineering 2005).

The current quality and extent of the estuary for seasonal (March 15 to November 15) juvenile Chinook rearing is controlled by hydrologic and water quality characteristics. Increases in water diversions have the potential to not only adversely affect the timing, but also reduce the magnitude of freshwater flow entering the estuary and thus having a significant impact on the health and ecology in the estuary. Therefore, further reductions in flow during the spring and summer, caused by water diversions and impoundments, pose a significant threat for not only salmonids rearing in sub-basins within the watershed (Klamt 2003), but also for juvenile rearing within the estuary (ECORP and Kamman Hydrology & Engineering 2005).

Fishing and Collecting

Current low flow regulations are based on the Russian River Hacienda stream gage. Unlike the Gualala and Navarro Rivers, the Russian River has two large reservoirs that regulate streamflows, and is operated for flood control during the wet months. These regulated operations often slow

descending hydrologic conditions, resulting in higher prolonged and sustained streamflows. These conditions do not accurately reflect unregulated hydrologic conditions of the Gualala and Navarro River. Adopting a more appropriate low flow fishing closure that protects all salmonids and better reflects hydrologic conditions in theses watersheds is needed.

Limiting Conditions, Lifestages, and Habitats

Each lifestage for Chinook is being limited by current conditions and future threats. The greatest threats appear to be future residential and commercial development, roads, severe weather and water diversions associated with agricultural, development and vineyard activities.

General Recovery Strategy

In general, recovery strategies focus on improving conditions and ameliorating conditions and threats identified rate as Poor or Fair, as discussed above, although strategies that address other factors may also be developed where their implementation is critical to restoring properly functioning habitat conditions within the watershed. The general recovery strategies for the populations in these watersheds are discussed below.

Improve Canopy Cover and LWD Volume

These watersheds would benefit from improved riparian composition and structure, which would increase stream shading, improve LWD recruitment, and increase instream shelter for juvenile fish. General practices to improve riparian condition include increasing the number of riparian conservation easements, reducing timber harvest in riparian areas, increased riparian planting, and installing livestock exclusion fencing where appropriate.

Address Upslope Sediment Sources

Roads supporting timber harvest, ranching, and to a lesser extent agriculture, exist throughout the basin. Many of these roads need to be upgraded to reduce fine sediment delivery into streams. Problem roads and active erosion sites should be prioritized and addressed as part of comprehensive sediment reduction plans at the subbasin level. Agricultural operations need to practice BMPs that minimize soil disturbance and sediment delivery to stream channels.

Increase Instream Shelter Ratings and Pool Volume

Shelter ratings are Low for many stream reaches in these watersheds. Where applicable, restoration efforts should incorporate instream wood/boulder structures, and/or implement large conifer recruitment (fall trees) into degraded reaches to improve shelter and overall habitat complexity.

Address Water Diversion and Groundwater Extraction

Low summer streamflow has been observed. Reduced flow conditions, and resulting disconnected flow conditions (dry stream channels), appear to be the result of water diversions and groundwater pumping. Federal, state and local government representatives should work with landowners to implement creative solutions that minimize these effects; these solutions should examine conservation methods, water management planning, and water storage and recharge solutions.

Establish a Population of Chinook Salmon

Since there is no Chinook salmon population that exists in the Navarro or Gualala Rivers, biologists should investigate developing a plan to develop a population. A Chinook salmon population restoration plan is needed to determine the steps that would be required to establish a population in these watersheds. This may include the selection of other Central Coast populations that are available and appropriate for use in rebuilding an in population. Several subwatersheds have the potential to provide high quality for Chinook salmon reestablishment. For the Navarro the areas for consideration could include the mainstem Navarro River, North Fork Navarro River, and Rancheria Creek. For the Gualala, the areas for consideration could include mainsteam Gualala, North and South Forks and Rockpile.

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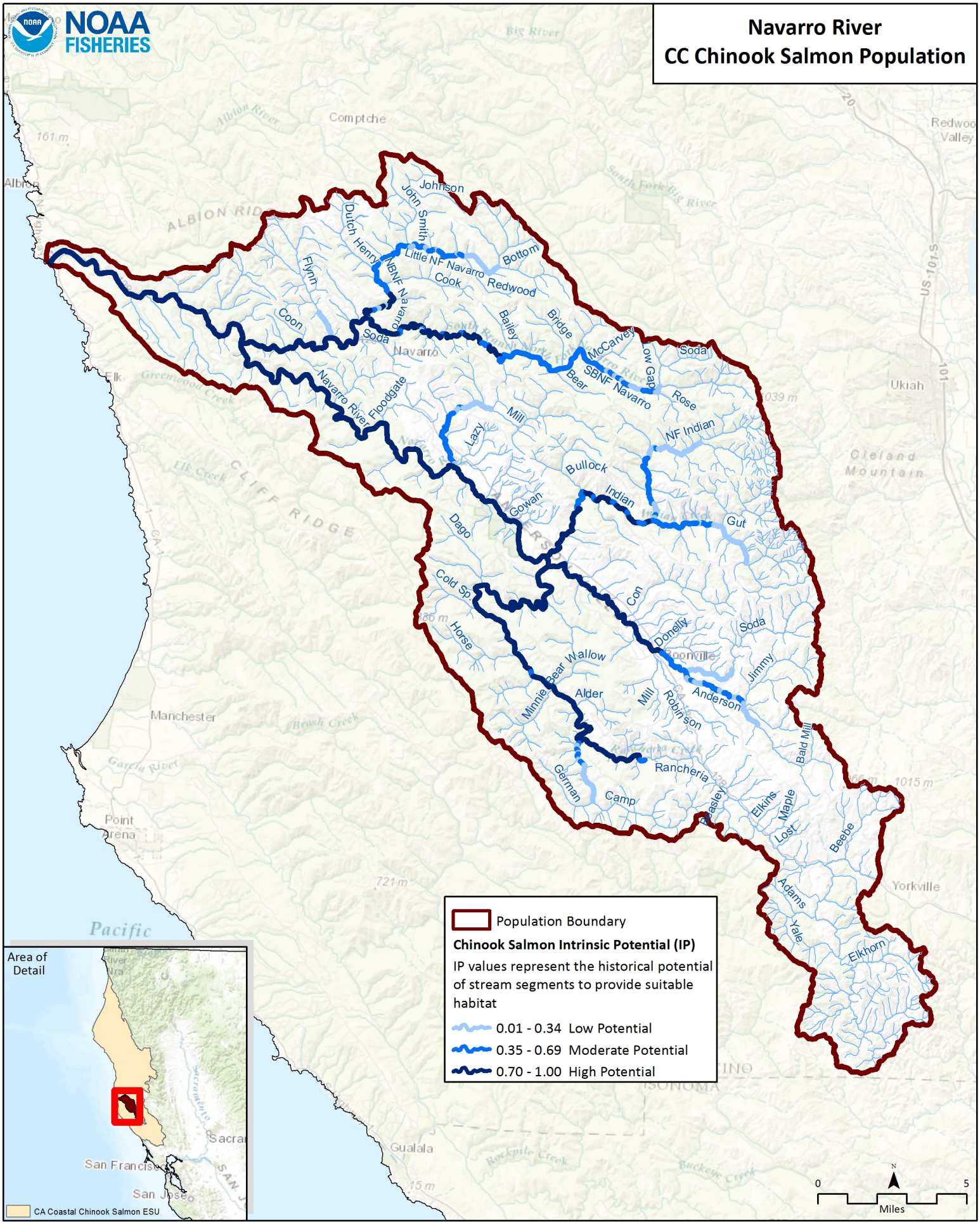
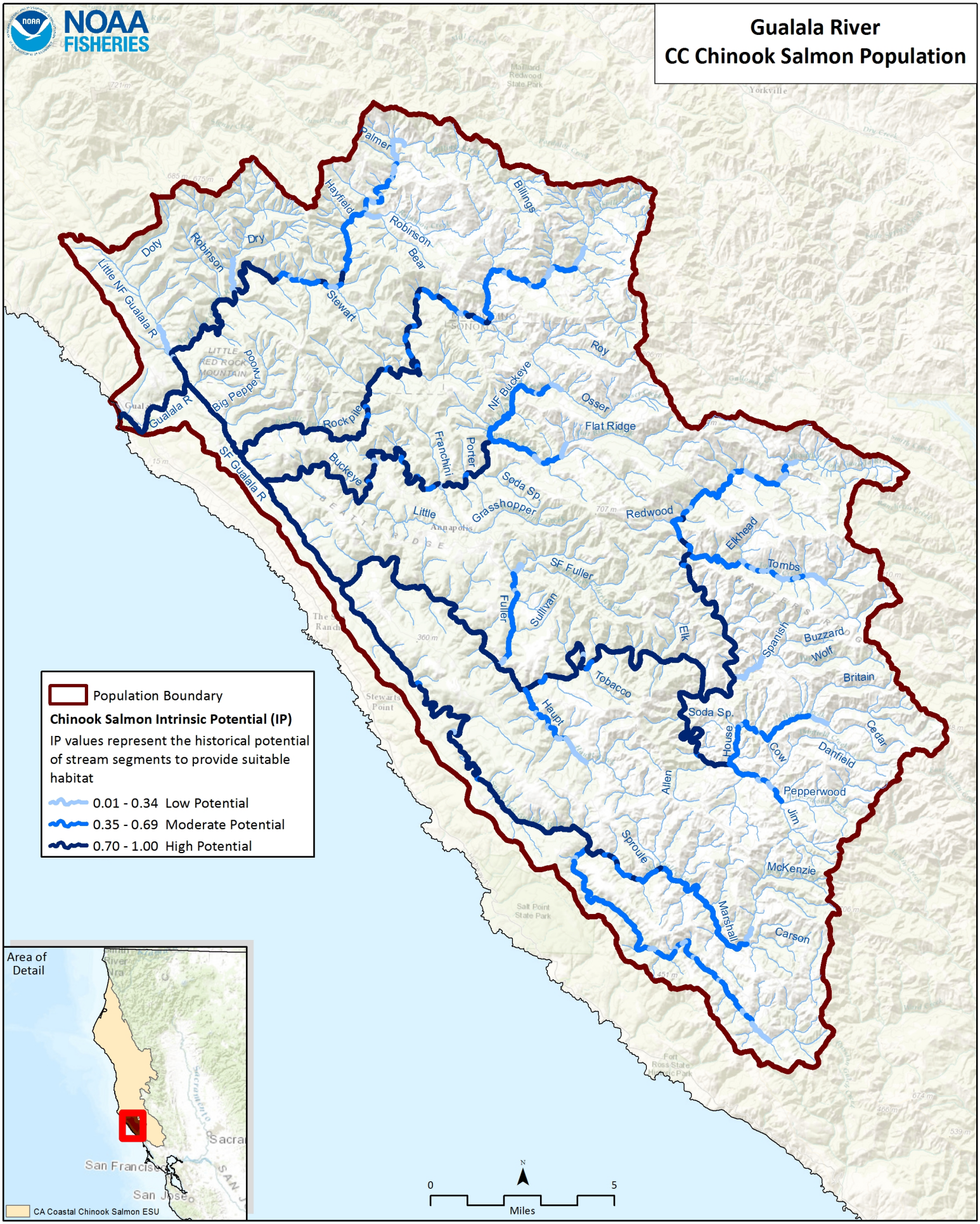

NOAA FISHERIES
Navarro River
CC Chinook Salmon Population
Comptche
Albion River
Big River
Redwood Valley
Ukiah
Elk
Manchester
Point Arena
Pacific
Gualala
Yorkville
Oleland Mountain
CLIFF RIDGE
ALBION RIDGE
Johnson
John Smith
Dutch Henry
Flynn
Little NF Navarro
NBNF Navarro
Bottom
Cook
Redwood
Coon
Soda
Navarro
Bailey
Bridge
McCarvey
Low Gap
Soda
Bear
SBNF Navarro
Rose
Navarro River
Floodgate
Mill
Lazy
NF Indian
Bullock
Indian
Gowan
Gut
Dago
Cold Sp.
Con
Horse
Donelly
Soda
Boonville
Wallow
Jimmy
Minnie
Bear
Alder
Mill
Robinson
Anderson
Bald Mill
Rancheria
German
Camp
Greasley
Elkins
Maple
Lost
Beebe
Adams
Yale
Elkhorn
Area of Detail
Sacra
San Francisco
San Jose
CA Coastal Chinook Salmon ESU
Population Boundary
Chinook Salmon Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
0
5
Miles
N


NOAA FISHERIES
Gualala River
CC Chinook Salmon Population
Palmer
Hayfield
Billings
Robinson
Bear
Doty
Robinson
Dry
Little NF Gualala R
Stewart
Roy
NF Buckeye
Osser
Flat Ridge
Rockpile
Big Pepper
Gualala R
SF Gualala R
Buckeye
Franchini
Porter
Soda Sp.
Grasshopper
Little
Redwood
Elkhead
Tombs
SF Fuller
Fuller
Sullivan
Elk
Spanish
Buzzard
Wolf
Britain
Tobacco
Haupt
Soda Sp.
House
Cow
Cedar
Danfield
Allen
Pepperwood
Jim
Sproule
McKenzie
Marshall
Carson
Population Boundary
Chinook Salmon Intrinsic Potential (IP)
IP values represent the historical potential of stream segments to provide suitable habitat
0.01 - 0.34 Low Potential
0.35 - 0.69 Moderate Potential
0.70 - 1.00 High Potential
Area of Detail
CA Coastal Chinook Salmon ESU
N
0
5
Miles

CC Chinook Salmon ESU: Central Coastal Diversity Stratum (Navarro/Gualala)						
Habitat & Population Condition Scores By Life Stage: **VG = Very Good** **G = Good** **F = Fair** **P = Poor**		**Chinook Salmon Life History Stages**				
		Adults	**Eggs**	**Pre-Smolt**	**Smolts**	
Stresses: Key Attribute: Indicators	**Estuary: Quality & Extent**	**F**		**G**	**G**	
	Velocity Refuge: Floodplain Connectivity	**VG**		**G**	**G**	
	Hydrology: Redd Scour		**F**			
	Hydrology: Baseflow & Passage Flows	**G**	**G**	**G**	**G**	
	Passage/Migration: Mouth or Confluence & Physical Barriers	**VG**		**VG**	**VG**	
	Habitat Complexity: Percent Primary/Staging Pools & Pool/Riffle/Flatwater Ratios	**F**		**F**	**F**	
	Habitat Complexity: Large Wood & Shelter	**F**		**F**	**F**	
	Sediment: Gravel Quality & Distribution of Spawning Gravels	**G**	**F**	**G**	**G**	
	Viability: Density, Abundance & Spatial Structure	**P**		**P**	**P**	
	Water Quality: Turbidity & Toxicity	**G**		**G**	**G**	

CC Chinook Salmon ESU: Central Coastal Diversity Stratum (Navarro/Gualala)											
Threat Scores **L: Low** **M: Medium** **H: High**		**Stresses**									
		Estuary: Impaired Quality & Extent	Floodplain Connectivity: Impaired Quality & Extent	Hydrology: Gravel Scouring Events	Hydrology: Impaired Water Flow	Impaired Passage & Migration	Instream Habitat Complexity: Altered Pool Frequency and/or Pool/Riffle Ratios	Instream Habitat Complexity: Reduced Large Wood and/or Shelter	Instream Substrate/Food Productivity: Impaired Gravel Quality & Quantity	Reduced Density, Abundance & Diversity	Water Quality: Increased Turbidity or Toxicity
Threats - Sources of Stress	**Agriculture**	L	L	L		L	L	L	L		L
	Channel Modification	L	L	L	L	L	L	L	L		L
	Disease, Predation, and Competition	L	L			L	L	L		L	L
	Fire, Fuel Management, and Fire Suppression	L	L	L		L	L	L	L		L
	Livestock Farming and Ranching	L	L	L		L	L	L	L		L
	Logging and Wood Harvesting	L	L	L		L	L	L	L		L
	Mining	L	L	L		L	L	L	L		L
	Recreational Areas and Activities	L	L	L		L	L	L	L		L
	Residential and Commercial Development	L	L	L	L	L	L	L	M		L
	Roads and Railroads	L	L	L	L	L	L	L	M		L
	Severe Weather Patterns	L	L	M	L	L	L	L	L		L
	Water Diversions and Impoundments	M	L	L	L	L	L	L	L	M	L
	Fishing and Collecting									M	
	Hatcheries and Aquaculture									L	L

Navarro River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
NavR-CCCh-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
NavR-CCCh-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity				
NavR-CCCh-2.1.1.1	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas, and develop and implement restoration action plans.	3	5	CDFW, Private Consultants, Private Landowners	
NavR-CCCh-2.1.1.2	Action Step	Floodplain Connectivity	Evaluate Highway 128 and associated crossings with focus on the segment from the North Fork Navarro Bridge to Barton Gulch. Modify crossing to provide access to historical floodplain habitats based on the evalation.	1	1	CalTrans, CDFW, NOAA RC	
NavR-CCCh-3.1	**Objective**	**Hydrology**	**Address the inadequacy of existing regulatory mechanisms**				
NavR-CCCh-3.1.1	Recovery Action	Hydrology	Improve flow conditions				
NavR-CCCh-3.1.1.1	Action Step	Hydrology	Monitor, identify problems, and prioritize need for changes to water diversion on current or potential Chinook salmon streams.	3	20	CDFW, NMFS, SWRCB	
NavR-CCCh-3.1.1.2	Action Step	Hydrology	Assess and map water diversions (CDFG 2004).	2	5	Private Consultants, Private Landowners, SWRCB	
NavR-CCCh-3.1.1.3	Action Step	Hydrology	Implement Best Management Practices (BMP's) for agriculture land use within Mendocino County (CDFG 2004).	3	100	CDFW, Mendocino County, NMFS, NOAA RC, Private Consultants, Private Landowners, RWQCB	
NavR-CCCh-3.1.1.4	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	2	20	CDFW, Mendocino County, NMFS, NOAA RC, Private Consultants, Private Landowners, SWRCB	
NavR-CCCh-3.1.1.5	Action Step	Hydrology	Require streamflow gauging devices to determine the level of impairment to natural flow. Focus initial efforts on Mill Creek, Flynn Creek, and North Fork Navarro.	3	5	Private Landowners, SWRCB, USGS	
NavR-CCCh-3.1.1.6	Action Step	Hydrology	Work with SWRCB and landowners to restore and maintain the natural hydrograph between March 1 and May 15 to minimize impacts to salmonid fry due to stranding by implementing alternative frost protection strategies.	1	5	Farm Bureau, NMFS, NMFS OLE, Private Landowners	
NavR-CCCh-3.1.1.7	Action Step	Hydrology	Support SWRCB in regulating the use of streamside wells and groundwater.	2	5	CDFW, , NOAA RC, Private Landowners, RCD, SWRCB	
NavR-CCCh-3.1.1.8	Action Step	Hydrology	Provide incentives to water rights holders willing to convert some or all of their water rights to instream use via petition change of use and §1707 (CDFG 2004).	1	20	CDFW, NOAA RC, Private Landowners, RCD, SWRCB	
NavR-CCCh-3.1.1.9	Action Step	Hydrology	Support a water conservation program for rural residential water users within the Navarro River watershed.	3	50	CDFW, NOAA RC, Private Landowners, RCD, SWRCB	
NavR-CCCh-3.1.1.10	Action Step	Hydrology	Improve compliance with existing water resource regulations via monitoring and enforcement.	3	25	CDFW, NMFS SWRCB	
NavR-CCCh-3.1.1.11	Action Step	Hydrology	Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed managers.	3	60	CDFW, NMFS, SWRCB	
NavR-CCCh-3.1.2	Recovery Action	Hydrology	Improve passage flows				
NavR-CCCh-3.1.2.1	Action Step	Hydrology	Develop BMP's (such as off-channel storage) for landowners conducting water diversion actions.	1	20	NMFS, NRCS, Private Landowners, SWRCB	
NavR-CCCh-3.1.2.2	Action Step	Hydrology	Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.	2	10	CDFW, NMFS, Private Landowners, SWRCB	
NavR-CCCh-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
NavR-CCCh-6.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency				
NavR-CCCh-6.1.1.1	Action Step	Habitat Complexity	Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (CDFG 2004). Focus on tributaries of Flynn Creek, North Fork Navarro, South Branch Navarro, and Mill Creek.	1	10	CDFW, NOAA RC, NRCS, Private Landowners	
NavR-CCCh-6.1.1.2	Action Step	Habitat Complexity	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	3	20	CDFW, NOAA RC, NRCS, Private Landowners	
NavR-CCCh-6.1.1.3	Action Step	Habitat Complexity	Maintain current LWD, boulders, and other structure providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004). Maintain large debris accumulations along Highway 128 on the North Fork Navarro.	2	50	CDFW, NOAA RC, NRCS, Private Landowners	
NavR-CCCh-6.1.2	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD and shelters				

Navarro River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
NavR-CCCh-6.1.2.1	Action Step	Habitat Complexity	Identify historic Chinook salmon habitats lacking in channel complexity, and promote restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover.	2	10	Campbell Timberland Management, CDFW, Private Landowners	
NavR-CCCh-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
NavR-CCCh-8.1.1	Recovery Action	Sediment	Improve instream gravel quality				
NavR-CCCh-8.1.1.1	Action Step	Sediment	Address high and medium priority sediment delivery sites as identified by the Mendocino RCD, Mendocino Redwoods Company, or other credible assessments.	1	20	CDFW, Mendocino Redwood Company, Private Landowners, RCD	
NavR-CCCh-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
NavR-CCCh-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity				
NavR-CCCh-11.1.1.1	Action Step	Viability	Measure or estimate the condition of key habitat attributes across the watershed.	2	10	CDFW	
NavR-CCCh-11.1.1.2	Action Step	Viability	Conduct monitoring activities to determine the population status of adult and smolt salmonids in major subbasins of the Navarro River.	2	60	CDFW, Mendocino Redwood Company, NOAA SWFSC, Private Landowners	
NavR-CCCh-11.1.1.3	Action Step	Viability	Identify how a conservation hatchery/supplementation/ augmentation program will complement the overall recovery effort.	2	20	NOAA RC, NOAA SWFSC, NOAA/NMFS	
NavR-CCCh-11.1.1.4	Action Step	Viability	If determined necessary, identify an out-of-basin or subwatershed source population that could be used to start a population augmentation/supplementation/broodstock program.	3	30	NOAA RC, NOAA SWFSC, NOAA/NMFS	
NavR-CCCh-12.1	**Objective**	**Agriculture**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
NavR-CCCh-12.1.1	Recovery Action	Agriculture	Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)				
NavR-CCCh-12.1.1.1	Action Step	Agriculture	Develop a Road Sediment Reduction Plan for agricultural lands that prioritizes problem sites and outlines implementation and a timeline of necessary actions.	2	10	Private Consultants, Private Landowners	
NavR-CCCh-12.1.1.2	Action Step	Agriculture	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	2	10	Board of Forestry, CDFW, Farm Bureau, NMFS, Private Landowners	
NavR-CCCh-12.1.1.3	Action Step	Agriculture	Work with landowners to assess the effectiveness of erosion control measures throughout the winter period.	2	10	Farm Bureau, NMFS, Private Consultants, Private Landowners	
NavR-CCCh-12.1.1.4	Action Step	Agriculture	Continue implementation of the NRCS/RCD coordinated permit program for fishery restoration practices.	2	30	CDFW, NMFS, State	
NavR-CCCh-12.1.2	Recovery Action	Agriculture	Prevent or minimize increased landscape disturbance				
NavR-CCCh-12.1.2.1	Action Step	Agriculture	Improve education and awareness of agencies, landowners and the public regarding salmonid protection and habitat requirements.	3	25	CDFW, Farm Bureau, NRCS, RCD	
NavR-CCCh-12.1.2.2	Action Step	Agriculture	Work within the agricultural community to educate landowners and enhance practices that provide for functional watershed processes.	3	3	Farm Bureau, NRCS, RCD	
NavR-CCCh-12.1.2.3	Action Step	Agriculture	Provide technical and staff support to counties to encourage general plan updates that include measures to protect salmonids.	3	25	CDFW, Counties, NMFS, NRCS, RCD	
NavR-CCCh-12.1.3	Recovery Action	Agriculture	Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)				
NavR-CCCh-12.1.3.1	Action Step	Agriculture	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	3	20	CDFW, Mendocino County, NMFS, NOAA RC, NRCS, Private Consultants, RCD	
NavR-CCCh-12.1.4	Recovery Action	Agriculture	Prevent or minimize alterations to riparian species composition and structure				
NavR-CCCh-12.1.4.1	Action Step	Agriculture	Maintain and enhance existing natural vegetation types within the Navarro watershed.	3	20	CDFW, Mendocino County, NMFS, NOAA RC, NRCS, Private Consultants, Private Landowners, RCD	
NavR-CCCh-12.2	**Objective**	**Agriculture**	**Address the inadequacy of existing regulatory mechanisms**				
NavR-CCCh-12.2.1	Recovery Action	Agriculture	Prevent or minimize increased landscape disturbance				
NavR-CCCh-12.2.1.1	Action Step	Agriculture	Coordinate with the agencies to minimize conversion of range and forestland in key watersheds.	2	50	CDFW, Counties, NMFS, NRCS	

Navarro River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
NavR-CCCh-12.2.1.2	Action Step	Agriculture	Work with the State and Mendocino County to impose a moratorium on conversion of open space, rangeland, or TPZ to vineyards or other agricultural uses that impact salmonids until a grading ordinance and land conversion ordinance are in place.	1	60	Farm Bureau, Private Consultants, Private Landowners	
NavR-CCCh-12.2.1.3	Action Step	Agriculture	Implement the NRCS/RCD coordinated permit program for fishery restoration practices.	2	40	CDFW, Farm Bureau, NMFS, Private Landowners	
NavR-CCCh-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
NavR-CCCh-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)				
NavR-CCCh-23.1.1.1	Action Step	Roads/Railroads	Restoration projects that upgrade or decommission high risk roads should be considered a high priority for funding (e.g., PCSRF).	1	10	CDFW, Mendocino County, Mendocino Redwood Company, NOAA RC, Private Landowners	
NavR-CCCh-23.1.1.2	Action Step	Roads/Railroads	For all rural (unpaved) and seasonal dirt roads apply best management practices for road construction maintenance management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	1	10	CDFW, Mendocino County Department of Public Works, Mendocino Redwood Company, NOAA RC, NRCS, Private Landowners, Public, RCD	
NavR-CCCh-23.1.1.3	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams.	1	5	CDFW, NOAA RC, Private Landowners, RCD	
NavR-CCCh-23.1.1.4	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	2	20	CDFW, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners, Public, RCD	
NavR-CCCh-23.1.1.5	Action Step	Roads/Railroads	Develop and implement a road management plan	2	5	CDFW, Mendocino County Department of Public Works, NRCS	
NavR-CCCh-23.1.1.6	Action Step	Roads/Railroads	Establish a moratorium on new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until road management plan is created and implemented.	2	2	CDFW, Mendocino County Department of Public Works, NRCS, Private Landowners, Public, RCD	
NavR-CCCh-23.1.1.7	Action Step	Roads/Railroads	Create and implement a management plan for new road construction within floodplains, riparian areas, unstable soils or other sensitive areas	2	5	CDFW, Mendocino County Department of Public Works, NRCS, Private Landowners, Public, RCD	
NavR-CCCh-23.1.1.8	Action Step	Roads/Railroads	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).	2	30	CDFW, Mendocino County Department of Public Works, Mendocino Redwood Company, NOAA RC, NRCS, Private Landowners, Public, RCD	
NavR-CCCh-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance				
NavR-CCCh-23.1.2.1	Action Step	Roads/Railroads	Continue education of Caltrans, County road engineers, and County maintenance staff regarding watershed processes and the adverse effects of improper road construction and maintenance on salmonids and their habitats.	3	60	CalFire, CDFW, Mendocino County, Private Landowners	
NavR-CCCh-23.1.2.2	Action Step	Roads/Railroads	Develop a Salmon Certification Program for road maintenance staff.	2	5	CDFW, , Mendocino County Department of Public Works, Mendocino Redwood Company, NOAA RC, Private Consultants, Private Landowners	
NavR-CCCh-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)				
NavR-CCCh-23.1.3.1	Action Step	Roads/Railroads	Develop a road database using standardized methods. The methods should document all roads features, apply erosion rates, and compile information into a GIS database.	3	5	NRCS, Private Landowners, Public, RCD	
NavR-CCCh-23.1.3.2	Action Step	Roads/Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.	2	100	CalFire, Mendocino Redwood Company, Private Landowners	
NavR-CCCh-23.1.4	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration				
NavR-CCCh-23.1.4.1	Action Step	Roads/Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and appropriate barrier databases when developing new or retrofitting existing road crossings.	2	10	CalTrans, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners	

Navarro River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
NavR-CCCh-23.1.4.2	Action Step	Roads/Railroads	Continue to refine, update, and maintain the California Fish Passage Assessment Database of barriers to fish passage.	2	10	California Coastal Conservancy, CDFW, Pacific States Marine Fisheries Commission, USFWS	
NavR-CCCh-23.2	**Objective**	**Roads/Railroads**	**Address the inadequacy of existing regulatory mechanisms**				
NavR-CCCh-23.2.1	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance				
NavR-CCCh-23.2.1.1	Action Step	Roads/Railroads	Expand the NRCS/RCD coordinated permit program to a statewide programmatic ESA consultation that gives technical expertise to small land owners and rural residential property owners.	2	20	CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, USACE	
NavR-CCCh-23.2.2	Recovery Action	Roads/Railroads	Prevent or minimize alterations to sediment transport (road condition/density, dams, etc.)				
NavR-CCCh-23.2.2.1	Action Step	Roads/Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a time line of necessary actions.	2	3	Mendocino Redwood Company, NRCS, Private Consultants, Private Landowners, RCD	
NavR-CCCh-24.1	**Objective**	**Severe Weather Patterns**	**Address the inadequacy of existing regulatory mechanisms**				
NavR-CCCh-24.1.1	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to watershed hydrology				
NavR-CCCh-24.1.1.1	Action Step	Severe Weather Patterns	If predicted flows are below a level considered critical to maintain viable rearing habitat for salmonids, measures to reduce water consumption should be initiated by municipal water suppliers and other users in the watershed through conservation programs.	2	60	Mendocino County, NOAA RC, Private Landowners, Public, SWRCB	
NavR-CCCh-24.1.1.2	Action Step	Severe Weather Patterns	Critical flow values should include minimum bypass flow requirements to support upstream adult migration during winter months and juvenile rearing in the summer and fall months.	2	60	CDFW, NMFS, NMFS OLE, Private Landowners, SWRCB	
NavR-CCCh-24.1.1.3	Action Step	Severe Weather Patterns	Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.	2	20	NOAA RC, Private Landowners, USACE	
NavR-CCCh-24.1.1.4	Action Step	Severe Weather Patterns	Implement mandatory water conservation measures during drought conditions. Each watershed/city should have a plan that establishes drought conservation measures and circumstances for implementation.	2	100	CDFW, NMFS, Private Landowners, SWRCB	
NavR-CCCh-24.1.1.5	Action Step	Severe Weather Patterns	Pursue opportunities to acquire or lease water, or acquire water rights from willing sellers, for salmonid recovery purposes. Develop incentives for water right holders to dedicate instream flows for the protection salmonids (Water Code § 1707).	3	40	CDFW, NMFS, SWRCB	
NavR-CCCh-24.1.2	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to instream substrate/food productivity (impaired gravel quality and quantity)				
NavR-CCCh-24.1.2.1	Action Step	Severe Weather Patterns	Protect high-risk shallow-seeded landslide areas and surfaces prone to erosion from being mobilized by intense storm events.	2	60	Board of Forestry, CalFire, CDFW, Mendocino County, Private Landowners	
NavR-CCCh-24.1.2.2	Action Step	Severe Weather Patterns	New development in all historic Chinook watersheds should meet a zero net increase in storm-water runoff, changes in duration, or magnitude of peak flow by following all BMPs and having retention systems	2	60	Counties, NMFS, RWQCB	
NavR-CCCh-24.1.2.3	Action Step	Severe Weather Patterns	Coordinate with county planners to eliminate or reduce new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all historic Chinook salmon watersheds.	2	50	Counties, NMFS, RWQCB	
NavR-CCCh-24.1.2.4	Action Step	Severe Weather Patterns	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	2	50	Counties, NMFS, Private Landowners, RWQCB	

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-1.1.1	Recovery Action	Estuary	Increase the physical extent of estuarine habitat				
GuR-CCCh-1.1.1.1	Action Step	Estuary	Investigate the extent of sedimentation within the estuary/lagoon associated with watershed legacy impacts (logging). Evaluate sediment transport within the estuary and determine if the estuary is "filling" with sediment or "flushing" sediment (recovering).	3	10	CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GuR-CCCh-1.1.1.2	Action Step	Estuary	Identify past mechanical fill sites (inside of Mill Bend) and develop strategies targeting the re-establishment of wetland marsh habitat (if feasible).	3	10	CDFW, NMFS, NOAA RC, NRCS, RCD	
GuR-CCCh-1.1.1.3	Action Step	Estuary	Develop and implement rehabilitation projects designed to increase the physical extent of high quality habitat for rearing juvenile salmonids within the Gualala River estuary.	3	10	CDFW, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners	
GuR-CCCh-1.1.1.4	Action Step	Estuary	Investigate the historical functions and ecology of the estuary	3	10	CDFW, Gualala Watershed Council	
GuR-CCCh-1.1.2	Recovery Action	Estuary	Increase and enhance estuarine habitat complexity features				
GuR-CCCh-1.1.2.1	Action Step	Estuary	Increase the percentage of area containing high value habitat complexity elements and features (SAV, LWD, boulders, marshes, vegetation, pools > 2 meters).	2	10	CDFW, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners	
GuR-CCCh-1.1.2.2	Action Step	Estuary	Identify strategic locations to install LWD structures designed to increased pool depth and habitat conditions within the Gualala River estuary.	2	10	CDFW, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners	
GuR-CCCh-1.1.3	Recovery Action	Estuary	Improve the quality of freshwater lagoon habitat				
GuR-CCCh-1.1.3.1	Action Step	Estuary	Install continuous water quality monitoring stations in the Gualala estuary during the summer months. Monitor at a minimum temperature, dissolved oxygen, and salinity.	2	5	CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, RCD, RWQCB	
GuR-CCCh-1.1.4	Recovery Action	Estuary	Improve freshwater inflow				
GuR-CCCh-1.1.4.1	Action Step	Estuary	Install a stream gauge immediately upstream of the estuary/lagoon to monitor inflow conditions during the dry season.	2	5	CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RWQCB	
GuR-CCCh-1.1.4.2	Action Step	Estuary	Investigate the hydrodynamics of freshwater inflow and estuary water quality conditions relative to juvenile salmonid estuarine summer rearing (osmo-regulating and non-osmoregulating).	2	10	CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, RCD, RWQCB, SWRCB	
GuR-CCCh-1.1.4.3	Action Step	Estuary	Identify and implement minimum freshwater inflow thresholds to ensure optimal estuary health and function.	2	5	CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, RWQCB, SWRCB	
GuR-CCCh-3.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-3.1.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)				
GuR-CCCh-3.1.1.1	Action Step	Hydrology	Continue to work with the North Gualala Water Company on water right Permit 14853. Ensure that the Site-specific Study Plan prepared for the NGWC by Stillwater Sciences (11 October 2011) is completed within the next 3-yrs. Implement recommendations within the next 5-years. Ensure salmonid life history requirements targeted in the proposal are evaluate under a range of water year types (dry - wet). Evaluate potential impacts to dry season estuary water quality conditions associated with Permit 14853.	2	20	CDFW, CDFW Law Enforcement, Gualala Watershed Council, NMFS, NMFS OLE, North Gualala Water Company, SWRCB	
GuR-CCCh-3.1.1.2	Action Step	Hydrology	Map all water diversions and upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.	2	60	CDFW, NMFS, North Gualala Water Company, Private Landowners, Sea Ranch, SWRCB	
GuR-CCCh-3.1.1.3	Action Step	Hydrology	Monitor, identify problems, and prioritize needed changes to permitted water diversions on current or potential steelhead streams.	2	10	BLM, CDFW, NMFS, North Gualala Water Company, Private Landowners, Sea Ranch, SWRCB	Problems should be identified through mapping diversion and developing stream flow model (other action steps).

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-3.1.1.4	Action Step	Hydrology	Install and maintain a gauging station immediately upstream of the estuary to monitor freshwater inflow during the dry season.	2	10	CDFW, NMFS, USGS	Provide consistent funding for the North Fork Gualala River and possible funding for the Wheatfield Forks of the Gualala River.
GuR-CCCh-3.1.1.5	Action Step	Hydrology	Develop critical flow values that are the basis for minimum bypass flow requirements to support juvenile rearing habitat conditions during the dry season.	1	5	CDFW, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, RCD, RWQCB, Sea Ranch, SWRCB	
GuR-CCCh-3.1.1.6	Action Step	Hydrology	Install and maintain a stream gauge at an appropriate location near the base of Rockpile Creek.	3	10	CDFW, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RWQCB, SWRCB	
GuR-CCCh-3.1.1.7	Action Step	Hydrology	Install and maintain a stream gauge at an appropriate location near the base of Buckeye Creek.	3	10	CDFW, NMFS, NRCS, Private Landowners, RCD, SWRCB	
GuR-CCCh-3.1.1.8	Action Step	Hydrology	Install and maintain a stream gauge at an appropriate location immediately downstream of the SF Gualala and Wheatfield Fork confluence.	3	10	CDFW, Gualala Watershed Council, NMFS, NRCS, Private Landowners, RCD, Sea Ranch, SWRCB	
GuR-CCCh-3.1.1.9	Action Step	Hydrology	Evaluate and implement off-channel storage facilities to reduce impacts of water diversion (storage tanks for rural residential users). Focus efforts in the NF Gualala and Wheatfield sub-watersheds.	2	20	CDFW, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, SWRCB	
GuR-CCCh-4.1	**Objective**	**Landscape Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-4.1.1	Recovery Action	Landscape Patterns	Prevent or minimize increased landscape disturbance				
GuR-CCCh-4.1.1.1	Action Step	Landscape Patterns	Consider developing and/or identifying Salmonid Preserves. Consider the Gualala River watershed as a Salmonid Preserve.	2	100	CDFW, NMFS, NMFS, NOAA RC	
GuR-CCCh-4.2	**Objective**	**Landscape Patterns**	**Address the inadequacy of existing regulatory mechanisms**				
GuR-CCCh-4.2.1	Recovery Action	Landscape Patterns	Prevent or minimize increased landscape disturbance				
GuR-CCCh-4.2.1.1	Action Step	Landscape Patterns	Discourage counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	2	100	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, RCD, Sea Ranch, Sonoma County, SWRCB	
GuR-CCCh-4.2.1.2	Action Step	Landscape Patterns	Discourage any forestland to agricultural and/or conversion to rural/urban development.	2	100	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, Gualala Watershed Council, NMFS, NMFS, North Gualala Water Company, NRCS, Private Landowners, Public, RCD, Sea Ranch, Sonoma County, SWRCB	
GuR-CCCh-5.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-5.1.1	Recovery Action	Passage	Modify or remove physical passage barriers				
GuR-CCCh-5.1.1.1	Action Step	Passage	Evaluate, design, and implement appropriate fish passage at South Beach Road Crossing on Fuller Creek (Wheatfield Fork sub-basin; See CALFISH: PAD_ID 736904; Passage ID 13268)	2	10	CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD	
GuR-CCCh-5.1.1.2	Action Step	Passage	Evaluate, design, and implement appropriate fish passage designs in Palmer Canyon and McKenzie creeks (Wheatfield Fork sub-basin; Klamt et al. 2003).	2	10	CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD	
GuR-CCCh-6.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**				
GuR-CCCh-6.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency (BFW 0-10 meters)				

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-6.1.1.1	Action Step	Habitat Complexity	Increase wood frequency in salmonid spawning and rearing areas to the extent that a minimum of 6 key LWD pieces exists every 100 meters in 0-10 meter BFW streams.	2	10	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RCD	
GuR-CCCh-6.1.1.2	Action Step	Habitat Complexity	Design and install LWD structures in McKenzie and Wild Hog creeks, and the SF sub-basin to the extent that optimal LWD frequency is achieved at strategic locations.	2	20	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RWQCB	
GuR-CCCh-6.1.2	Recovery Action	Habitat Complexity	Increase large wood frequency (BFW 10-100 meters)				
GuR-CCCh-6.1.2.1	Action Step	Habitat Complexity	Increase wood frequency in seasonal habitat and migratory reaches to the extent that a minimum of 1.3 to 4 key LWD pieces exists every 100 meters in 10-100 meter BFW streams.	2	10	CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, RWQCB	
GuR-CCCh-6.1.2.2	Action Step	Habitat Complexity	Design and implement a SF Gualala mainstem migration project. Focus should include a higher frequency of significantly large wood structures to enhance staging pool development.	2	10	CDFW, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD	
GuR-CCCh-6.1.2.3	Action Step	Habitat Complexity	Evaluate, design, and implement salmonid habitat improvement structures as appropriate to the stream channel type and hydrologic conditions within the Rockpile Sub-basin	2	5	Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, North Gualala Water Company, NRCS, Private Landowners, Public, RCD, The Nature Conservancy	
GuR-CCCh-6.1.2.4	Action Step	Habitat Complexity	Evaluate, design, and implement salmonid habitat improvement structures as appropriate to the stream channel type and hydrologic conditions within the Buckeye Sub-basin.	2	5	CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, Private Landowners, Public, RCD, RWQCB	
GuR-CCCh-6.1.3	Recovery Action	Habitat Complexity	Improve pool shelter				
GuR-CCCh-6.1.3.1	Action Step	Habitat Complexity	Evaluate, design, and implement strategies to improve shelter pools ratings within the Rockpile and Buckeye sub-basins and the following tributaries: Boyd, Buckeye, Camper, Carson, Danfield, Doty, Dry, Franchini, Fuller, Grasshopper, Groshong Gulch, House, Little NF GR, Log Cabin, Marshall, McGann, McKenzie, NF Fuller, Lower NF GR, Palmer Canyon, Pepperwood, Rockpile, SF Fuller, Sullivan, Tombs, Wheatfield Fork, and Wild Hog creeks.	2	20	CDFW, Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD, The Nature Conservancy	
GuR-CCCh-6.1.4	Recovery Action	Habitat Complexity	Increase primary pools frequency				
GuR-CCCh-6.1.4.1	Action Step	Habitat Complexity	Evaluate, develop, and implement strategies to increase primary pool frequency in high priority reaches within the following tributaries: Boyd, Doty, Dry, Fuller, Little NF GR, Log Cabin, Marshall, McGann, McKenzie, Palmer, Robinson, Tombs, and West Fork Fuller.	2	20	CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD	
GuR-CCCh-6.1.4.2	Action Step	Habitat Complexity	Identify historic salmonid habitats lacking in channel complexity and implement restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover. Prioritize areas with IP greater than 75%	2	20	CDFW, NOAA RC, Private Landowners	
GuR-CCCh-6.1.4.3	Action Step	Habitat Complexity	Encourage coordination of LWD placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort (CDFG 2004).	2	20	CalFire, CDFW, NOAA RC, Private Landowners	
GuR-CCCh-6.1.4.4	Action Step	Habitat Complexity	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	2	60	CDFW, NOAA RC, Private Landowners	

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-6.1.4.5	Action Step	Habitat Complexity	Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004).	2	60	CDFW, NMFS, NRCS, Private Landowners	
GuR-CCCh-7.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-7.1.1	Recovery Action	Riparian	Improve tree diameter				
GuR-CCCh-7.1.1.1	Action Step	Riparian	Increase tree diameter to a minimum of 80% CWHR density rating "D" across all current and potential spawning and juvenile rearing areas.	2	20	Board of Forestry, CalFire, CDFW, Conservation Fund, Gualala Redwood Company, NMFS, The Nature Conservancy	
GuR-CCCh-7.1.1.2	Action Step	Riparian	Encourage large tree retention along the SF Gualala River. Focus areas with IP greater than 50%.	2	50	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS	
GuR-CCCh-7.1.1.3	Action Step	Riparian	Conduct conifer release to promote growth of larger diameter trees where appropriate.	2	10	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, NRCS, RCD	
GuR-CCCh-7.1.2	Recovery Action	Riparian	Improve canopy cover				
GuR-CCCh-7.1.2.1	Action Step	Riparian	Increase the average stream canopy cover within potential spawning and rearing reaches to a minimum of 80%.	2	20	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, The Nature Conservancy	
GuR-CCCh-7.1.2.2	Action Step	Riparian	Evaluate buffers width and/or timber harvest in terms of light penetration and potential changes to micro-climate conditions along the SF Gualala River.	2	50	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS	
GuR-CCCh-7.1.2.3	Action Step	Riparian	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the NF Gualala sub-basin: upper reaches of Dry Creek, Robinson Creek, the central and higher reaches of the mainstem, and the lower reaches of Bear and Stewart Creeks (Klamt et al. 2003).	2	20	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RCD	
GuR-CCCh-7.1.2.4	Action Step	Riparian	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the Rockpile sub-basin: mainstem Rockpile Creek, Red Rock Creek, and Horsetheif (Klamt et al. 2003).	2	20	Board of Forestry, CalFire, CDFW, Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RCD, The Nature Conservancy	
GuR-CCCh-7.1.2.5	Action Step	Riparian	Identify and implement riparian enhancement projects where current canopy density and diversity are inadequate and site conditions are appropriate to: initiate tree planting, thinning, and other vegetation management to encourage the development of a denser more extensive riparian canopy in the following reaches and tributaries of the Buckeye sub-basin: upper reaches of Buckeye Creek, Franchini, Grasshopper, and Soda Springs creeks (Klamt et al. 2003).	2	20	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, Private Landowners, RCD	
GuR-CCCh-8.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-8.1.1	Recovery Action	Sediment	Improve instream gravel quality				
GuR-CCCh-8.1.1.1	Action Step	Sediment	Treat high priority slides and landings identified in credible landowner assessments.	2	20	CDFW, NOAA RC, Private Landowners	
GuR-CCCh-8.1.1.2	Action Step	Sediment	Continue efforts such as erosion proofing, improvements, and decommissioning, through the Rockpile sub-basin to reduce sediment delivery to central Rockpile Creeks and Rockpile tributaries.	2	10	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD	

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-10.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-10.1.1	Recovery Action	Water Quality	Improve stream temperature conditions				
GuR-CCCh-10.1.1.1	Action Step	Water Quality	Expand continuous temperature monitoring efforts into the upper sub-basins and tributaries that provide summer rearing for salmonids. Investigate canopy composition and monitoring air temperature to examine the relationship between canopy, temperature, and other micro-climate effects on water temperature (Klamt et al. 2003).	2	5	CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC	
GuR-CCCh-10.1.1.2	Action Step	Water Quality	Evaluate the current adequacy of buffer zones in recently logged areas and determine whether stream temperatures have increased due to these activities.	2	30	Board of Forestry, CalFire, CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, Private Landowners, RCD	
GuR-CCCh-10.1.1.3	Action Step	Water Quality	Implement actions to maintain and restore water temperatures to meet habitat requirements for salmonids in specific streams (CDFG 2004).	2		CDFW, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NRCS, Private Landowners	
GuR-CCCh-11.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-11.1.1	Recovery Action	Viability	Increase density, abundance, spatial structure, and diversity				
GuR-CCCh-11.1.1.1	Action Step	Viability	Measure or estimate the condition of key habitat attributes across the watershed.	2	10	CDFW	
GuR-CCCh-11.1.1.2	Action Step	Viability	Identify where a conservation hatchery/supplementation/ augmentation program will complement the overall recovery effort.	2	20	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GuR-CCCh-11.1.1.3	Action Step	Viability	If determined necessary, identify an out-of-basin or subwatershed source population that could be used to start a population augmentation/supplementation/broodstock program.	3	30	NOAA RC, NOAA SWFSC, NOAA/NMFS	
GuR-CCCh-12.1	**Objective**	**Agriculture**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-12.1.1	Recovery Action	Agriculture	Prevent or minimize impairment to instream habitat complexity (altered pool complexity and/or pool riffle ratio)				
GuR-CCCh-12.1.1.1	Action Step	Agriculture	Discourage forest-to-vineyard land conversions or other agricultural activities that may impact natural stream channel morphology.	2	30	Board of Forestry, CalFire, CDFW, NMFS, Sonoma County	
GuR-CCCh-12.1.2	Recovery Action	Agriculture	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)				
GuR-CCCh-12.1.2.1	Action Step	Agriculture	Assess sources from agricultural activities that deliver sediment and runoff to stream channels.	3	10	CA Coastal Commission, CDFW, DWR, NOAA RC, NRCS, Private Landowners, RCD	
GuR-CCCh-12.1.2.2	Action Step	Agriculture	Work with vineyard owners to assess the effectiveness of erosion control measures throughout the winter period.	3	5	CalFire, CDFW, NMFS, RWQCB, Sonoma County	
GuR-CCCh-12.1.2.3	Action Step	Agriculture	Encourage and assist the NRCS and RCD to increase the number of landowners participating in sediment reduction planning and implementation.	3	25	CDFW, NMFS, NOAA RC, Private Landowners	
GuR-CCCh-12.1.2.4	Action Step	Agriculture	Establish appropriately sized and properly functioning riparian buffers adjacent to watercourses that have a potential to deliver sediment to spawning and rearing habitat.	3	50	NRCS, Private Landowners, RCD	
GuR-CCCh-12.1.3	Recovery Action	Agriculture	Prevent or minimize impairment to water quality (instream water temperature)				
GuR-CCCh-12.1.3.1	Action Step	Agriculture	Maintain functional riparian stream buffers that provide desirable stream canopy cover adjacent to agricultural land activities.	2	20	NOAA RC, Private Landowners, Sonoma County	
GuR-CCCh-12.1.4	Recovery Action	Agriculture	Prevent or minimize impairment to watershed hydrology				
GuR-CCCh-12.1.4.1	Action Step	Agriculture	Promote off-channel storage facilities (e.g. winter diversion ponds) in efforts to reduce in-stream flow impacts associated with agricultural water use.	2	10	CalFire, CDFW, NMFS, NMFS OLE, Private Landowners, Sonoma County, SWRCB	
GuR-CCCh-12.1.5	Recovery Action	Agriculture	Prevent or minimize increased landscape disturbance				
GuR-CCCh-12.1.5.1	Action Step	Agriculture	Work within the agricultural community to educate landowners and enhance practices that provide for functional watershed processes.	3	20	Farm Bureau, Private Landowners, Sonoma County	

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-12.1.5.2	Action Step	Agriculture	Improve education and awareness to agencies, landowners, and the general public regarding salmonid recovery and habitat requirements.	3	30	NMFS, NOAA RC, NRCS, Private Landowners, Public, RCD	
GuR-CCCh-12.2	**Objective**	**Agriculture**	**Address the inadequacy of existing regulatory mechanisms**				
GuR-CCCh-12.2.1	Recovery Action	Agriculture	Prevent or minimize increased landscape disturbance				
GuR-CCCh-12.2.1.1	Action Step	Agriculture	Coordinate with regulatory agencies authorizing/permitting forestland-to-agriculture conversions to ensure consistency with salmonid recovery goals.	2	50	CalFire, CDFW, NMFS, Sonoma County	
GuR-CCCh-12.2.1.2	Action Step	Agriculture	Streamline permit processing where landowners are conducting actions aligned with recovery priorities.	2	30	CDFW, NMFS, NOAA RC, Private Landowners, RCD	
GuR-CCCh-12.2.1.3	Action Step	Agriculture	Technical support to counties by NMFS staff should be conducted to encourage county general plan updates that include measures to conserve and protect salmonids and their habitats.	3	50	NMFS, NOAA RC, NRCS, Private Landowners, Public Works, RCD, Sonoma County	
GuR-CCCh-12.2.2	Recovery Action	Agriculture	Prevent or minimize impairment to watershed hydrology				
GuR-CCCh-12.2.2.1	Action Step	Agriculture	Identify and eliminate depletion of summer base flows from unauthorized water users.	2	10	CDFW, NMFS, NMFS OLE, NOAA RC, North Gualala Water Company, SWRCB	
GuR-CCCh-12.2.2.2	Action Step	Agriculture	Develop legislation to fund county planning for environmentally sound agricultural growth and water supply.	2	30	CDFW, NMFS, Sonoma County, SWRCB	
GuR-CCCh-16.1	**Objective**	**Fishing/Collecting**	**Address the inadequacy of existing regulatory mechanisms**				
GuR-CCCh-16.1.1	Recovery Action	Fishing/Collecting	Prevent or minimize reduced density, abundance, and diversity based on based on the biological recovery criteria				
GuR-CCCh-16.1.1.1	Action Step	Fishing/Collecting	Work with CDFW to modify 14 California Code of Regulations, section 8.00(b)(1) low flow minimum flow closure for Mendocino, Sonoma, and Marin counties to restrict fishing during low flows. Discontinue using the Russian River at Guerneville gauging station for angling closures and use the Navarro River USGS gauging station (11468000) which better reflects hydrologic conditions in smaller unregulated coastal Sonoma/Mendocino streams.	2	100	CDFW, NMFS	
GuR-CCCh-18.1	**Objective**	**Livestock**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-18.1.1	Recovery Action	Livestock	Prevent or minimize adverse alterations to riparian species composition and structure				
GuR-CCCh-18.1.1.1	Action Step	Livestock	Reduce livestock and feral pig access to the riparian zone to encourage bank stabilization and re-vegetation of riparian areas within the following sub-basins: Gualala Main stem/ SF Garcia, Wheatfield Fork, Rockpile (Klamt et al. 2003).	3	10	CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD	
GuR-CCCh-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-19.1.1	Recovery Action	Logging	Prevent or minimize impairment to floodplain connectivity (quality & extent)				
GuR-CCCh-19.1.1.1	Action Step	Logging	Ensure that timber harvest plans evaluate and avoid impacts to off channel habitat, floodplains, ponds, and oxbows.	2	50	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, NRCS, RCD	
GuR-CCCh-19.1.2	Recovery Action	Logging	Prevent or minimize impairment to instream habitat complexity (reduced large wood and/or shelter)				
GuR-CCCh-19.1.2.1	Action Step	Logging	Encourage coordination of LWD placement projects in streams (as necessary) as part of logging operations.	3	30	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, NOAA RC, RCD	
GuR-CCCh-19.1.2.2	Action Step	Logging	Asses and identify for retainment the largest trees in all riparian zones (including intermittent and ephemeral streams) for bank stability and long-term wood recruitment.	2	100	Board of Forestry, CalFire, Gualala Redwood Company, NMFS, NRCS, RCD	
GuR-CCCh-19.1.3	Recovery Action	Logging	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)				
GuR-CCCh-19.1.3.1	Action Step	Logging	Encourage all permanent and year-round access roads beyond the THP parcel be surfaced after harvest completion with base rock and road gravel, asphalt, or chipseal, as appropriate.	3	60	CalFire, Private Landowners	
GuR-CCCh-19.1.3.2	Action Step	Logging	Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities that can promote erosion.	3	20	CalFire, California Geological Survey, Private Consultants, Private Landowners, RWQCB	

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-19.1.3.3	Action Step	Logging	Establish equipment limitation zones on headwater streams and swales.	3	50	Board of Forestry, CalFire, CDFW, NMFS, NRCS, RCD	
GuR-CCCh-19.1.3.4	Action Step	Logging	Decommission legacy roads, upgrade road networks, and plan and implement other rehabilitation work targeting reductions in fine sediment inputs to stream networks.	2	20	Board of Forestry, CalFire, CDFW, Conservation Fund, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, Private Landowners, RCD	
GuR-CCCh-19.1.4	Recovery Action	Logging	Prevent or minimize impairment to water quality (instream water temperature)				
GuR-CCCh-19.1.4.1	Action Step	Logging	Encourage wider riparian buffer zones in areas where stream temperatures or riparian canopy are found limiting.	2	30	Board of Forestry, CalFire, Friends of the Gualala River Watershed, Gualala Redwood Company, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD	
GuR-CCCh-19.1.4.2	Action Step	Logging	Protect current riparian zones in all summer salmonid rearing areas to the extent that they are able to mature, provide, and maintain a minimum of 80% canopy cover.	2	100	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS, Private Landowners, RCD	
GuR-CCCh-19.1.5	Recovery Action	Logging	Prevent or minimize adverse alterations to riparian species composition and structure				
GuR-CCCh-19.1.5.1	Action Step	Logging	Conserve and manage forestlands for older forest stages.	2	100	Board of Forestry, CalFire, CDFW, Gualala Redwood Company, NMFS	
GuR-CCCh-19.1.5.2	Action Step	Logging	Manage riparian areas for their potential to provide shade and rearing habitat for salmonids.	2	60	Board of Forestry, CalFire, CDFW, NMFS	
GuR-CCCh-19.1.6	Recovery Action	Logging	Prevent or minimize increased landscape disturbance				
GuR-CCCh-19.1.6.1	Action Step	Logging	Consider the development of a Watershed Database (similar to the CDFW Northern Spotted Owl database) for salmonids that provides watershed data and information in a consistent fashion to all foresters for consideration in their harvest plans.	3	20	Board of Forestry, CDFW, NMFS	
GuR-CCCh-19.1.6.2	Action Step	Logging	Acquire key large tracts of forestlands identified as a priority by Federal, State, local government, and non-governmental organizations	2	30	CDFW, NMFS, NOAA RC	
GuR-CCCh-19.1.6.3	Action Step	Logging	Provide for properly functioning watershed processes (e.g., cycles of wood, water and sediment) by promoting long term sustainable forestry practices that support salmonid habitats.	2	100	Board of Forestry, CalFire, CDFW, NMFS, RWQCB	
GuR-CCCh-19.1.6.4	Action Step	Logging	Should large tracts of forestlands within the Gualala River watershed become available for purchase, the State of California or other entities should consider purchasing the area as a Demonstration Forest or State Park.	2	20	BLM, CalFire, California Coastal Conservancy, CDFW, Conservation Fund, NMFS, Private Landowners, Sonoma County, State Parks, The Nature Conservancy	
GuR-CCCh-19.1.6.5	Action Step	Logging	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	3	60	CalFire, CDFW, NMFS, Private Landowners, Sonoma County	
GuR-CCCh-19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms**				
GuR-CCCh-19.2.1	Recovery Action	Logging	Prevent or minimize increased landscape disturbance				
GuR-CCCh-19.2.1.1	Action Step	Logging	Work with Sonoma county planning staff to minimize rezoning forestlands to rural residential or other land uses (e.g., vineyards).	2	60	CalFire, NMFS, Sonoma County	
GuR-CCCh-19.2.1.2	Action Step	Logging	Coordinate with regulatory agencies to minimize conversions in key watersheds and discourage forestland conversions.	2	30	Board of Forestry, CalFire, CDFW, NMFS	
GuR-CCCh-19.2.1.3	Action Step	Logging	Establish greater oversight and post-harvest monitoring by the permitting agency for operations.	2	20	Board of Forestry, CalFire, CDFW, NMFS, RWQCB	
GuR-CCCh-19.2.1.4	Action Step	Logging	Assign NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004).	2	10	CalFire, NMFS	
GuR-CCCh-19.2.1.5	Action Step	Logging	Require tree retention on the axis of headwall swales Any deviations should be reviewed and receive written approval by a licensed engineering geologist.	2	60	CalFire, California Geological Survey, CDFW, NMFS, Private Landowners, RWQCB	
GuR-CCCh-19.2.1.6	Action Step	Logging	Extend the monitoring period and upgrade THP road maintenance after harvest.	2	10	CalFire, CDFW, NMFS, Private Landowners, RWQCB	

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-19.2.1.7	Action Step	Logging	Investigate opportunities to programmatically permit the forest certification program to authorize incidental take for landowners through Endangered Species Act Section 10(a)(1)(B).	3	10	Board of Forestry, CalFire, CDFW, NMFS	
GuR-CCCh-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-23.1.1	Recovery Action	Roads/Railroads	Prevent or minimize impairment to instream substrate/food productivity (gravel quality and quantity)				
GuR-CCCh-23.1.1.1	Action Step	Roads/Railroads	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).	2	10	CDFW, NOAA RC, Private Landowners, RCD, Sonoma County	
GuR-CCCh-23.1.1.2	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	2	60	Private Landowners, RCD, Sonoma County	
GuR-CCCh-23.1.1.3	Action Step	Roads/Railroads	Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity.	2	5	NRCS, Private Consultants, Private Landowners, RCD	
GuR-CCCh-23.1.1.4	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.	2	5	CDFW, Private Consultants, Private Landowners, RWQCB	
GuR-CCCh-23.1.1.5	Action Step	Roads/Railroads	Encourage, when necessary and appropriate, restricted access to unpaved roads in winter to reduce road degradation and sediment release. Where restricted access is not feasible, encourage measures such as rocking to prevent sediment from reaching streams with steelhead (CDFG 2004).	2	20	Private Landowners	
GuR-CCCh-23.1.1.6	Action Step	Roads/Railroads	Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following Gualala mainstem/ SF Gualala Subbasin tributaries: McKenzie Creek, Marchall Creek, Palmer Canyon Creek, Wild Hog Creek, South Fork, and Marshall Creek.	2	20	CDFW, Gualala Redwood Company, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB	
GuR-CCCh-23.1.1.7	Action Step	Roads/Railroads	Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following Wheatfield Fork sub-basin tributary reaches: Lower reaches of Haupt and Tabacco Creeks; Lower to middle reaches of Tombs, Wolf, and Elk creeks, and unnamed trib to the mainstem Wheatfield Fork upstream from Tombs Creek, to Elk Creek, and flanked by Bear and Gibson ridges; larger watercourses to the lower reaches of House Creek; middle to higher reaches of House, Pepperwood, Danfield, and Cedar creeks (Klamt et al. 2003).	2	20	CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GuR-CCCh-23.1.1.8	Action Step	Roads/Railroads	Evaluate, develop, and implement strategies to address decommissioning old roads, maintaining existing roads, and constructing new roads in the following North Fork sub-basin tributaries: Stewart, Dry, Upper Billings, upper Robinson, Doty, Log Cabin creeks, and McGann Gulch (Klamt et al. 2003).	2	20	CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GuR-CCCh-23.1.1.9	Action Step	Roads/Railroads	Use appropriately sized culverts in steep terrain to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure in the Buckeye sub-basin (GRWA 2003).	2	50	CDFW, Friends of the Gualala River Watershed, Gualala Watershed Council, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GuR-CCCh-23.1.1.10	Action Step	Roads/Railroads	Install locked gates at river access points to prevent 4wd vehicles from driving in the river.	2	10	CDFW, FOGualalaR, Gualala Redwood Company, Gualala Watershed Council	
GuR-CCCh-23.1.2	Recovery Action	Roads/Railroads	Prevent or minimize impairment to passage and migration				
GuR-CCCh-23.1.2.1	Action Step	Roads/Railroads	Prevent future barriers on newly constructed roads utilizing NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a)	2	20	CDFW, NMFS, NOAA RC, NRCS, Private Landowners, RCD, RWQCB	
GuR-CCCh-23.1.2.2	Action Step	Roads/Railroads	Work with partner agencies to ensure that all future road or bridge repairs at stream crossing provide unimpaired fish passage for all salmonid life stages.	2	20	CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GuR-CCCh-23.1.3	Recovery Action	Roads/Railroads	Prevent or minimize impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)				
GuR-CCCh-23.1.3.1	Action Step	Roads/Railroads	Design new roads that avoid riparian areas to the extent feasible and are hydrologically disconnected from the stream network.	2	60	Private Consultants, Private Landowners, Sonoma County	
GuR-CCCh-23.1.4	Recovery Action	Roads/Railroads	Prevent or minimize increased landscape disturbance				

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-23.1.4.1	Action Step	Roads/Railroads	Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in historical habitats or salmonid watersheds.	2	10	Private Landowners, RCD	
GuR-CCCh-23.1.4.2	Action Step	Roads/Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions.	3	5	Board of Forestry, CDFW, NMFS, NRCS, RCD, RWQCB	
GuR-CCCh-23.1.4.3	Action Step	Roads/Railroads	Conduct outreach and education regarding the adverse effects of roads, and the types of best management practices protective of salmonids.	3	30	Board of Forestry, CDFW, NMFS, NOAA RC, NRCS, RCD, RWQCB	
GuR-CCCh-23.1.4.4	Action Step	Roads/Railroads	Develop a Salmon Certification Program for road maintenance staff.	2	10	CDFW	
GuR-CCCh-24.1	**Objective**	**Severe Weather Patterns**	**Address the inadequacy of existing regulatory mechanisms**				
GuR-CCCh-24.1.1	Recovery Action	Severe Weather Patterns	Prevent or minimize impairment to stream hydrology (stream flow)				
GuR-CCCh-24.1.1.1	Action Step	Severe Weather Patterns	Use the emergency drought operations center (EDOC) or other similar group to oversee implementation of water conservation measures and alternatives.	2	60	CDFW, CDFW Law Enforcement, NMFS OLE, North Gualala Water Company, Private Landowners, Public, Sea Ranch, Sonoma County	
GuR-CCCh-24.1.1.2	Action Step	Severe Weather Patterns	Work with CDFW, Counties, other agencies, and knowledgeable biologists to develop emergency flow regulations to ensure there is enough water instream for salmonids and adopt implementation agreements.	2	10	CDFW, NMFS, North Gualala Water Company, Sea Ranch, Sonoma County Water Agency, SWRCB	
GuR-CCCh-25.1	**Objective**	**Water Diversion/ Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**				
GuR-CCCh-25.1.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (stream flow)				
GuR-CCCh-25.1.1.1	Action Step	Water Diversion/ Impoundment	Work with partner agencies to monitor and ensure water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.	1	20	CDFW, CDFW Law Enforcement, NMFS, SWRCB	
GuR-CCCh-25.1.1.2	Action Step	Water Diversion/ Impoundment	Provide incentives to water rights holders willing to convert some or all of their water rights to instream use via petition change of use and §1707 (CDFG 2004).	2	20	CDFW, NMFS, SWRCB	
GuR-CCCh-25.1.2	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to passage and migration				
GuR-CCCh-25.1.2.1	Action Step	Water Diversion/ Impoundment	Establish flow related adult and smolt migration thresholds prior to authorizing future water diversions.	1	10	CDFW, NMFS, North Gualala Water Company, SWRCB	
GuR-CCCh-25.1.3	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to the estuary (quality and extent)				
GuR-CCCh-25.1.3.1	Action Step	Water Diversion/ Impoundment	Discourage the development of any surface water diversions in the watershed that independently or cumulatively have significant impact on reducing inflow to the estuary during spring/summer/fall months (ECORP and Kamman Hydrology & Engineering 2005).	1	10	CDFW, Gualala Watershed Council, NMFS, North Gualala Water Company, SWRCB	
GuR-CCCh-25.1.3.2	Action Step	Water Diversion/ Impoundment	Develop and implement Estuary Inflow Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.	2	10	CDFW, NMFS, SWRCB	
GuR-CCCh-25.1.4	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to water quality (instream temperature)				
GuR-CCCh-25.1.4.1	Action Step	Water Diversion/ Impoundment	Ensure future water diversions do not impair instream water temperatures during the dry season.	1	10	CDFW, Gualala Watershed Council, NMFS, North Gualala Water Company, NRCS, RCD, Sea Ranch, SWRCB	
GuR-CCCh-25.2	**Objective**	**Water Diversion/ Impoundment**	**Address the inadequacy of existing regulatory mechanisms**				

Gualala River Chinook Salmon (Central Coastal) Recovery Actions

Action ID	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partner	Comment
GuR-CCCh-25.2.1	Recovery Action	Water Diversion/ Impoundment	Prevent or minimize impairment to stream hydrology (stream flow)				
GuR-CCCh-25.2.1.1	Action Step	Water Diversion/ Impoundment	Ensure all water diversions and impoundments are compliant with AB2121 or other appropriate protective measures.	1	10	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GuR-CCCh-25.2.1.2	Action Step	Water Diversion/ Impoundment	Identify and work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinate efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams.	1	10	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	
GuR-CCCh-25.2.1.3	Action Step	Water Diversion/ Impoundment	Improve coordination between agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of steelhead and their habitats, and avoidance of adverse impacts caused by water diversion (CDFG 2004).	2	10	CDFW, CDFW Law Enforcement, NMFS, NMFS OLE, SWRCB	