

# Russian River



Russian River  
Photo by Joe Pedarich

Location	• Mendocino and Sonoma Counties
Watershed Area	• 1,483.0 Square Miles
Potential Habitat	• 457.5 Stream Miles
Vegetation	• 12% Coniferous, 40% Montane Hardwood, 18% Grassland, 13% Agricultural
Erodability	• Moderate to High
Ownership Patterns	• 99% Private
Dominant Land Uses	• Urbanization, Agriculture, Ranching, Gravel Mining
Housing Density	• Moderate to High
TMDL Pollutants	• Sediment, Temperature, Nutrients, Pathogens, Metals

## Russian River Coho Salmon: Nearly Extirpated



### Recovery Goals

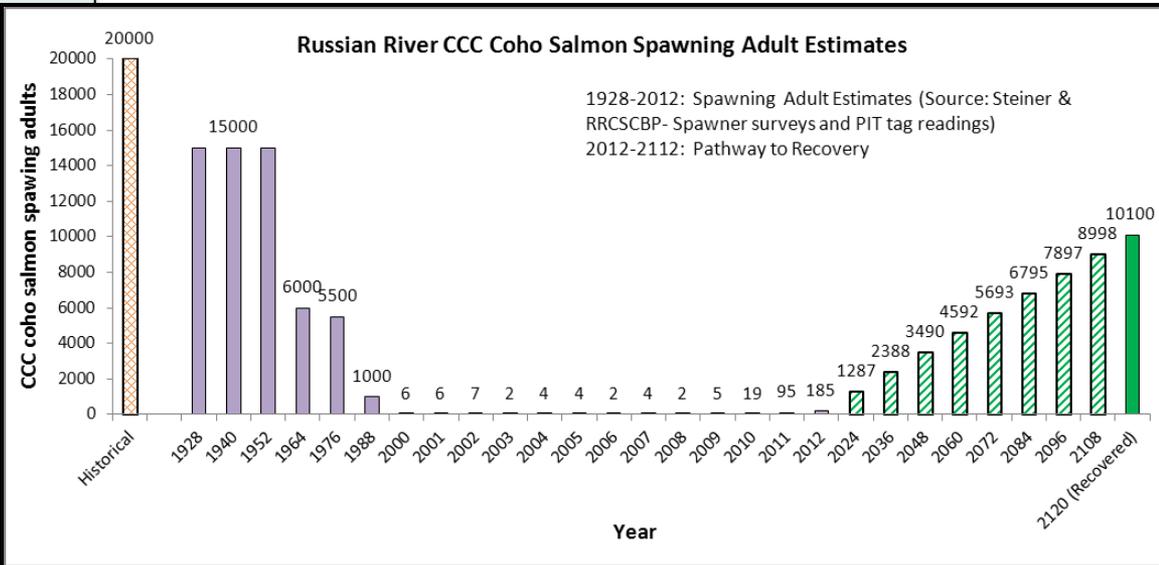
- ✓ Continue and expand captive broodstock program
- ✓ Encourage establishment and use of conservation banks
- ✓ Expand fish and habitat monitoring programs
- ✓ Increase enforcement and outreach and education to prevent take

**Russian River  
Adult Spawner Targets**

**Downlisting to Threatened  
5,050**

**Recovery  
10,100**

**STEELHEAD: YES  
CHINOOK SALMON: YES**



## Current Instream, Watershed and Population Conditions



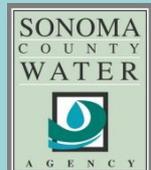
## Preventing Extinction & Improving Conditions

### Priority 1: Immediate Restoration Actions

- Continue and expand operation and rearing capacity of the Coho Salmon Captive Broodstock Program
- Use surplus broodstock to repopulate nearby watersheds (within diversity strata) where populations are extirpated
- Conduct outreach with landowners to expand broodstock releases within Core, then remaining Phase 1 and Phase 2 areas
- Remove or modify the flashboard dam on lower Mill Creek near the confluence with Wallace Creek
- Install continuous water quality monitoring stations in lower Green Valley and Atascadero Creeks

### Priority 2 & 3: Long-Term Restoration Actions

- Restore estuarine habitat and the associated wetlands and sloughs
- Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats
- Evaluate the potential to reconstruct historical lakes in northern Laguna de Santa Rosa
- Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth
- Investigate the feasibility of beaver re-location and re-introductions
- Address season of diversion, off-stream reservoirs, and bypass flows to be more protective of coho salmon



**Recovery Partners**  
CDFG, MCRFCD, RWQCB,  
Sonoma Grapegrowers, Russian River  
Property Association, and Mendocino  
United Winegrowers



## Future Threats



## Reducing Future Threats

### Priority 1: Immediate Threat Abatement Actions

- Enforce requirements of local regulations and riparian/setbacks
- Implement water conservation strategies such as off-stream water storage and rooftop water storage
- Implement exclusion fencing in riparian zones
- Implement results of existing sediment source surveys, and assess remaining watershed road networks to eliminate high sediment sources



Low flow conditions in a tributary to the Russian River  
Photo by Joe Pecharich

### Priority 2 & 3: Long-Term Threat Abatement Actions

- Maintain and enhance functional riparian stream buffers that provide desirable stream canopy cover adjacent to agricultural land
- Minimize interception of CCC coho salmon during the trout and steelhead freshwater sport fishing season
- Develop sustainable gravel mining practices which create and promote habitat development and maintenance
- Retain the largest trees in all riparian zones (including intermittent and ephemeral streams) for bank stability and long-term wood recruitment
- Identify and remediate upstream pollution sources which contribute to poor water quality conditions in the estuary
- Adequately screen water diversions to prevent juvenile salmonid mortalities

## Conservation Highlights

- Conservation Hatchery
- Fish Friendly Farming Program
- Citizen Monitoring
- Agricultural BMP's



Monitoring on Mill Creek Photo by Joe Pecharich

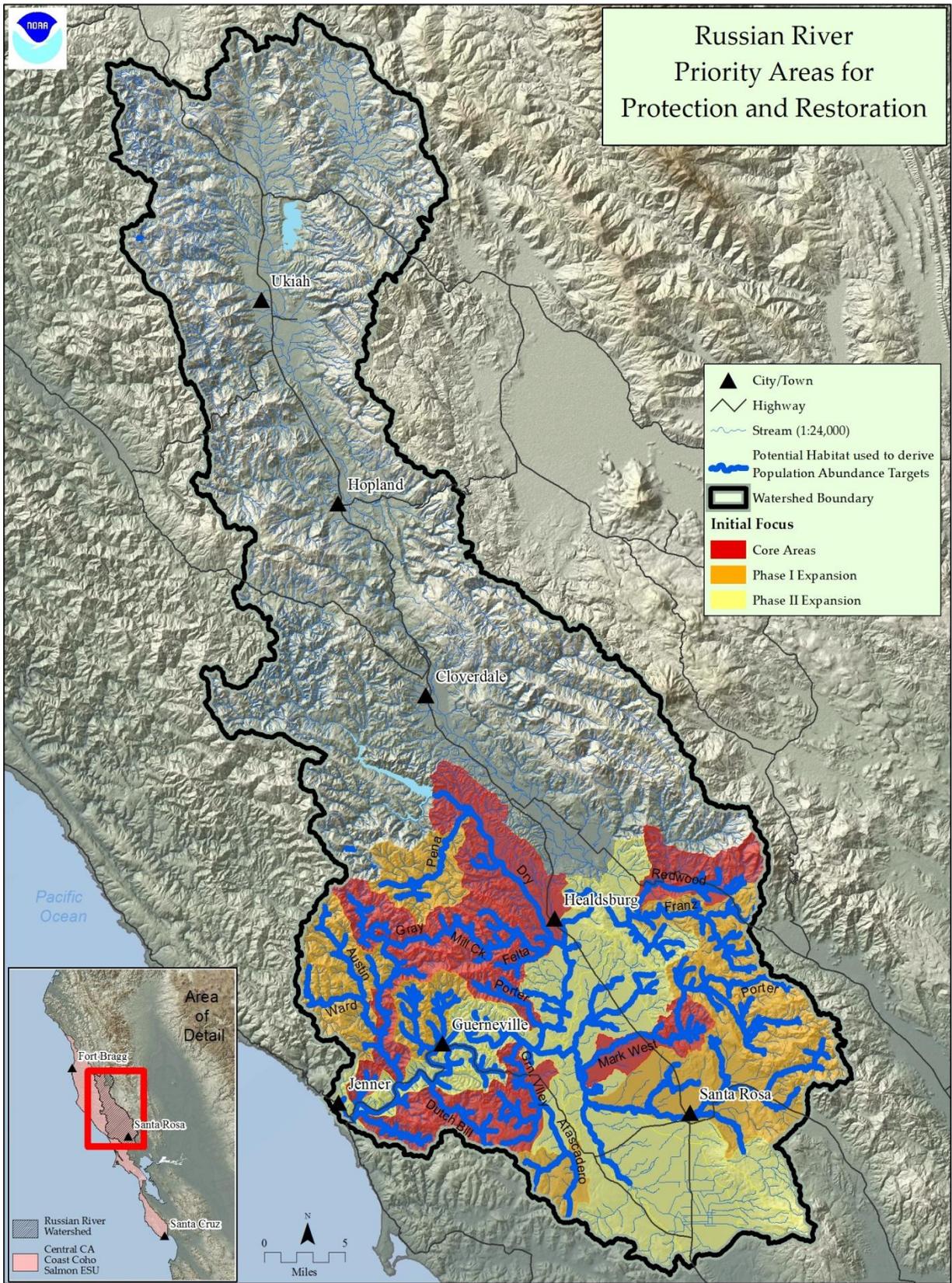


Figure 1: Map of Russian River

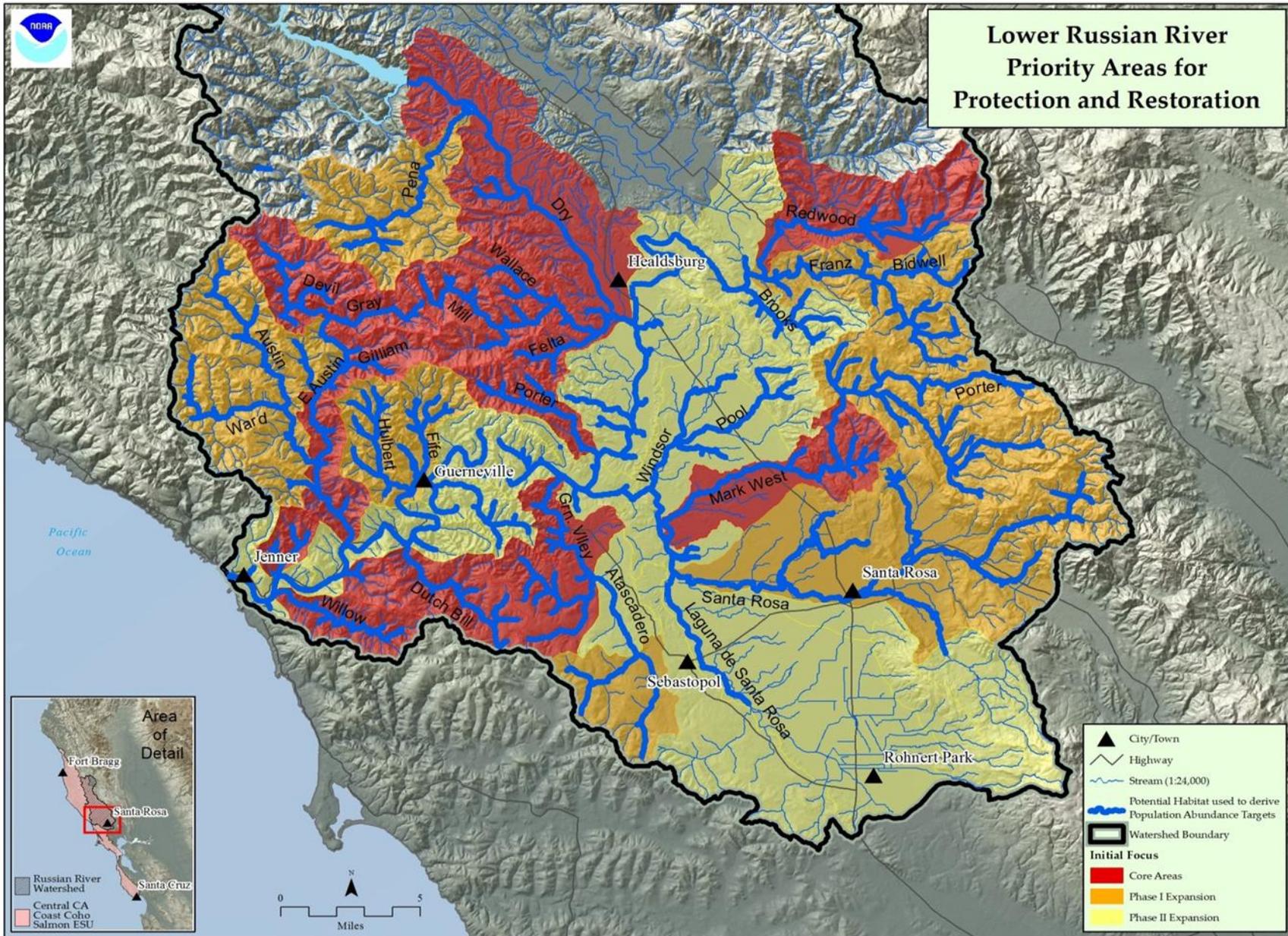


Figure 2: Map of Lower Russian River

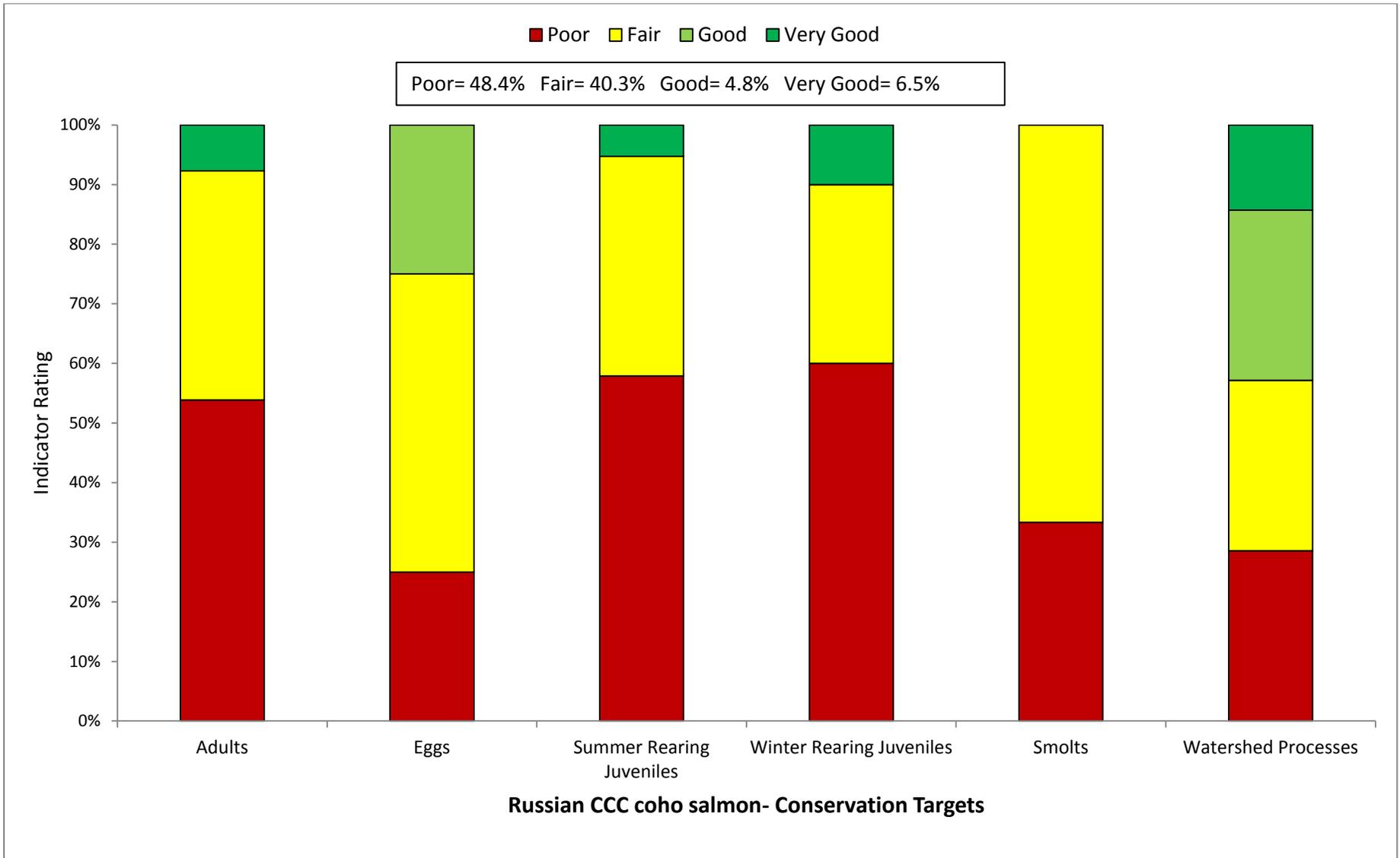


Figure 3: Viability Results by Lifestage

**Table 1: CAP Viability Results ~ Russian River**

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	<b>2 Key Pieces/100m</b>	Poor	NMFS Expert Estuary/Lagoon Panel	6 to 11 key pcs/100m
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	<b>0.6 Key Pieces/100m</b>	Poor	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	<b>49% stream; 46% IP-km (&gt;30% Pools; &gt;20% Riffles)</b>	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	<b>12% streams; 9% IP-km (&gt;80 stream average)</b>	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>80 stream average)
Adults	Hydrology	Passage Flows	<b>Risk Factor Score =75</b>	Fair	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Adults	Passage/Migration	Passage at Mouth or Confluence	<b>50% of IP-km to 74% of IP-km accessible</b>	Fair	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Passage/Migration	Physical Barriers	<b>96% of IP-km accessible</b>	Very Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	<b>7% Class 5 &amp; 6 across IP-km</b>	Poor	SEC Analysis/CDFG Data	55 - 69% Class 5 & 6 across IP-km
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Adults	Sediment	Quantity & Distribution of Spawning Gravels	<b>50% of IP-km to 74% of IP-km accessible</b>	Fair	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	<b>&lt;50% Response Reach Connectivity</b>	Poor	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Adults	Water Quality	Toxicity	<b>Sublethal or Chronic</b>	Fair	SEC Analysis/CDFG Data	No Acute or Chronic
Adults	Water Quality	Turbidity	<b>50% to 74% of streams/ IP-km maintains severity score of 3 or lower</b>	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Adults	Viability	Density	<b>&lt;1 spawner per IP-km</b>	Poor	SEC Analysis/CDFG Data	low risk spawner density per Spence (2008)
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	<b>Risk Factor Score =67</b>	Fair	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	<b>Risk Factor Score =83</b>	Poor	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50

Eggs	Sediment	Gravel Quality (Bulk)	12-14% (0.85mm) and <30% (6.4mm)	Good	NMFS Instream Flow Analysis	12-14% (0.85mm) and <30% (6.4mm)
Eggs	Sediment	Gravel Quality (Embeddedness)	56% streams; 36% IP-km (>50% stream average scores of 1 & 2)	Fair	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	Impaired/non-functional	Poor	NMFS Instream Flow Analysis	Properly Functioning Condition
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	2 Key Pieces/100m	Poor	NMFS Instream Flow Analysis	6 to 11 key pcs/100m
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	0.6 Key Pieces/100m	Poor	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	31% stream; 38% IP-km (>49% of pools are primary pools)	Poor	NMFS Instream Flow Analysis	75% to 89% of streams/ IP-Km (>49% of pools are primary pools)
Summer Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	49% stream; 46% IP-km (>30% Pools; >20% Riffles)	Poor	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	12% streams; 9% IP-km (>80 stream average)	Poor	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>80 stream average)
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	Risk Factor Score =92	Poor	NMFS Instream Flow Analysis	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	Risk Factor Score =83	Poor	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	3.99 Diversions/10 IP-km	Fair	NMFS Watershed Characterization	0.01 - 1 Diversions/10 IP km
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	50% of IP-km to 74% of IP-km accessible	Fair	NMFS Watershed Characterization	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	96% of IP-km accessible	Very Good	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	50% to 74% of streams/ IP-km (>85% average stream canopy)	Fair	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>85% average stream canopy)
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	7% Class 5 & 6 across IP-km	Poor	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	0	SEC or PAD/CDFG Data	≥80% Density rating "D" across IP-km
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	56% streams; 36% IP-km (>50% stream average scores of 1 & 2)	Fair	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)

Summer Rearing Juveniles	Water Quality	Temperature (MWMT)	<50% IP-km (<16 C MWMT)	Poor	Population Profile/BPJ	75 to 89% IP km (<16 C MWMT)
Summer Rearing Juveniles	Water Quality	Toxicity	Sublethal or Chronic	Fair	NMFS Watershed Characterization/CWHR	No Acute or Chronic
Summer Rearing Juveniles	Water Quality	Turbidity	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Summer Rearing Juveniles	Viability	Density	<0.2 fish/meter^2	Poor	SEC Analysis/CDFG Data	0.5 - 1.0 fish/meter^2
Summer Rearing Juveniles	Viability	Spatial Structure	50-74% of Historical Range	Fair	NMFS Watershed Characterization/CWHR	75-90% of Historical Range
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	2 Key Pieces/100m	Poor	NMFS Watershed Characterization/CWHR	6 to 11 key pcs/100m
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	0.6 Key Pieces/100m	Poor	NMFS Watershed Characterization/CWHR	1.3 to 4 Key Pieces/100 meters
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	49% stream; 46% IP-km (>30% Pools; >20% Riffles)	Poor	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	12% streams 9% IP-km (>80 stream average)	Poor	CDF Vegetation Maps/BPJ	75% to 90% of streams/ IP-Km (>80 stream average)
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	96% of IP-km accessible	Very Good	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	7% Class 5 & 6 across IP-km	Poor	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	56% streams; 36% IP-km (>50% stream average scores of 1 & 2)	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	Poor	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Winter Rearing Juveniles	Water Quality	Toxicity	Sublethal or Chronic	Fair	NMFS Watershed Characterization	No Acute or Chronic
Winter Rearing Juveniles	Water Quality	Turbidity	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair	NMFS Watershed Characterization	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower

Smolts	Estuary/Lagoon	Quality & Extent	Impaired but functioning	Fair	SEC Analysis/CDFG Data	Property Functioning Condition
Smolts	Habitat Complexity	Shelter Rating	12% streams; 9% IP-km (>80 stream average)	Poor	Population Profile	75% to 90% of streams/ IP-Km (>80 stream average)
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	3.99 Diversions/10 IP-km	Fair	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	Risk Factor Score =81	Poor	TRT Spence (2008)	NMFS Flow Protocol: Risk Factor Score 35-50
Smolts	Passage/Migration	Passage at Mouth or Confluence	50% of IP-km to 74% of IP-km accessible	Fair	TRT Spence (2008)	75% of IP-Km to 90% of IP-km
Smolts	Smoltification	Temperature	50-74% IP-km (>6 and <16 C)	Fair	TRT Spence (2008)	75-90% IP-Km (>6 and <16 C)
Smolts	Water Quality	Toxicity	Sublethal or Chronic	Fair	TRT Spence (2008)	No Acute or Chronic
Smolts	Water Quality	Turbidity	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair	EPA/RWQCB/NMFS Criteria	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Smolts	Viability	Abundance	Abundance leading to high risk spawner density = 0	Poor	Newcombe and Jensen 2003	Smolt abundance to produce low risk spawner density per Spence (2008)
Watershed Processes	Hydrology	Impervious Surfaces	3-6% of Watershed in Impervious Surfaces	Good	SEC Analysis	3-6% of Watershed in Impervious Surfaces
Watershed Processes	Landscape Patterns	Agriculture	10-19% of Watershed in Agriculture	Good	EPA/RWQCB/NMFS Criteria	10-19% of Watershed in Agriculture
Watershed Processes	Landscape Patterns	Timber Harvest	2% of Watershed in Timber Harvest	Very Good	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	19% of watershed >1 unit/20 acres	Fair	EPA/RWQCB/NMFS Criteria	8-11% of watershed >1 unit/20 acres
Watershed Processes	Riparian Vegetation	Species Composition	25-50% Historical Species Composition	Fair	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	4.4 Miles/Square Mile	Poor	EPA/RWQCB/NMFS Criteria	1.6 to 2.4 Miles/Square Mile
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	4.2 Miles/Square Mile	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

**Table 2: CAP Threats Results ~ Russian River**

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

# Central CA Coast Coho Salmon ~ Russian River

## ACTIONS FOR RESTORING HABITATS

### 1. Restoration- Estuary

1.1. **Objective:** Address the present of threatened destruction, modification or curtailment of the species habitat or range

1.1.1. **Recovery Action:** Increase the extent of estuarine habitat

1.1.1.1. **Action Step:** Restore estuarine habitat and the associated wetlands and sloughs by providing fully functioning habitat (CDFG 2004).

1.1.1.2. **Action Step:** Per the Russian River Biological Opinion, utilize adaptive management to guide future management and development of above guidelines

1.1.1.3. **Action Step:** Restore and enhance estuary habitat in the watershed.

1.1.1.4. **Action Step:** Develop Estuary Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.

1.1.2. **Recovery Action:** Rehabilitate natural river mouth dynamics

1.1.2.1. **Action Step:** Evaluate alterations to river mouth dynamics (e.g. jetty at the mouth) and implement changes to restore natural function

1.1.3. **Recovery Action:** Rehabilitate inner estuarine hydrodynamics

1.1.3.1. **Action Step:** Modify alterations to freshwater inflow and water quality (temperature, dissolved oxygen) and the practice of artificial breaching, through implementation of the Russian River estuary management program, as described within NMFS' Russian River Biological Opinion.

1.1.3.2. **Action Step:** Evaluate the effect of nearby landuse practices and development structures which may impair or reduce the historical tidal prism and other estuarine functions and implement improvements

1.1.3.3. **Action Step:** Prevent future encroachment of landuse (agricultural, residential and commercial) into floodplain areas of the estuary

1.1.4. **Recovery Action:** Reduce extent of estuarine shoreline development

1.1.4.1. **Action Step:** Where appropriate, remove structures and/or modify practices which impair or reduce the historical tidal prism and/or estuarine function where feasible and where benefits to coho salmon and/or the estuarine environment are predicted.

### 2. Restoration- Floodplain Connectivity

2.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

2.1.1. **Recovery Action:** Increase and enhance velocity refuge

- 2.1.1.1. **Action Step:** Design new development to allow streams to meander in historical patterns, Protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.
  - 2.1.1.2. **Action Step:** Avoid new development within riparian zones and the 100 year floodprone zones.
  - 2.1.1.3. **Action Step:** Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.
- 2.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range
- 2.2.1. **Recovery Action:** Increase and enhance velocity refuge
    - 2.2.1.1. **Action Step:** Delineate reaches possessing both potential winter rearing habitat and floodplain areas.
    - 2.2.1.2. **Action Step:** Identify areas where floodplain connectivity can be re-established in low gradient response reaches
    - 2.2.1.3. **Action Step:** Identify the floodplain activation flow - the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation (Williams et al. 2009).
    - 2.2.1.4. **Action Step:** Target habitat restoration and enhancement that will function between summer base flows and flood stage.
    - 2.2.1.5. **Action Step:** Improve conditions to re-create, and restore alcove, backwater, or perennial pond habitats where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity. Develop and implement site specific plans to improve these conditions to re-create, and restore alcove, backwater, or perennial pond habitats
    - 2.2.1.6. **Action Step:** Support landowners in developing projects to improve channel conditions and restore natural channel geomorphology, including side channels and dense contiguous riparian vegetation (CDFG 2004).
    - 2.2.1.7. **Action Step:** Improve over-winter and summer survival by increasing the frequency and functionality of off-channel habitats.
    - 2.2.1.8. **Action Step:** Investigate the potential role of the Laguna de Santa Rosa in supporting floodplain and off-channel habitat.
  - 2.2.2. **Recovery Action:** Rehabilitate and enhance floodplain connectivity
    - 2.2.2.1. **Action Step:** Evaluate the potential to improve winter rearing habitat, and upstream and downstream migration in the Laguna de Santa Rosa channel between River Road and the channel's confluence with Mark West Creek by planting riparian vegetation and deepening the channel

- 2.2.2.2. **Action Step:** Evaluate the potential to reconstruct historic lakes in northern Laguna de Santa Rosa, upstream of the confluence of Laguna Channel & Mark West Creek to enhance overwintering habitat and to improve passage opportunities for upstream migration during dry winters; plant riparian tree species around ponds; debris removal

### 3. Restoration- Habitat Complexity

- 3.1. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range

- 3.1.1. **Recovery Action:** Increase large wood frequency (BFW 0-10 meters)

- 3.1.1.1. **Action Step:** Increase large wood frequency to 75% of streams within the watershed to improve conditions for adults, and winter/summer rearing juveniles
- 3.1.1.2. **Action Step:** Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in all reaches of Green Valley, Purrington, Atascadero, Redwood, Jonive, Castellini and Sexton Creeks
- 3.1.1.3. **Action Step:** Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in select reaches of Bearpen, Black Rock, Kidd, Kohute Gulch, Clear, Pole Mtn, Blue Jay, Tiny, and Holmes Canyon Creeks
- 3.1.1.4. **Action Step:** Increase LWD frequency to optimal conditions (>2 key LWD pieces/100 meters) in select reaches of Austin and Ward Creeks
- 3.1.1.5. **Action Step:** Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in select reaches of Mark West, Dry, and Maacama Creeks

- 3.1.2. **Recovery Action:** Increase frequency of primary pools

- 3.1.2.1. **Action Step:** Increase pool frequency to 75% of streams within the watershed to improve conditions for adults, and summer/winter juveniles
- 3.1.2.2. **Action Step:** Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in all reaches of Purrington, Atascadero, and Castellini Creeks
- 3.1.2.3. **Action Step:** Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in select reaches of Austin, Bear Pen, Black Rock, Blue Jay, Conshea, Devils, Gray, Holmes Canyon, Kidd, Kohute Gulch, Pole Mtn, and Schoolhouse Creeks
- 3.1.2.4. **Action Step:** Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in select reaches of Dry, Maacama, and Mark West Creeks
- 3.1.2.5. **Action Step:** Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (CDFG 2004). Priority streams include Redwood Creek, Foote Creek, Kellogg Creek, and Yellowjacket Creek.

3.1.2.6. **Action Step:** Where feasible, increase woody cover in the pool and flatwater habitat units throughout the Mark West watershed, focusing on a combination of cover/scour structures constructed with boulders and woody debris within flatwater and pool locations. Work should be done in conjunction with stream bank stabilization to prevent erosion (CDFG habitat inventory reports).

3.1.3. **Recovery Action:** Improve shelter rating

3.1.3.1. **Action Step:** Increase shelter ratings to 75% of streams across the watershed to improve conditions for adults, and winter/summer rearing juveniles

3.1.3.2. **Action Step:** Increase shelter ratings to optimal conditions (>80 pool shelter value) in all reaches of Green Valley, Purrington, Atascadero, Redwood, Jonive, Castellini and Sexton Creeks

3.1.3.3. **Action Step:** Increase shelter ratings to optimal conditions (>80 pool shelter value) in select reaches of Austin, Bearpen, Black Rock, Kidd, Kohute Gulch, Clear, Ward, Pole Mtn, Blue Jay, Tiny, and Ward Creeks and Holmes Canyon Creeks

3.1.3.4. **Action Step:** Increase shelter ratings to optimal conditions (>80 pool shelter value) in select reaches of Dry, Mark West and Maacama Creeks

3.1.3.5. **Action Step:** Increase shelter rating on the following streams : tributaries of and including Dry Creek, Forsythe Creek, Willow Creek, Sheephouse Creek, Porter Creek, Dutch Bill Creek, Redwood Creek, Foote Creek, Kellogg Creek, Wine Creek and Yellowjacket Creek.

3.1.4. **Recovery Action:** Improve pool/riffle/flatwater ratios (hydraulic diversity)

3.1.4.1. **Action Step:** Increase the frequencies to 75% of the streams within the watershed

3.1.4.2. **Action Step:** Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Green Valley, Atascadero, Jonive, Castellini and Sexton Creeks

3.1.4.3. **Action Step:** Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Austin Creek.

3.1.4.4. **Action Step:** Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Mark West, Dry and Maacama Creeks

3.2. **Objective:** Address other natural or manmade factors affecting the species' continued existence

3.2.1. **Recovery Action:** Improve Habitat Complexity

3.2.1.1. **Action Step:** Investigate the feasibility of beaver re-location and re-introductions to Sonoma (specifically Austin, Green Valley, lower Russian River independent populations and Salmon Creek) to promote channel complexity, improve baseflows and provide rearing habitat

#### 4. Restoration- Hydrology

4.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

4.1.1. **Recovery Action:** Improve flow conditions (baseflow conditions)

4.1.1.1. **Action Step:** Develop rearing habitat curves to identify optimal base flow conditions

4.1.1.2. **Action Step:** Promote, via technical assistance and/or regulatory action, the reduction of water use affecting the natural hydrograph, development of alternative water sources, and implementation of diversion regimes protective of the natural hydrograph.

4.1.1.3. **Action Step:** Avoid and/or minimize the adverse effects of water diversion on coho salmon by establishing: a more natural hydrograph, by-pass flows, season of diversion, and off-stream storage

4.1.2. **Recovery Action:** Improve flow conditions (instantaneous conditions)

4.1.2.1. **Action Step:** Reduce the rate of frost protection and domestic drawdown in the spring

4.1.2.2. **Action Step:** Assess and map water diversions (CDFG 2004).

4.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

4.2.1. **Recovery Action:** Improve flow conditions (baseflow conditions)

4.2.1.1. **Action Step:** Develop cooperative projects with private landowners to conserve summer flows based on results of the NFWF efforts

4.2.1.2. **Action Step:** Support the water conservation training conducted by the Occidental Arts and Ecology Center Water Institute, Gold Ridge RCD, and Salmon Creek Watershed Council.

4.2.1.3. **Action Step:** 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).

4.2.2. **Recovery Action:** Improve flow conditions (instantaneous conditions)

4.2.2.1. **Action Step:** Work with SWRCB and landowners to improve over summer survival of juveniles by re-establishing summer baseflows (from July 1 to October 1) in rearing reaches that are currently impacted by water use.

4.2.2.2. **Action Step:** Work with SWRCB and landowners to improve flow regimes for adult migration to spawning habitats and smolt outmigration.

4.2.2.3. **Action Step:** Promote alternative frost protection strategies.

4.2.3. **Recovery Action:** Minimize redd scour

4.2.3.1. **Action Step:** Develop floodplain enhancement and LWD projects in modified and incised channel areas of major tributaries

## 5. [Restoration- Landscape Patterns](#)

5.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

- 5.1.1. **Recovery Action:** Prevent increased landscape disturbance
  - 5.1.1.1. **Action Step:** Utilize BMP's which prevent fracturing of landscapes and interruption of natural function in forested watersheds, riparian corridors, and stream systems
  - 5.1.1.2. **Action Step:** Avoid new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas
  - 5.1.1.3. **Action Step:** Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements

5.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

- 5.2.1. **Recovery Action:** Improve sediment transport by implementing DS level actions
- 5.2.2. **Recovery Action:** Improve watershed hydrology by implementing DS level actions
- 5.2.3. **Recovery Action:** Conserve hydrology by implementing DS level actions

## 6. [Restoration- Passage](#)

6.1. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range

- 6.1.1. **Recovery Action:** Rehabilitate and enhance passage into tributaries (aggradation/degradation)
  - 6.1.1.1. **Action Step:** Improve passage in the mainstem and confluences of Austin Creek
  - 6.1.1.2. **Action Step:** Continue restoration projects which employ improved gravel mining practices upstream of mile 1 on Austin Creek
- 6.1.2. **Recovery Action:** Modify or remove physical passage barriers
  - 6.1.2.1. **Action Step:** Identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a).
  - 6.1.2.2. **Action Step:** Remove or modify the flashboard dam on lower Mill Creek near the confluence with Wallace Creek. This barrier is the highest priority barrier within the Russian River population for remediation.
  - 6.1.2.3. **Action Step:** Investigate passage at multiple sites along Atascadero Creek and tributaries and implement improvements
  - 6.1.2.4. **Action Step:** Improve passage at existing County culvert barriers on Pole Mountain Creek, Kid Creek and Kohute Gulch.
  - 6.1.2.5. **Action Step:** Assess the old flashboard dam on Bear Pen Creek, and implement recommendations to improve passage.
  - 6.1.2.6. **Action Step:** Assess the log jam/slide barrier on Gilliam and Schoolhouse Creeks and implement recommendations to improve passage

- 6.1.2.7. **Action Step:** Improve passage at sites identified in Mill, Pena and Grape Creek. The falls on lower Mill Creek and on lower Felta Creek need to be evaluated for passage periodically and improved/maintained if necessary. (CDFG 2004).
- 6.1.2.8. **Action Step:** Investigate passage barriers on Dutcher Creek, Felta Creek (CDFG survey reach 2), Foss Creek, Mill Creek, Norton Creek, Pine Ridge Canyon Creek, Schoolhouse Creek, West Slough, and Wine Creek (CDFG stream survey reports). Pena Creek tributaries should also be investigated.
- 6.1.2.9. **Action Step:** Several large barriers exist on Dutcher Creek. Fish passage specialists should investigate the cost/benefit of improving passage at these locations. If advantageous, the barriers should be addressed. (CDFG 2004).
- 6.1.2.10. **Action Step:** Log-jams in the Chapman Branch and Pena Creek need to be monitored/investigated for passage. Prior to removing logjams, consult with NMFS and CDFG fish passage specialists (CDFG 2004).
- 6.1.2.11. **Action Step:** Barriers on mainstem Russian River (memorial beach and Willow Water District Dam) should be assessed by a fish passage specialist and modified if needed.
- 6.1.2.12. **Action Step:** Evaluate and implement passage opportunities in the Maacama Creek subwatershed and its tributaries. Priority streams include Redwood Creek, Foote Creek, Kellogg Creek and Yellowjacket Creek.

## 7. [Restoration- Pool Habitat](#)

No species-specific actions were developed. See Habitat Complexity.

## 8. [Restoration- Riparian](#)

- 8.1. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range

- 8.1.1. **Recovery Action:** Improve tree diameter

- 8.1.1.1. **Action Step:** In the upper Austin Creek sub-basin reforestation to a conifer forest should be a long term strategy to return the area to fully functioning condition. Implementing this type of strategy will need to employ incentives and assistance to landowners
- 8.1.1.2. **Action Step:** Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream). Watersheds identified by CDFG include Porter, Foote, Grub, Franz, and Franchi.
- 8.1.1.3. **Action Step:** Conduct conifer release to promote growth of larger diameter trees where appropriate. High priority areas for consideration may include Austin Creek, and upper Briggs Creek and upper Bidwell Creek (Laurel Marcus and Associates 2004).
- 8.1.1.4. **Action Step:** In Willow Creek there is a limited supply of large diameter, riparian redwood and Douglas-fir in the watershed. Promote growth of conifers in the riparian zone for later in-channel recruitment.

- 8.1.2. **Recovery Action:** Improve canopy cover

- 8.1.2.1. **Action Step:** Increase tree diameter within 40% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 tree)
- 8.1.2.2. **Action Step:** Plant native riparian species and native conifers/hardwoods in the riparian zone within the Upper and Lower Gray Creek sub-basin to increase overall tree diameter
- 8.1.2.3. **Action Step:** Plant native riparian species and native conifers/hardwoods throughout riparian zones within the eastern and southern portions of Green Valley Creek watershed to increase overall tree diameter
- 8.1.2.4. **Action Step:** Mark West Tributaries, specifically Humbug, Porter, Horse Hill and Weeks Creeks are high priority creeks for riparian restoration
- 8.1.2.5. **Action Step:** Work with landowners to evaluate any existing conservation easements that exist within the Maacama watershed. Changes in these easements to better protect riparian habitat should be investigated (Laurel Marcus and Associates 2004).
- 8.1.2.6. **Action Step:** Focus riparian restoration within Santa Rosa, Matanzas, Brush/Rincon, Piner, Paulin, Windsor and Pool Creeks. Where appropriate, riparian surveys should be continued above CDFG survey section. Santa Rosa Creek work should focus on survey reach 1 and the channelized section. Matanzas Creek work would benefit from utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel (CDFG stream survey reports).
- 8.1.2.7. **Action Step:** Increase canopy cover levels within the Dry Creek watershed. Priority streams include Fall Creek (reach 1), Felta Creek (reach 2,3), Foss Creek, Mill Creek, Norton Creek, Pechaco Creek (reach 1,2,3), Pena Creek, West Slough, Wine Creek (reach 1), and Woods Creek (reach 1,2,3) (CDFG stream survey reports).
- 8.1.2.8. **Action Step:** Restore and protect riparian vegetation in Turtle Creek, Fife Creek, Porter Creek, Bluejay Creek, Fisher Creek, Grub Creek, and Corral Creek (CDFG stream survey reports).

8.2. **Objective:** Address the inadequacy of existing regulatory mechanisms

- 8.2.1. **Recovery Action:** Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).

## 9. Restoration- Sediment

9.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

9.1.1. **Recovery Action:** Reduce turbidity and suspended sediment

- 9.1.1.1. **Action Step:** Reduce embeddedness levels to the extent that 75% to 90% of streams within the watershed meet optimal criteria (>50% stream average scores of 1 & 2)
- 9.1.1.2. **Action Step:** Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004). High priority streams identified by CDFG habitat reports include Sheephouse Creek, Austin and East Austin Creeks, Pena Creek, Porter Creek, Kidd Creek, Sexton Creek, Gilliam Creek, Hobson

Creek, Conshea Creek, Crane Creek, and Schoolhouse Creek (<http://coastalwatersheds.ca.gov/>).

- 9.1.1.3. **Action Step:** In Purrington Creek several stream crossings exist in Reach 1. These crossings should be improved to eliminate active soil erosion and runoff.
- 9.1.1.4. **Action Step:** Maintenance of ditches, culverts, and inboard cutbank slides should be improved to decrease the potential of sediment delivery to Dutchbill and Grub Creeks.
- 9.1.1.5. **Action Step:** In the East Austin Creek watershed, implement results of existing sediment source surveys, and assess remaining watershed road networks to eliminate high priority and high sediment yield sources. Upgrade and decommission sites and road networks where appropriate. These actions include outsloping roads, ditch relief culverts, and installing rolling dips.
- 9.1.1.6. **Action Step:** Implement recommendations of completed sediment source surveys in Austin and East Austin Creek mainstems, Gray Creek, and Pole Mountain Creeks (See ROADS for specific actions)
- 9.1.1.7. **Action Step:** Implement recommendations of completed sediment source surveys in Mark West, Dry Creek and Green Valley and Purrington Creeks (See ROADS for specific actions)
- 9.1.1.8. **Action Step:** Conduct instream and upslope sediment source surveys in Atascadero, Mark West, and Maacama Creeks to identify existing sources of high sediment yield using accepted protocols and implement recommendations
- 9.1.1.9. **Action Step:** Conduct sediment source surveys in Black Rock Creek, Kidd Creek and other tributaries to identify existing sources of high sediment yield using accepted protocols and implement recommendations
- 9.1.1.10. **Action Step:** Initiate sediment assessments and landslide mapping in the Dry Creek watershed. High priority streams include Crane Creek, Felta Creek (reach 3,4), Grape Creek, Mill Creek, Palmer Creek, Pena Creek, Pine Ridge Canyon Creek, Wallace Creek, Wine Creek and Woods Creek (CDFG stream survey reports).
- 9.1.2. **Recovery Action:** Improve and expand instream gravel quantity
  - 9.1.2.1. **Action Step:** Develop habitat enhancement projects to establish additional riffle habitat and import spawning gravel from mining operations in the Russian River basin to select reaches of Green Valley, Atascadero, Jonive, Castelini and Sexton Creeks
  - 9.1.2.2. **Action Step:** Debris jams are potentially trapping sediment and eroding adjacent banks within Schoolhouse Creek, Wine Creek, and Woods Creek. The jams should be analyzed for possible removal or modification (CDFG stream survey reports).
  - 9.1.2.3. **Action Step:** Spawning gravel is limited within Dutcher Creek (reach 1), Fall Creek, Felta Creek, Grape Creek, and Wine Creek (upper and lower reaches) (CDFG stream habitat reports). Implement actions to improve spawning gravel abundance and quality within these stream.

10.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

10.1.1. **Recovery Action:** Increase abundance

10.1.1.1. **Action Step:** Continue the operation of the Captive Broodstock Program

10.1.1.2. **Action Step:** Improve and expand rearing capacity of the Coho Salmon Captive Broodstock facility.

10.1.1.3. **Action Step:** Continue and expand the existing coho salmon life-cycle monitoring efforts.

10.1.1.4. **Action Step:** Minimize departure from the genetic profile that historically existed in the population.

10.1.1.5. **Action Step:** Use surplus broodstock to repopulate nearby watersheds (within diversity strata) where populations have extirpated.

10.1.1.6. **Action Step:** Continue to rescue juvenile coho salmon with existing permittees that are under an imminent risk of stranding and mortality and relocate to suitable habitat when deemed appropriate by NMFS and CDFG

10.1.1.7. **Action Step:** Implement recovery actions where indicators rated poor or fair in streams which are currently receiving broodstock as a priority .

10.1.1.8. **Action Step:** Monitor the effectiveness and maintenance of watershed restoration projects and augment inventories as needed (CDFG 2004).

10.1.1.9. **Action Step:** Adjust population targets and indicator ratings to reflect new habitat improvements and accessible habitat expansions

10.1.1.10. **Action Step:** Conduct habitat surveys to monitor change in key habitat variables. Specific locations to be monitored will be determined through implementation of the Coastal Salmonid Monitoring Plan

10.1.1.11. **Action Step:** Utilize the hatchery criteria and assessment guidance provided in Spence et al. 2008 when evaluating the risks and benefits of proposed and ongoing hatchery operations

10.1.2. **Recovery Action:** Increase spawner density

10.1.2.1. **Action Step:** Fund monitoring actions to evaluate success of adult reintroductions towards salmon recovery.

10.1.2.2. **Action Step:** Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed. Surveys should include all three cohorts.

10.1.2.3. **Action Step:** Increase size at release to attain 160 mm at emigration, to enhance marine survival and increasing adult returns

10.1.2.4. **Action Step:** Establish a release imprinting station on Mill Creek and Green Valley Creeks, and other smolt release streams, so that smolts can be held for a minimum two week period

prior to release. The holding period should allow for imprinting to occur on the parent release stream, increasing the potential for returns as adults which spawn naturally.

10.1.2.5. **Action Step:** Increase coho salmon smolt production at the Russian River Coho Salmon Broodstock facility to a level where consistent returns can be incorporated reliably into the spawning matrix

10.1.2.6. **Action Step:** Continue to utilize surplus fish in additional recovery opportunities (adult releases, releases to extirpated watersheds) and evaluate such actions in the context of recovering coho in the Russian River, extirpated watersheds, and the contribution to the diversity stratum

10.1.2.7. **Action Step:** Utilize different marking method to identify program coho salmon from wild coho salmon to facilitate monitoring while reducing adult mortality. Transition away from adipose clipping broodstock program coho salmon to reduce by catch of adult coho salmon during the recreational steelhead season (only adipose clipped steelhead can be legally harvested and coho salmon can be confused for steelhead).

10.1.3. **Recovery Action:** Increase spatial structure and diversity

10.1.3.1. **Action Step:** Conduct outreach with landowners to expand broodstock releases within core, then remaining phase 1, then phase 2 streams within the watershed.

10.1.3.2. **Action Step:** Annually capture or retain (during rescue efforts) - small numbers of surplus fish from drying streams/habitats in Marin and Sonoma Counties for purposes of broodstock in Russian River, Walker and Salmon Creeks.

10.1.3.3. **Action Step:** Conduct periodic, standardized smolt outmigration surveys to estimate smolt abundance in the watershed. Surveys should occur during the same period as adult spawning surveys.

10.1.3.4. **Action Step:** Evaluate the tailwater section of the upper Russian River below Lake Mendocino in its capacity to serve as rearing habitat for juvenile and smolt coho salmon

## 11. Restoration- Water Quality

11.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

11.1.1. **Recovery Action:** Improve stream temperature conditions

11.1.1.1. **Action Step:** Increase the canopy by planting native species where shade canopy is not at acceptable levels within middle Salmon Creek, Nolan, and Coleman Valley Creeks.

11.1.1.2. **Action Step:** Plant native vegetation to promote streamside shade: increase the canopy by planting native species where shade canopy is not at acceptable levels.

11.1.1.3. **Action Step:** Improve riparian and instream conditions in rearing habitats by establishing riparian protection zones that extends from the outer edge of the channel out to the site potential of tree height to allow LWD recruitment.

11.1.1.4. **Action Step:** Develop site-specific recommendations, including incentives, to remedy high temperatures and implement (CDFG 2004) initially in core areas, following with phase 1 and 2 areas.

11.1.2. **Recovery Action:** Improve stream water quality conditions

11.1.2.1. **Action Step:** Install continuous water quality monitoring stations in lower Green Valley and Atascadero Creeks

11.1.2.2. **Action Step:** Work with livestock and ranch owners to implement BMP's to control sediment and nitrates

11.1.2.3. **Action Step:** Domestic garbage along Purrington Creek should be cleaned up and existing illegal dump sites along the road should be posted to reduce the possibility of toxic substances entering the creek. These dump sites appear to be routinely visited and periodic patrols by local law enforcement should be encouraged.

11.1.2.4. **Action Step:** Assess the number of septic systems or other wastewater producers that deliver toxics to the lower mainstem Russian River and tributaries (such as Dutchbill Creek and others). Work with cities and Sonoma County to eliminate these sources of toxic input.

## *THREAT ABATEMENT ACTIONS*

### **12. Threat- Agricultural Practices**

12.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

12.1.1. **Recovery Action:** Prevent increased landscape disturbance

12.1.1.1. **Action Step:** Design new developments to avoid unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to watercourses

12.1.1.2. **Action Step:** Develop legislation that will fund county planning for environmentally sound agricultural growth and water supply

12.1.2. **Recovery Action:** Prevent adverse alterations to riparian species composition and structure

12.1.2.1. **Action Step:** Enforce requirements of local regulations and riparian/setbacks

12.1.2.2. **Action Step:** Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.

12.1.2.3. **Action Step:** Enforce existing building permit programs to minimize unpermitted construction.

12.1.2.4. **Action Step:** Encourage the purchase of land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities and corridors.

12.1.2.5. **Action Step:** Develop riparian setbacks/buffers where they do not currently occur, and enforce requirements of local regulations where they do

12.1.2.6. **Action Step:** Continue to educate and encourage the County of Mendocino to adopt a grading ordinance that meets NMFS, RWQCB, and CDFG approval.

12.2. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range.

12.2.1. **Recovery Action:** Prevent increased landscape disturbance

12.2.1.1. **Action Step:** Implement Best Management Practices such as those in the Fish Friendly Farming program (California Land Stewardship Institute), or other cooperative conservation programs.

12.2.1.2. **Action Step:** Streamline permit processing where landowners are conducting actions aligned with recovery priorities.

12.2.1.3. **Action Step:** 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 salmon recovery priorities.

12.2.2. **Recovery Action:** Prevent adverse alterations to riparian species composition and structure

12.2.2.1. **Action Step:** Improve water temperature conditions for migrating smolts and summer rearing juveniles throughout 35% of watershed by increasing the canopy by planting native species where shade canopy is not at acceptable levels .

### **13. Threat- Channel Modification**

13.1. **Objective:** Address inadequacies of regulatory mechanisms

13.1.1. **Recovery Action:** Prevent impairment to floodplain connectivity

13.1.1.1. **Action Step:** All proposed flood control projects should include habitat protection, and/or alternatives that minimize impacts to salmon habitat.

13.1.1.2. **Action Step:** Channel modifying projects should be designed to ensure potential effects to salmonid habitat are fully minimized or mitigated, and where possible, existing poor conditions should be remediated.

13.1.1.3. **Action Step:** Ensure that all future and existing channel designed for flood conveyance incorporate features that enhance salmonid migration under high and low flow conditions.

13.1.1.4. **Action Step:** Modify city and county regulatory and planning processes to eliminate provisions allowing new construction of permanent infrastructure that will adversely affect watershed processes, within the 100-year flood prone zones

13.1.1.5. **Action Step:** Develop a mitigation policy that requires in-kind replacement of removed large woody debris at a 3:1 ratio.

13.1.1.6. **Action Step:** Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.

13.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

13.2.1. **Recovery Action:** Prevent impairment to floodplain connectivity

13.2.1.1. **Action Step:** Where feasible, remove obsolete bank stabilization structures from the channel which contribute to channel incision and reduced habitat complexity.

13.2.1.2. **Action Step:** Evaluate undeveloped and developed floodplain property for potential function and conservation easement and/or acquisition potential.

13.2.1.3. **Action Step:** Conduct rehabilitation activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows, (see FLOODPLAIN for specific actions).

13.2.1.4. **Action Step:** Promote bio-engineering solutions as appropriate (e.g. carefully evaluate feasibility where critical infrastructure is located) for bank hardening projects.

13.2.1.5. **Action Step:** Set-back existing levees in strategic areas to increase flood-flow detention and promote flood-tolerant land uses.

#### 14. Threat- Disease/Predation/Competition

No species-specific actions were developed.

#### 15. Threat- Fire/Fuel Management

No species-specific actions were developed.

#### 16. Threat- Fishing/Collecting

16.1. **Objective:** Address the overutilization for commercial, recreational, scientific or educational purposes

16.1.1. **Recovery Action:** Prevent reduced density, abundance, and diversity

16.1.1.1. **Action Step:** Work with CDFG to improve the Fishing Regulation manual to clearly identify differences in body morphology of all potentially present adult salmonids with color photos of diagnostic features (e.g., caudal fin spotting, caudal fin shape, coloration of lower jaw, peduncle width, etc.).

16.1.1.2. **Action Step:** Install/construct permanent signs at major public fishing access points along the Russian River (below Dry Creek) that clearly identify differences in body morphology of all potentially present adult salmonids with color photos (e.g., caudal fin spotting, caudal fork shape, coloration of lower jaw, peduncle width, etc.).

16.2. **Objective:** Address the inadequacy of existing regulatory mechanisms

16.2.1. **Recovery Action:** Prevent reduced density, abundance, and diversity

16.2.1.1. **Action Step:** Minimize interception of CCC coho salmon during the trout and steelhead freshwater sport fishing season.

16.2.1.2. **Action Step:** NMFS and CDFG will work to improve the California Freshwater Sport Fishing Regulations to minimize interception of adult salmonids.

- 16.2.1.3. **Action Step:** NMFS will work with CDFG to modify low flow restrictions under Article 4. Supplemental Regulations, Section 8.00 (a).
- 16.2.1.4. **Action Step:** NMFS and CDFG will work to improve the marking strategy of the coho captive broodstock recovery program to decrease confusion with allowable harvested hatchery steelhead.
- 16.2.1.5. **Action Step:** Promote CalTip to discourage poaching (CDFG 2004).

## 17. Threat- Hatcheries

17.1. **Objective:** Address other natural or manmade factors affecting the species' continued existence

17.1.1. **Recovery Action:** Increase spatial structure and diversity

- 17.1.1.1. **Action Step:** Continue the operation of the Captive Broodstock Program
- 17.1.1.2. **Action Step:** Utilize the hatchery criteria and assessment guidance provided in Spence et al. 2008 when evaluating the risks and benefits of proposed and ongoing hatchery operations
- 17.1.1.3. **Action Step:** Preserve the remaining genetic and phenotypic characteristics that promote life history variability through captive broodstock, supplementation, and gene-bank programs to reduce risk of extirpation.
- 17.1.1.4. **Action Step:** Utilize resources to increase genetic variability in Captive Programs as well as for adult re-introduction efforts in barren Marin and Sonoma County streams (Walker and Salmon Creek Programs are models for others)

## 18. Threat- Livestock

18.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

18.1.1. **Recovery Action:** Prevent adverse alterations to riparian species composition and structure

18.1.1.1. **Action Step:** Support grazing practices that minimize impacts to riparian and instream habitat: livestock exclusion, rotational grazing, etc.

18.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

18.2.1. **Recovery Action:** Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)

- 18.2.1.1. **Action Step:** Encourage riparian restoration to regain riparian corridors damaged from livestock and other causes.
- 18.2.1.2. **Action Step:** To minimize gully initiation, grazing should be kept at relatively low intensities on steeper slopes
- 18.2.1.3. **Action Step:** Where necessary, establish predetermined stream crossings when herding cattle between pastures.
- 18.2.1.4. **Action Step:** Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.

- 18.2.2. **Recovery Action:** Prevent impairment to stream hydrology (impaired water flow)
- 18.2.2.1. **Action Step:** Aid landowners willing to fence off riparian areas with development of offstream alternative water sources
  - 18.2.2.2. **Action Step:** Increase the use of water storage and catchment systems that collect rainwater in the winter for use during the dry summer and fall seasons.
- 18.2.3. **Recovery Action:** Prevent adverse alterations to riparian species composition and structure
- 18.2.3.1. **Action Step:** Provide funding assistance to landowners willing to fence riparian and other sensitive areas (areas prone to erosion) to exclude cattle and sheep. Calf/cow operations should take first priority for riparian fencing programs over steer operations.
  - 18.2.3.2. **Action Step:** Encourage develop and fund riparian restoration projects to regain riparian corridors damaged from livestock and other causes.
  - 18.2.3.3. **Action Step:** Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff. Short term, seasonal and long term rest from grazing in overgrazed areas would improve soil conditions for native revegetation and land values as well.
  - 18.2.3.4. **Action Step:** Manage rotational grazing to aid in the reduction of noxious weeds.
  - 18.2.3.5. **Action Step:** Fence riparian areas within the Dry Creek watershed from grazing by using fencing standards that excludes cattle but allows other wildlife to access the stream. High priority stream reaches include Pechaco Creek (reach 1 and 2) and Pena Creek (reach 3) (CDFG stream survey reports).
  - 18.2.3.6. **Action Step:** Fence riparian areas within the Mark West watershed from grazing by using fencing standards that allow other wildlife to access the stream.
  - 18.2.3.7. **Action Step:** Fence riparian areas within the Maacama Creek watershed from grazing by using fencing standards that allow other wildlife to access the stream. Combine fencing with appropriate riparian regeneration projects when possible. High priority streams include Bear, Ingall, McDonnell, Lower Briggs, Little Briggs, and Coon Creek (Laurel Marcus and Associates 2004).
  - 18.2.3.8. **Action Step:** Exclusion fencing and off-stream water development should be explored and implemented within the McDonnell Creek watershed to address livestock damage in riparian areas.

## 19. [Threat- Logging](#)

19.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

19.1.1. **Recovery Action:** Prevent future impacts to habitat complexity

19.1.1.1. **Action Step:** Acquire key large tracts of forestlands identified as a priority by Federal, State, local government, and non-governmental organizations

19.1.1.2. **Action Step:** Encourage forest management which allows for optimal levels of natural LWD recruitment of larger older trees into stream channels

19.1.1.3. **Action Step:** Conserve and manage forestlands for older forest stages.

19.1.1.4. **Action Step:** 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).

19.1.1.5. **Action Step:** Establish greater oversight and post-harvest monitoring by the permitting agency for operations within high value habitat areas

19.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range.

19.2.1. **Recovery Action:** Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)

19.2.1.1. **Action Step:** Develop a Transportation Plan and adequately upgrade necessary roads, and relocate and/or decommission riparian or unnecessary roads (see ROADS for specific actions/areas)

19.2.1.2. **Action Step:** Develop a Road Sediment Reduction Plan that prioritizes problem sites and outlines implementation and a timeline of necessary actions.

19.2.1.3. **Action Step:** Utilize BMP's to properly construct roads for storm proofing and Avoid the construction of roads in the riparian zone.

## **20. Threat- Mining**

20.1. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range.

20.1.1. **Recovery Action:** Prevent impairment to instream habitat complexity (altered pool complexity and/or pool riffle ratio)

20.1.1.1. **Action Step:** Utilize NMFS guidelines and geomorphic considerations in developing sustainable mining practices which create and promote habitat development and maintenance

## **21. Threat- Recreation**

No species-specific actions were developed.

## **22. Threat- Residential/Commercial Development**

22.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

22.1.1. **Recovery Action:** Prevent impairment to watershed hydrology

22.1.1.1. **Action Step:** Modify Federal, State, local processes, and County General Plans, to eliminate provisions allowing new construction in undeveloped areas within the 100-year flood prone zone

22.1.1.2. **Action Step:** Encourage infill and high density developments over dispersal of low density rural residential in undeveloped areas.

22.1.1.3. **Action Step:** Standards and recommendations regarding development should apply to all jurisdictions, including school districts and other special districts not subject to county and/or state related ordinances or policies.

22.1.1.4. **Action Step:** 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.

22.1.2. **Recovery Action:** Prevent impairment to water quality

22.1.2.1. **Action Step:** Implement performance standards in Stormwater Management Plans.

22.1.2.2. **Action Step:** Disperse discharge from commercial and residential areas into a spatially distributed network rather than a few point discharges.

22.1.2.3. **Action Step:** Improve water quality where necessary by addressing residential and commercial pollutant sources.

22.1.2.4. **Action Step:** Implement performance standards in Stormwater Management Plans.

22.1.3. **Recovery Action:** Prevent adverse alterations to riparian species composition and structure

22.1.3.1. **Action Step:** Develop riparian setbacks/buffers where they do not currently occur, and enforce requirements of local regulations where they do

22.1.3.2. **Action Step:** Enforce requirements of local regulations and riparian/setbacks

22.1.3.3. **Action Step:** Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).

22.1.3.4. **Action Step:** Assess efficacy and necessity of ongoing stream maintenance practices and evaluate, avoid, minimize and/or mitigate their impacts to rearing and migrating steelhead.

22.1.3.5. **Action Step:** Address failing septic systems in rural areas

22.2. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range

22.2.1. **Recovery Action:** Prevent adverse alterations to riparian species composition and structure

22.2.1.1. **Action Step:** Utilize native plants when landscaping and discourage the use of exotic invasives

22.2.1.2. **Action Step:** Identify areas at high risk of conversion, and develop incentives and alternatives for landowners that discourage conversion.

22.2.1.3. **Action Step:** Explore the use of conservation easements to provide incentives for private landowners to preserve riparian corridors

22.2.2. **Recovery Action:** Prevent impairment to watershed hydrology

22.2.2.1. **Action Step:** Encourage the use and provide incentives for rooftop water storage and other conservation devices

### **23. Threat- Roads/Railroads**

23.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

23.1.1. **Recovery Action:** Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)

23.1.1.1. **Action Step:** Assess and redesign transportation network to minimize road density and maximize transportation efficiency.

23.1.1.2. **Action Step:** In the Russian River watershed, implement results of existing sediment source surveys, and assess remaining watershed road networks to eliminate high priority and high sediment yield sources. Upgrade and decommission sites and road networks where appropriate. These actions include outslowing roads, ditch relief culverts, and installing rolling dips.

23.1.1.3. **Action Step:** Establish adequate spoils storage sites throughout the watershed so material from landslides and road maintenance can be stored safely away from watercourses. Coordinate these efforts with all landowners in the watershed.

23.1.1.4. **Action Step:** Implement DS level recommendations

23.1.2. **Recovery Action:** Prevent impairment to watershed hydrology

23.1.2.1. **Action Step:** Utilize best management practices for road construction (e.g. Fishnet 4C, 2004; Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).

23.1.2.2. **Action Step:** Reduce riparian road densities by 10 percent over the next 10 years, prioritizing high risk areas in Core CCC coho salmon watersheds.

23.2. **Objective:** Address the inadequacy of existing regulatory mechanism

23.2.1. **Recovery Action:** Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)

23.2.1.1. **Action Step:** Establish a moratorium on new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.

### **24. Threat- Severe Weather Patterns**

24.1. **Objective:** Address the inadequacy of existing regulatory mechanisms

24.1.1. **Recovery Action:** Prevent impairment to hydrology

24.1.1.1. **Action Step:** Work with CDFG, County of Sonoma, State Parks, municipalities, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.

24.1.1.2. **Action Step:** Land use zoning should be appropriate to the site and be tolerant to anticipated conditions (e.g., tolerant to frequent flooding).

24.1.1.3. **Action Step:** Work with local governments to incorporate protection of CCC coho salmon in any flood management activity (CDFG 2004).

24.2. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range

24.2.1. **Recovery Action:** Prevent impairment to hydrology

24.2.1.1. **Action Step:** Minimize water use and seek alternatives during droughts.

24.2.1.2. **Action Step:** Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.

24.2.1.3. **Action Step:** Pursue opportunities to acquire or lease water, or acquire water rights from willing sellers, for coho salmon recovery purposes. Develop incentives for water right holders to dedicate instream flows for the protection of coho salmon (CDFG 2004)(Water Code § 1707).

24.2.2. **Recovery Action:** Prevent impairment to water quality (impaired instream temperature)

24.2.2.1. **Action Step:** Maintain canopy levels at desirable levels in all streams and restore canopy levels to desirable levels in high value habitat areas (See WATER QUALITY for specific actions/areas)

## 25. Threat- Water Diversion/Impoundment

25.1. **Objective:** Address the present or threatened destruction, modification or curtailment of the species habitat or range

25.1.1. **Recovery Action:** Prevent impairment to stream hydrology (impaired water flow)

25.1.1.1. **Action Step:** Promote the use of reclaimed water for agricultural or other uses.

25.1.1.2. **Action Step:** Promote water conservation by the public, water agencies, agriculture, private industry, and the citizenry.

25.1.1.3. **Action Step:** Promote off-channel storage to reduce impacts of water diversion (e.g., storage tanks for rural residential users).

25.1.1.4. **Action Step:** 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 §1707 (CDFG 2004).

25.1.1.5. **Action Step:** Improve coordination between agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and their habitats, and avoidance of adverse impacts caused by water diversion (CDFG 2004).

25.1.1.6. **Action Step:** Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).

25.1.1.7. **Action Step:** Promote the use of reclaimed water for agricultural or other uses.

25.1.1.8. **Action Step:** Promote water conservation best practices such as drip irrigation for vineyards.

25.1.2. **Recovery Action:** Prevent impairment to estuary

25.1.2.1. **Action Step:** Identify upstream pollution sources which contribute to poor water quality conditions in the estuary

25.1.3. **Recovery Action:** Prevent reduced density, abundance, and diversity

25.1.3.1. **Action Step:** Adequately screen water diversions to prevent juvenile salmonid mortalities.

## 26. [Threat- Watershed Process](#)

No species-specific actions were developed.

**Table 3: Implementation Schedule ~ Russian River**

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-1.1	Objective	Estuary	Address the present of threatened destruction, modification or curtailment of the species habitat or range										
RR-CCC-1.1.1	Recovery Action	Estuary	Increase the extent of estuarine habitat										
RR-CCC-1.1.1.1	Action Step	Estuary	Restore estuarine habitat and the associated wetlands and sloughs by providing fully functioning habitat (CDFG 2004).	2	20	CA Coastal Commission, California Coastal Conservancy, CDFG, Private Landowners	2,650	2,650	2,650	2,650		10,600	Cost based on treating 38 acres (assume 5% of total estuarine habitat) at a rate of \$272,120/acre.
RR-CCC-1.1.1.2	Action Step	Estuary	Per the Russian River Biological Opinion, utilize adaptive management to guide future management and development of above guidelines	2	15	NMFS, Sonoma County Water Agency						In-Kind	Sonoma County Water Agency will incur most of this cost.
RR-CCC-1.1.1.3	Action Step	Estuary	Restore and enhance estuary habitat in the watershed.	2	40	CalFire, California Geological Survey, CalTrans, CDFG, Mendocino Redwood Company, NRCS, Private Landowners, Public, RCD, RWQCB						TBD	Cost accounted for in above action step.
RR-CCC-1.1.1.4	Action Step	Estuary	Develop Estuary Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.	3	10	CDFG, NMFS, NRCS, Private Consultants	136.50	136.50				273	Cost for estuary use/residence time estimated at \$273,120/project.
RR-CCC-1.1.2	Recovery Action	Estuary	Rehabilitate natural river mouth dynamics										
RR-CCC-1.1.2.1	Action Step	Estuary	Evaluate alterations to river mouth dynamics (e.g. jetty at the mouth) and implement changes to restore natural function	3	20							In-Kind	
RR-CCC-1.1.3	Recovery Action	Estuary	Rehabilitate inner estuarine hydrodynamics										
RR-CCC-1.1.3.1	Action Step	Estuary	Modify alterations to freshwater inflow and water quality (temperature, dissolved oxygen) and the practice of artificial breaching, through implementation of the Russian River estuary management program, as described within NMFS' Russian River Biological Opinion.	2								In-Kind	
RR-CCC-1.1.3.2	Action Step	Estuary	Evaluate the effect of nearby landuse practices and development structures which may impair or reduce the historical tidal prism and other estuarine functions and implement improvements	3								TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-1.1.3.3	Action Step	Estuary	Prevent future encroachment of landuse (agricultural, residential and commercial) into floodplain areas of the estuary	3									
RR-CCC-1.1.4	Recovery Action	Estuary	Reduce extent of estuarine shoreline development										
RR-CCC-1.1.4.1	Action Step	Estuary	Where appropriate, remove structures and/or modify practices which impair or reduce the historical tidal prism and/or estuarine function where feasible and where benefits to coho salmon and/or the estuarine environment are predicted.	3	10	CA Coastal Commission, California Coastal Conservancy, CDFG						TBD	Costs associated with removal of structures will depend on the number and type of structures identified and cannot be accurately determined at this time.
RR-CCC-2.1	Objective	Floodplain Connectivity	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Increase and enhance velocity refuge										
RR-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Design new development to allow streams to meander in historical patterns, Protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.	3	20	CDFG, Gold Ridge RCD, NOAA RC						In-Kind	This recommendation should be considered standard practice.
RR-CCC-2.1.1.2	Action Step	Floodplain Connectivity	Avoid new development within riparian zones and the 100 year floodprone zones.	3	30	CDFG, NMFS, Sonoma County						In-Kind	
RR-CCC-2.1.1.3	Action Step	Floodplain Connectivity	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.	3	10	County Planning, Land Trusts, Private Landowners, RCD						TBD	Cost difficult to determine because of landowner participation.
RR-CCC-2.2	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-2.2.1	Recovery Action	Floodplain Connectivity	Increase and enhance velocity refuge										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-2.2.1.1	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	3	10	CalFire, California Coastal Conservancy, California Geological Survey, CalTrans, CDFG, Laguna Foundation, Mendocino Redwood Company, NMFS, NRCS, Private Landowners, RCD, RWQCB	103.50	103.50				207	Cost based on wetland restoration estimated at \$206,493/project.
RR-CCC-2.2.1.2	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in low gradient response reaches	3		Farm Bureau, NMFS HCD, Public Works, RCD							Cost accounted for in above action step.
RR-CCC-2.2.1.3	Action Step	Floodplain Connectivity	Identify the floodplain activation flow - the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation (Williams et al. 2009).	3	5	Private Consultants, Private Landowners, Sonoma County	63.00					63	Cost for stream flow model estimated at \$63,005/project.
RR-CCC-2.2.1.4	Action Step	Floodplain Connectivity	Target habitat restoration and enhancement that will function between summer base flows and flood stage.	2	10	CDFG, NMFS, NRCS, Sonoma County Water Agency	55.50	55.50				111	Cost for fish/habitat restoration estimated at \$111,192/project.
RR-CCC-2.2.1.5	Action Step	Floodplain Connectivity	Improve conditions to re-create, and restore alcove, backwater, or perennial pond habitats where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity. Develop and implement site specific plans to improve these conditions to re-create, and restore alcove, backwater, or perennial pond habitats	2	10	California Coastal Conservancy, MMWD, NMFS HCD, RCD	153.50	153.50				307	Cost to treat 85 miles (assume 1 project/mile in 25% High IP) at a rate of \$36,046/mile.
RR-CCC-2.2.1.6	Action Step	Floodplain Connectivity	Support landowners in developing projects to improve channel conditions and restore natural channel geomorphology, including side channels and dense contiguous riparian vegetation (CDFG 2004).	3	60	Gold Ridge RCD, Private Landowners						In-Kind	
RR-CCC-2.2.1.7	Action Step	Floodplain Connectivity	Improve over-winter and summer survival by increasing the frequency and functionality of off-channel habitats.	2	2	CDFG, NMFS, Private Landowners, Sonoma County Water Agency						TBD	Cost will include GIS and validation in the field.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-2.2.1.8	Action Step	Floodplain Connectivity	Investigate the potential role of the Laguna de Santa Rosa in supporting floodplain and off-channel habitat.	3								In-Kind	
RR-CCC-2.2.2	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
RR-CCC-2.2.2.1	Action Step	Floodplain Connectivity	Evaluate the potential to improve winter rearing habitat, and upstream and downstream migration in the Laguna de Santa Rosa channel between River Road and the channel's confluence with Mark West Creek by planting riparian vegetation and deepening the channel	3								TBD	
RR-CCC-2.2.2.2	Action Step	Floodplain Connectivity	Evaluate the potential to reconstruct historic lakes in northern Laguna de Santa Rosa, upstream of the confluence of Laguna Channel & Mark West Creek to enhance overwintering habitat and to improve passage opportunities for upstream migration during dry winters; plant riparian tree species around ponds; debris removal	2								TBD	
RR-CCC-3.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
RR-CCC-3.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency (BFW 0-10 meters)			CDFG, NOAA RC, Private Landowners, RCD, Sonoma County, Sonoma County Water Agency, USACE							
RR-CCC-3.1.1.1	Action Step	Habitat Complexity	Increase large wood frequency to 75% of streams within the watershed to improve conditions for adults, and winter/summer rearing juveniles	2	15		143.33	143.33	143.33			430	Cost based on treating 170 miles (assume 1 project/mile in 50% High IP) at a rate of \$25,000/mile.
RR-CCC-3.1.1.2	Action Step	Habitat Complexity	Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in all reaches of Green Valley, Purrington, Atascadero, Redwood, Jonive, Castellini and Sexton Creeks	2									
RR-CCC-3.1.1.3	Action Step	Habitat Complexity	Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in select reaches of Bearpen, Black Rock, Kidd, Kohute Gulch, Clear, Pole Mtn, Blue Jay, Tiny, and Holmes Canyon Creeks	2									
RR-CCC-3.1.1.4	Action Step	Habitat Complexity	Increase LWD frequency to optimal conditions (>2 key LWD pieces/100 meters) in select reaches of Austin and Ward Creeks	2									

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-3.1.1.5	Action Step	Habitat Complexity	Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in select reaches of Mark West, Dry, and Maacama Creeks	2									
RR-CCC-3.1.2	Recovery Action	Habitat Complexity	Increase frequency of primary pools		5	CDFG, NOAA RC, Sonoma County, Sonoma County Water Agency	87.50					88	Cost estimates for placement of LWD range from \$20K to \$30K per mile. Assuming proximally half the ~7stream miles require treatment, costs would be approximately \$25K per mile.
RR-CCC-3.1.2.1	Action Step	Habitat Complexity	Increase pool frequency to 75% of streams within the watershed to improve conditions for adults, and summer/winter juveniles	2	15		143.33	143.33	143.33			430	Cost based on treating 170 miles (assume 1 project/mile in 50% High IP) at a rate of \$25,000/mile. If ELJ used, cost estimated at \$171,904,000.
RR-CCC-3.1.2.2	Action Step	Habitat Complexity	Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in all reaches of Purrington, Atascadero, and Castellini Creeks	2									
RR-CCC-3.1.2.3	Action Step	Habitat Complexity	Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in select reaches of Austin, Bear Pen, Black Rock, Blue Jay, Conshea, Devils, Gray, Holmes Canyon, Kidd, Kohute Gulch, Pole Mtn, and Schoolhouse Creeks	2									
RR-CCC-3.1.2.4	Action Step	Habitat Complexity	Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in select reaches of Dry, Maacama, and Mark West Creeks	2									
RR-CCC-3.1.2.5	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). Priority streams include Redwood Creek, Foote Creek, Kellogg Creek, and Yellowjacket Creek.	2									
RR-CCC-3.1.2.6	Action Step	Habitat Complexity	Where feasible, increase woody cover in the pool and flatwater habitat units throughout the Mark West watershed, focusing on a combination of cover/scour structures constructed with boulders and woody debris within flatwater and pool locations. Work should be done in conjunction with stream bank stabilization to prevent erosion (CDFG habitat inventory reports).	2									

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-3.1.3	Recovery Action	Habitat Complexity	Improve shelter rating		5	CDFG, NOAA RC, Sonoma County, Sonoma County Water Agency	700					700	Estimate 35 structures at ~20K per structure. Structures have already been placed in some areas.
RR-CCC-3.1.3.1	Action Step	Habitat Complexity	Increase shelter ratings to 75% of streams across the watershed to improve conditions for adults, and winter/summer rearing juveniles	2	20							TBD	Cost should be accounted for in increase LWD frequency and primary pools.
RR-CCC-3.1.3.2	Action Step	Habitat Complexity	Increase shelter ratings to optimal conditions (>80 pool shelter value) in all reaches of Green Valley, Purrington, Atascadero, Redwood, Jonive, Castellini and Sexton Creeks	2									
RR-CCC-3.1.3.3	Action Step	Habitat Complexity	Increase shelter ratings to optimal conditions (>80 pool shelter value) in select reaches of Austin, Bearpen, Black Rock, Kidd, Kohute Gulch, Clear, Ward, Pole Mtn, Blue Jay, Tiny, and Ward Creeks and Holmes Canyon Creeks	2									
RR-CCC-3.1.3.4	Action Step	Habitat Complexity	Increase shelter ratings to optimal conditions (>80 pool shelter value) in select reaches of Dry, Mark West and Maacama Creeks	2									
RR-CCC-3.1.3.5	Action Step	Habitat Complexity	Increase shelter rating on the following streams : tributaries of and including Dry Creek, Forsythe Creek, Willow Creek, Sheephouse Creek, Porter Creek, Dutch Bill Creek, Redwood Creek, Foote Creek, Kellogg Creek, Wine Creek and Yellowjacket Creek.	2									
RR-CCC-3.1.4	Recovery Action	Habitat Complexity	Improve pool/riffle/flatwater ratios (hydraulic diversity)		5	CDFG, NOAA RC, Sonoma County, Sonoma County Water Agency	200.00					200	Estimate 10 structures in these reaches would add complexity at \$20K per structure.
RR-CCC-3.1.4.1	Action Step	Habitat Complexity	Increase the frequencies to 75% of the streams within the watershed	2	20							TBD	Cost should be accounted for in increase LWD frequency and primary pools.
RR-CCC-3.1.4.2	Action Step	Habitat Complexity	Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Green Valley, Atascadero, Jonive, Castellini and Sexton Creeks	2									
RR-CCC-3.1.4.3	Action Step	Habitat Complexity	Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Austin Creek.	2									
RR-CCC-3.1.4.4	Action Step	Habitat Complexity	Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Mark West, Dry and Maacama Creeks	2									

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-3.2	Objective	Habitat Complexity	Address other natural or manmade factors affecting the species' continued existence										
RR-CCC-3.2.1	Recovery Action	Habitat Complexity	Improve Habitat Complexity										
RR-CCC-3.2.1.1	Action Step	Habitat Complexity	Investigate the feasibility of beaver re-location and re-introductions to Sonoma (specifically Austin, Green Valley, lower Russian River independent populations and Salmon Creek) to promote channel complexity, improve baseflows and provide rearing habitat	2	5		10.00					10	Cost for beaver re-introduction estimated at \$10,000/beaver family translocation.
RR-CCC-4.1	Objective	Hydrology	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-4.1.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)										
RR-CCC-4.1.1.1	Action Step	Hydrology	Develop rearing habitat curves to identify optimal base flow conditions	3	10	CDFG, SWRCB	31.50	31.50				63	Cost for stream flow model estimated at \$63,005/project. This cost may be accounted for in FLOODPLAIN CONNECTIVITY.
RR-CCC-4.1.1.2	Action Step	Hydrology	Promote, via technical assistance and/or regulatory action, the reduction of water use affecting the natural hydrograph, development of alternative water sources, and implementation of diversion regimes protective of the natural hydrograph.	3	60	Private Landowners, RCD						tbd	
RR-CCC-4.1.1.3	Action Step	Hydrology	Avoid and/or minimize the adverse effects of water diversion on coho salmon by establishing: a more natural hydrograph, by-pass flows, season of diversion, and off-stream storage	2	20	Private Consultants, Private Landowners, RCD, Sonoma County	125.00	125.00	125.00	125.00		500	
RR-CCC-4.1.2	Recovery Action	Hydrology	Improve flow conditions (instantaneous conditions)										
RR-CCC-4.1.2.1	Action Step	Hydrology	Reduce the rate of frost protection and domestic drawdown in the spring	2	10	CDFG, CDFG Law Enforcement, NMFS HCD, NMFS OLE, Private Consultants, Private Landowners, RCD, SWRCB, UC Extension						TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-4.1.2.2	Action Step	Hydrology	Assess and map water diversions (CDFG 2004).	2	20	California Coastal Conservancy, CDFG, NMFS, NOAA RC, Private Landowners, Sonoma County, Sonoma County Water Agency							Stream flow model should identify water diversions.
RR-CCC-4.2	Objective	Hydrology	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-4.2.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)										
RR-CCC-4.2.1.1	Action Step	Hydrology	Develop cooperative projects with private landowners to conserve summer flows based on results of the NFWF efforts	2	20	CDFG, NFWF, NMFS HCD, Private Consultants, Private Landowners, RCD						In-Kind	
RR-CCC-4.2.1.2	Action Step	Hydrology	Support the water conservation training conducted by the Occidental Arts and Ecology Center Water Institute, Gold Ridge RCD, and Salmon Creek Watershed Council.	3	20	Gold Ridge RCD, Private Consultants, Private Landowners, Sonoma County						In-Kind	
RR-CCC-4.2.1.3	Action Step	Hydrology	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	5	Sonoma County Water Agency, USACE						TBD	Changes in flow management may incur costs to diverters and water delivery systems, but costs are unknown.
RR-CCC-4.2.2	Recovery Action	Hydrology	Improve flow conditions (instantaneous conditions)										
RR-CCC-4.2.2.1	Action Step	Hydrology	Work with SWRCB and landowners to improve over summer survival of juveniles by re-establishing summer baseflows (from July 1 to October 1) in rearing reaches that are currently impacted by water use.	2	10	RWQCB						TBD	Costs to adjudicate and enforce water allocations cannot be determined at this time.
RR-CCC-4.2.2.2	Action Step	Hydrology	Work with SWRCB and landowners to improve flow regimes for adult migration to spawning habitats and smolt outmigration.	2	10	Private Landowners, Sonoma County Water Agency						TBD	Costs to water users may be substantial, but cannot be determined.
RR-CCC-4.2.2.3	Action Step	Hydrology	Promote alternative frost protection strategies.	3	60	CDFG, Private Landowners, Sonoma County, SWRCB						In-Kind	These costs will likely be included as part of the ongoing 1600 agreement requirements per DFG.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-4.2.3	Recovery Action	Hydrology	Minimize redd scour										
RR-CCC-4.2.3.1	Action Step	Hydrology	Develop floodplain enhancement and LWD projects in modified and incised channel areas of major tributaries	2	10	California Conservations Corps, CDFG, NOAA RC, Private Consultants, Private Landowners, Trout Unlimited						TBD	Cost likely accounted for in other action steps.
RR-CCC-5.1	Objective	Landscape Patterns	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-5.1.1	Recovery Action	Landscape Patterns	Prevent increased landscape disturbance										
RR-CCC-5.1.1.1	Action Step	Landscape Patterns	Utilize BMP's which prevent fracturing of landscapes and interruption of natural function in forested watersheds, riparian corridors, and stream systems	3									
RR-CCC-5.1.1.2	Action Step	Landscape Patterns	Avoid new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas	3									
RR-CCC-5.1.1.3	Action Step	Landscape Patterns	Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements	3									
RR-CCC-5.2	Objective	Landscape Patterns	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-5.2.1	Recovery Action	Landscape Patterns	Improve sediment transport by implementing DS level actions	3		Private Landowners, RCD						240,000	Cost based on decommissioning 20 miles of riparian road at a rate of \$12,000/mile
RR-CCC-5.2.2	Recovery Action	Landscape Patterns	Improve watershed hydrology by implementing DS level actions	3		Private Landowners, Public Works, RCD						420,000	Cost based on upgrading 20 miles of road network at a rate of \$21,000/mile.
RR-CCC-5.2.3	Recovery Action	Landscape Patterns	Conserve hydrology by implementing DS level actions	3									
RR-CCC-6.1	Objective	Passage	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
RR-CCC-6.1.1	Recovery Action	Passage	Rehabilitate and enhance passage into tributaries (aggradation/degradation)			CDFG, County Planning, NMFS, NMFS HCD, RCD							

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-6.1.1.1	Action Step	Passage	Improve passage in the mainstem and confluences of Austin Creek	2	20		7,225	7,225	7,225	7,225		28,900	Cost based on treating 16 impassable barriers on mainstem streams at a rate of \$914,769/barrier and for treating 31 partial barriers at a rate of \$457,382/barrier.
RR-CCC-6.1.1.2	Action Step	Passage	Continue restoration projects which employ improved gravel mining practices upstream of mile 1 on Austin Creek	2								TBD	Cost difficult to determine based on level of completion of restoration projects.
RR-CCC-6.1.2	Recovery Action	Passage	Modify or remove physical passage barriers			CalTrans, CDFG, NMFS, NMFS HCD, Private Consultants, Private Landowners, Public Works, RCD							
RR-CCC-6.1.2.1	Action Step	Passage	Identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a).	2	30							In-Kind	
RR-CCC-6.1.2.2	Action Step	Passage	Remove or modify the flashboard dam on lower Mill Creek near the confluence with Wallace Creek. This barrier is the highest priority barrier within the Russian River population for remediation.	1									Cost accounted for in above action step.
RR-CCC-6.1.2.3	Action Step	Passage	Investigate passage at multiple sites along Atascadero Creek and tributaries and implement improvements	2								TBD	Cost accounted for in above action step.
RR-CCC-6.1.2.4	Action Step	Passage	Improve passage at existing County culvert barriers on Pole Mountain Creek, Kid Creek and Kohute Gulch.	2								TBD	Cost accounted for in above action step.
RR-CCC-6.1.2.5	Action Step	Passage	Assess the old flashboard dam on Bear Pen Creek, and implement recommendations to improve passage.	2								TBD	Cost accounted for in above action step.
RR-CCC-6.1.2.6	Action Step	Passage	Assess the log jam/slide barrier on Gilliam and Schoolhouse Creeks and implement recommendations to improve passage	2								TBD	Cost difficult to determine at this time.
RR-CCC-6.1.2.7	Action Step	Passage	Improve passage at sites identified in Mill, Pena and Grape Creek. The falls on lower Mill Creek and on lower Felta Creek need to be evaluated for passage periodically and improved/maintained if necessary. (CDFG 2004).	2								TBD	Cost accounted for in above action steps.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-6.1.2.8	Action Step	Passage	Investigate passage barriers on Dutcher Creek, Felta Creek (CDFG survey reach 2), Foss Creek, Mill Creek, Norton Creek, Pine Ridge Canyon Creek, Schoolhouse Creek, West Slough, and Wine Creek (CDFG stream survey reports). Pena Creek tributaries should also be investigated.	2								TBD	Cost accounted for in above action steps.
RR-CCC-6.1.2.9	Action Step	Passage	Several large barriers exist on Dutcher Creek. Fish passage specialists should investigate the cost/benefit of improving passage at these locations. If advantageous, the barriers should be addressed. (CDFG 2004).	3								TBD	
RR-CCC-6.1.2.10	Action Step	Passage	Log-jams in the Chapman Branch and Pena Creek need to be monitored/investigated for passage. Prior to removing logjams, consult with NMFS and CDFG fish passage specialists (CDFG 2004).	2								TBD	
RR-CCC-6.1.2.11	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.	2								TBD	Cost likely accounted for in above action steps.
RR-CCC-6.1.2.12	Action Step	Passage	Evaluate and implement passage opportunities in the Maacama Creek subwatershed and its tributaries. Priority streams include: Redwood Creek, Foote Creek, Kellogg Creek and Yellowjacket Creek.	2									
RR-CCC-8.1	Objective	Riparian	<b>Address the present or threatened destruction, modification or curtailment of the species habitat or range</b>										
RR-CCC-8.1.1	Recovery Action	Riparian	Improve tree diameter	2	10	CDFG, RCD, Sonoma County, Sonoma County Water Agency						TBD	Costs depend on assessment methods and extent and types of programs implemented.
RR-CCC-8.1.1.1	Action Step	Riparian	In the upper Austin Creek sub-basin reforestation to a conifer forest should be a long term strategy to return the area to fully functioning condition. Implementing this type of strategy will need to employ incentives and assistance to landowners	3	20	CDFG, NOAA RC, Private Landowners, RCD, Sonoma County, Sonoma County Water Agency	135.00	135.00	135.00	135.00		540	DFG estimated the cost of riparian planting at about \$180 K per mile (2004), and assumption was that as much as 3 miles will require treatment. Implementation will take advantage of existing programs and will reduce costs somewhat.
RR-CCC-8.1.1.2	Action Step	Riparian	Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream). Watersheds identified by CDFG include Porter, Foote, Grub, Franz, and Franchi.	2	10	CDFG, NMFS, NOAA RC, Private Landowners, RCD, Sonoma County, Sonoma County Water Agency, USACE	50.00	50.00				100	Cost based on 10K for 10 years.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-8.1.1.3	Action Step	Riparian	Conduct conifer release to promote growth of larger diameter trees where appropriate. High priority areas for consideration may include Austin Creek, and upper Briggs Creek and upper Bidwell Creek (Laurel Marcus and Associates 2004).	3	20		1,450	1,450	1,450	1,450		5,800	Cost based on treating 50 miles (assume 80 acres/mile in 15% High IP) at a rate of \$1422/acre.
RR-CCC-8.1.1.4	Action Step	Riparian	In Willow Creek there is a limited supply of large diameter, riparian redwood and Douglas-fir in the watershed. Promote growth of conifers in the riparian zone for later in-channel recruitment.	3									
RR-CCC-8.1.2	Recovery Action	Riparian	Improve canopy cover		30	Mendocino County, Private Landowners, RCD, Sonoma County							
RR-CCC-8.1.2.1	Action Step	Riparian	Increase tree diameter within 40% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 tree)	3	20		6,825	6,825	6,825	6,825		27,300	Cost based on treating 17 miles (assume 80 acres/mile in 5% High IP) are a rate of \$20,057/acre.
RR-CCC-8.1.2.2	Action Step	Riparian	Plant native riparian species and native conifers/hardwoods in the riparian zone within the Upper and Lower Gray Creek sub-basin to increase overall tree diameter	2									
RR-CCC-8.1.2.3	Action Step	Riparian	Plant native riparian species and native conifers/hardwoods throughout riparian zones within the eastern and southern portions of Green Valley Creek watershed to increase overall tree diameter	2									
RR-CCC-8.1.2.4	Action Step	Riparian	Mark West Tributaries, specifically Humbug, Porter, Horse Hill and Weeks Creeks are high priority creeks for riparian restoration	2									
RR-CCC-8.1.2.5	Action Step	Riparian	Work with landowners to evaluate any existing conservation easements that exist within the Maacama watershed. Changes in these easements to better protect riparian habitat should be investigated (Laurel Marcus and Associates 2004).	3									
RR-CCC-8.1.2.6	Action Step	Riparian	Focus riparian restoration within Santa Rosa, Matanzas, Brush/Rincon, Piner, Paulin, Windsor and Pool Creeks. Where appropriate, riparian surveys should be continued above CDFG survey section. Santa Rosa Creek work should focus on survey reach 1 and the channelized section. Matanzas Creek work would benefit from utilizing bio-technical vegetative techniques to re-establish floodplain benches and a defined low flow channel (CDFG stream survey reports).	2									

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-8.1.2.7	Action Step	Riparian	Increase canopy cover levels within the Dry Creek watershed. Priority streams include Fall Creek (reach 1), Felta Creek (reach 2,3), Foss Creek, Mill Creek, Norton Creek, Pechaco Creek (reach 1,2,3), Pena Creek, West Slough, Wine Creek (reach 1), and Woods Creek (reach 1,2,3) (CDFG stream survey reports).	2									
RR-CCC-8.1.2.8	Action Step	Riparian	Restore and protect riparian vegetation in Turtle Creek, Fife Creek, Porter Creek, Bluejay Creek, Fisher Creek, Grub Creek, and Corral Creek (CDFG stream survey reports).	2									
RR-CCC-8.2	Objective	Riparian	<b>Address the inadequacy of existing regulatory mechanisms</b>										
RR-CCC-8.2.1	Recovery Action	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	3	60	CDFG, Farm Bureau, Mendocino County, NMFS, NRCS, Private Landowners, RCD, Sonoma County						TBD	Cost is dependent on the specific conservation measures implemented.
RR-CCC-9.1	Objective	Sediment	<b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>										
RR-CCC-9.1.1	Recovery Action	Sediment	Reduce turbidity and suspended sediment										
RR-CCC-9.1.1.1	Action Step	Sediment	Reduce embeddedness levels to the extent that 75% to 90% of streams within the watershed meet optimal criteria (>50% stream average scores of 1 & 2)	3									
RR-CCC-9.1.1.2	Action Step	Sediment	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004). High priority streams identified by CDFG habitat reports include Sheephouse Creek, Austin and East Austin Creeks, Pena Creek, Porter Creek, Kidd Creek, Sexton Creek, Gilliam Creek, Hobson Creek, Conshea Creek, Crane Creek, and Schoolhouse Creek ( <a href="http://coastalwatersheds.ca.gov/">http://coastalwatersheds.ca.gov/</a> ).	2	15	CDFG, Private Landowners, RCD, Sonoma County, Sonoma County Water Agency, State Parks	280.00	280.00	280.00			840	Costs cannot be accurately determined due to an unknown extent and types of treatments required, however, road treatment or decommissioning in the Russian River has been estimated at approximately \$7,027,012.00 (DFG 2004). Cost based on decommissioning 70 miles of riparian road network at a rate of \$12,000/mile.
RR-CCC-9.1.1.3	Action Step	Sediment	In Purrington Creek several stream crossings exist in Reach 1. These crossings should be improved to eliminate active soil erosion and runoff.	2	10	CDFG, RCD, Sonoma County	335.00	335.00				670	Cost based on treating 3 crossings (assume bottomless/open bottom arch) at a rate of \$223,051/crossing.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-9.1.1.4	Action Step	Sediment	Maintenance of ditches, culverts, and inboard cutbank slides should be improved to decrease the potential of sediment delivery to Dutchbill and Grub Creeks.	2	10	CDFG, Sonoma County	59.91	59.91				120	Costs cannot be accurately determined due to an unknown extent and type of treatment required, however, road treatment in the Russian River has been estimated at approximately \$78,933,524.00 (DFG 2004). Costs associated with this action were estimated by multiplying the approximately 10 stream miles by the per mile cost (\$11,982) provided in DFG 2004.
RR-CCC-9.1.1.5	Action Step	Sediment	In the East Austin Creek watershed, implement results of existing sediment source surveys, and assess remaining watershed road networks to eliminate high priority and high sediment yield sources. Upgrade and decommission sites and road networks where appropriate. These actions include outsloping roads, ditch relief culverts, and installing rolling dips.	2	10	CDFG, NOAA RC, Private Landowners, RCD, Sonoma County	59.91	59.91				120	Road treatment in the Russian River has been estimated at approximately \$78,933,524.00 (DFG 2004). Costs associated with this action were estimated by multiplying the approximately 10 stream miles by the per mile cost (\$11,982) provided in DFG 2004.
RR-CCC-9.1.1.6	Action Step	Sediment	Implement recommendations of completed sediment source surveys in Austin and East Austin Creek mainstems, Gray Creek, and Pole Mountain Creeks (See ROADS for specific actions)	2									
RR-CCC-9.1.1.7	Action Step	Sediment	Implement recommendations of completed sediment source surveys in Mark West, Dry Creek and Green Valley and Purrington Creeks (See ROADS for specific actions)	2								TBD	
RR-CCC-9.1.1.8	Action Step	Sediment	Conduct instream and upslope sediment source surveys in Atascadero, Mark West, and Maacama Creeks to identify existing sources of high sediment yield using accepted protocols and implement recommendations	2	10		1,600	1,600				3,200	Cost for fish/habitat restoration monitoring estimated at \$111,192/project and for erosion assessment (assume 25% of total watershed acres) at a rate of \$12.22/acre.
RR-CCC-9.1.1.9	Action Step	Sediment	Conduct sediment source surveys in Black Rock Creek, Kidd Creek and other tributaries to identify existing sources of high sediment yield using accepted protocols and implement recommendations	2									
RR-CCC-9.1.1.10	Action Step	Sediment	Initiate sediment assessments and landslide mapping in the Dry Creek watershed. High priority streams include Crane Creek, Felta Creek (reach 3,4), Grape Creek, Mill Creek, Palmer Creek, Pena Creek, Pine Ridge Canyon Creek, Wallace Creek, Wine Creek and Woods Creek (CDFG stream survey reports).	2									

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-9.1.2	Recovery Action	Sediment	Improve and expand instream gravel quantity		30	California Coastal Conservancy, California Geological Survey, Mendocino County, NMFS, NOAA RC, Private Landowners, Public, RCD, Sonoma County, State Parks						TBD	Costs cannot be determined until appropriate assessments have been conducted. Costs may vary significantly depending on type of road related problems and whether roads are closed or decommissioned.
RR-CCC-9.1.2.1	Action Step	Sediment	Develop habitat enhancement projects to establish additional riffle habitat and import spawning gravel from mining operations in the Russian River basin to select reaches of Green Valley, Atascadero, Jonive, Castellini and Sexton Creeks	2									
RR-CCC-9.1.2.2	Action Step	Sediment	Debris jams are potentially trapping sediment and eroding adjacent banks within Schoolhouse Creek, Wine Creek, and Woods Creek. The jams should be analyzed for possible removal or modification (CDFG stream survey reports).	2									
RR-CCC-9.1.2.3	Action Step	Sediment	Spawning gravel is limited within Dutcher Creek (reach 1), Fall Creek, Felta Creek, Grape Creek, and Wine Creek (upper and lower reaches) (CDFG stream habitat reports). Implement actions to improve spawning gravel abundance and quality within these stream.	2	15							TBD	Cost difficult to determine because lack of information regarding extent and volume of spawning gravel needed. Spawning gravel supplementation estimated at \$32/cubic yard.
RR-CCC-10.1	Objective	Viability	<b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>										
RR-CCC-10.1.1	Recovery Action	Viability	Increase abundance										
RR-CCC-10.1.1.1	Action Step	Viability	Continue the operation of the Captive Broodstock Program	1									
RR-CCC-10.1.1.2	Action Step	Viability	Improve and expand rearing capacity of the Coho Salmon Captive Broodstock facility.	1	30	CDFG, USACE						TBD	This action is partially funded through the USACE Biological Opinion.
RR-CCC-10.1.1.3	Action Step	Viability	Continue and expand the existing coho salmon life-cycle monitoring efforts.	3	25	CDFG, NMFS, Sonoma County Water Agency, USACE	1,325	1,325	1,325	1,325	1,325	6,625	The cost can vary depending on the number of stations within the watershed. Recent funding for the Freshwater Creek (Humboldt County) life-cycle monitoring station was \$265,000 per season.
RR-CCC-10.1.1.4	Action Step	Viability	Minimize departure from the genetic profile that historically existed in the population.	1	5	NOAA SWFSC						TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-10.1.1.5	Action Step	Viability	Use surplus broodstock to repopulate nearby watersheds (within diversity strata) where populations have extirpated.	1	30	CDFG, NMFS, Sonoma County Water Agency, USACE						TBD	Specific plan needed to estimate cost.
RR-CCC-10.1.1.6	Action Step	Viability	Continue to rescue juvenile coho salmon with existing permittees that are under an imminent risk of stranding and mortality and relocate to suitable habitat when deemed appropriate by NMFS and CDFG	2	10	CDFG, Gold Ridge RCD, NMFS, Trout Unlimited							Existing operations
RR-CCC-10.1.1.7	Action Step	Viability	Implement recovery actions where indicators rated poor or fair in streams which are currently receiving broodstock as a priority .	2									
RR-CCC-10.1.1.8	Action Step	Viability	Monitor the effectiveness and maintenance of watershed restoration projects and augment inventories as needed (CDFG 2004).	3	20	CDFG, Gold Ridge RCD, NMFS							Cost accounted for in other action steps.
RR-CCC-10.1.1.9	Action Step	Viability	Adjust population targets and indicator ratings to reflect new habitat improvements and accessible habitat expansions	3	10	NMFS						TBD	
RR-CCC-10.1.1.10	Action Step	Viability	Conduct habitat surveys to monitor change in key habitat variables. Specific locations to be monitored will be determined through implementation of the Coastal Salmonid Monitoring Plan	3	10	CDFG, NMFS	91.00	91.00				182	Cost for habitat surveys estimated at \$333/IP km.
RR-CCC-10.1.1.11	Action Step	Viability	Utilize the hatchery criteria and assessment guidance provided in Spence et al. 2008 when evaluating the risks and benefits of proposed and ongoing hatchery operations	3	30	CDFG, USACE						0	Action not expected to result in significant additional cost.
RR-CCC-10.1.2	Recovery Action	Viability	Increase spawner density										
RR-CCC-10.1.2.1	Action Step	Viability	Fund monitoring actions to evaluate success of adult reintroductions towards salmon recovery.	2	10	CDFG						TBD	
RR-CCC-10.1.2.2	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed. Surveys should include all three cohorts.	3	20	CDFG, Gold Ridge RCD, NMFS	320.00	320.00	320.00	320.00		1,280	Cost for annual spawner ground surveys estimated at \$64,040/year.
RR-CCC-10.1.2.3	Action Step	Viability	Increase size at release to attain 160 mm at emigration, to enhance marine survival and increasing adult returns	2	30	USACE							
RR-CCC-10.1.2.4	Action Step	Viability	Establish a release imprinting station on Mill Creek and Green Valley Creeks, and other smolt release streams, so that smolts can be held for a minimum two week period prior to release. The holding period should allow for imprinting to occur on the parent release stream, increasing the potential for returns as adults which spawn naturally.	2		CDFG, Private Landowners, Trout Unlimited, UC Extension, USACE						TBD	Cost cannot be determined at this time. More specific methods in development will determine cost.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-10.1.2.5	Action Step	Viability	Increase coho salmon smolt production at the Russian River Coho Salmon Broodstock facility to a level where consistent returns can be incorporated reliably into the spawning matrix	2	30	CDFG, USACE						0	The action is already funded by the USACE as a result of the Russian River Biological Opinion.
RR-CCC-10.1.2.6	Action Step	Viability	Continue to utilize surplus fish in additional recovery opportunities (adult releases, releases to extirpated watersheds) and evaluate such actions in the context of recovering coho in the Russian River, extirpated watersheds, and the contribution to the diversity stratum	1	30	CDFG, NMFS						existing operations	
RR-CCC-10.1.2.7	Action Step	Viability	Utilize different marking method to identify program coho salmon from wild coho salmon to facilitate monitoring while reducing adult mortality. Transition away from adipose clipping broodstock program coho salmon to reduce by catch of adult coho salmon during the recreational steelhead season (only adipose clipped steelhead can be legally harvested and coho salmon can be confused for steelhead).	2									
RR-CCC-10.1.3	Recovery Action	Viability	Increase spatial structure and diversity										
RR-CCC-10.1.3.1	Action Step	Viability	Conduct outreach with landowners to expand broodstock releases within core, then remaining phase 1, then phase 2 streams within the watershed.	1	2	CDFG, NMFS						TBD	
RR-CCC-10.1.3.2	Action Step	Viability	Annually capture or retain (during rescue efforts) - small numbers of surplus fish from drying streams/habitats in Marin and Sonoma Counties for purposes of broodstock in Russian River, Walker and Salmon Creeks.	1	10	CDFG						tbd	
RR-CCC-10.1.3.3	Action Step	Viability	Conduct periodic, standardized smolt outmigration surveys to estimate smolt abundance in the watershed. Surveys should occur during the same period as adult spawning surveys.	3	20	CDFG, Gold Ridge RCD, NMFS	300.00	300.00	300.00	300.00		1,200	Cost for smolt outmigration monitoring estimated at \$58,404/year.
RR-CCC-10.1.3.4	Action Step	Viability	Evaluate the tailwater section of the upper Russian River below Lake Mendocino in it's capacity to serve as rearing habitat for juvenile and smolt coho salmon	2									
RR-CCC-11.1	Objective	Water Quality	<b>Address the present or threatened destruction, modification, or curtailment of the species habitat or range</b>										
RR-CCC-11.1.1	Recovery Action	Water Quality	Improve stream temperature conditions										
RR-CCC-11.1.1.1	Action Step	Water Quality	Increase the canopy by planting native species where shade canopy is not at acceptable levels within middle Salmon Creek, Nolan, and Coleman Valley Creeks.										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-11.1.1.2	Action Step	Water Quality	Plant native vegetation to promote streamside shade: increase the canopy by planting native species where shade canopy is not at acceptable levels.	2	10	Mendocino County, Private Landowners, RCD, Sonoma County						TBD	
RR-CCC-11.1.1.3	Action Step	Water Quality	Improve riparian and instream conditions in rearing habitats by establishing riparian protection zones that extends from the outer edge of the channel out to the site potential of tree height to allow LWD recruitment.	2	60	Board of Forestry, CalFire, CDFG, Private Landowners						TBD	Costs depend on the size of the buffer area, the level of technical assistance provided and the types of projects proposed.
RR-CCC-11.1.1.4	Action Step	Water Quality	Develop site-specific recommendations, including incentives, to remedy high temperatures and implement (CDFG 2004) initially in core areas, following with phase 1 and 2 areas.		5	CDFG, NMFS, Private Landowners						TBD	Cannot estimate at this time.
RR-CCC-11.1.2	Recovery Action	Water Quality	Improve stream water quality conditions										
RR-CCC-11.1.2.1	Action Step	Water Quality	Install continuous water quality monitoring stations in lower Green Valley and Atascadero Creeks	1	5	NMFS, Private Landowners, RWQCB	10.00					10	Cost for continuous water quality monitoring stations estimated at \$5,000/station. Cost does not account for maintenance or data management.
RR-CCC-11.1.2.2	Action Step	Water Quality	Work with livestock and ranch owners to implement BMP's to control sediment and nitrates	1		NRCS, Private Landowners, RCD							
RR-CCC-11.1.2.3	Action Step	Water Quality	Domestic garbage along Purrington Creek should be cleaned up and existing illegal dump sites along the road should be posted to reduce the possibility of toxic substances entering the creek. These dump sites appear to be routinely visited and periodic patrols by local law enforcement should be encouraged.	3	10	CDFG Law Enforcement, NMFS, NMFS OLE, Private Landowners, Sonoma County						TBD	cost is difficult to estimate at this time.
RR-CCC-11.1.2.4	Action Step	Water Quality	Assess the number of septic systems or other wastewater producers that deliver toxics to the lower mainstem Russian River and tributaries (such as Dutchbill Creek and others). Work with cities and Sonoma County to eliminate these sources of toxic input.	3	5	NMFS, Private Landowners, RWQCB, Sonoma County						TBD	cost is difficult to estimate.
RR-CCC-12.1	Objective	Agricultural Practices	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-12.1.1	Recovery Action	Agricultural Practices	Prevent increased landscape disturbance										
RR-CCC-12.1.1.1	Action Step	Agricultural Practices	Design new developments to avoid unstable slopes, wetlands, areas of high habitat value, and similarly constrained sites that occur adjacent to watercourses	3	60	Private Landowners, RCD, Sonoma County, USACE						In-Kind	Stringent review by permitting agencies is expected to reduce costs associated with poorly planned and poorly located developments.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-12.1.1.2	Action Step	Agricultural Practices	Develop legislation that will fund county planning for environmentally sound agricultural growth and water supply	3		Farm Bureau, NRCS, Sonoma County, UC Extension							
RR-CCC-12.1.2	Recovery Action	Agricultural Practices	Prevent adverse alterations to riparian species composition and structure										
RR-CCC-12.1.2.1	Action Step	Agricultural Practices	Enforce requirements of local regulations and riparian/setbacks	2		City Planning, Sonoma County							
RR-CCC-12.1.2.2	Action Step	Agricultural Practices	Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.	3	5	CalFire, CDFG, NMFS, RWQCB, Sonoma County, Sonoma County Water Agency, State Parks						In-Kind	Costs are expected to be minimal.
RR-CCC-12.1.2.3	Action Step	Agricultural Practices	Enforce existing building permit programs to minimize unpermitted construction.	3		Sonoma County							
RR-CCC-12.1.2.4	Action Step	Agricultural Practices	Encourage the purchase of land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities and corridors.	3		Land Trusts, Sonoma County							
RR-CCC-12.1.2.5	Action Step	Agricultural Practices	Develop riparian setbacks/buffers where they do not currently occur, and enforce requirements of local regulations where they do	3		CDFG, City Planning, Farm Bureau, NMFS HCD, Sonoma County							
RR-CCC-12.1.2.6	Action Step	Agricultural Practices	Continue to educate and encourage the County of Mendocino to adopt a grading ordinance that meets NMFS, RWQCB, and CDFG approval.	3	5	CDFG, MCRRFCD, Mendocino County, Sonoma County, Sonoma County Water Agency, State Parks						In-Kind	Costs are expected to be minimal to work with the County of Mendocino. Cost to implement and carryout grading ordinance is likely high. Cost estimates should be determined from counties that have grading ordinance such as Sonoma and Napa.
RR-CCC-12.2	Objective	Agricultural Practices	Address the present or threatened destruction, modification or curtailment of the species habitat or range.										
RR-CCC-12.2.1	Recovery Action	Agricultural Practices	Prevent increased landscape disturbance										
RR-CCC-12.2.1.1	Action Step	Agricultural Practices	Implement Best Management Practices such as those in the Fish Friendly Farming program (California Land Stewardship Institute), or other cooperative conservation programs.	3	10	CDFG, Farm Bureau, NMFS, Private Landowners, RCD						TBD	Cost is TBD since the vagaries of the plan are unknown at this time.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Comments	
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		Entire Duration
RR-CCC-12.2.1.2	Action Step	Agricultural Practices	Streamline permit processing where landowners are conducting actions aligned with recovery priorities.	3	5	CDFG, NMFS, NRCS, RCD, SWRCB, USACE						0	Streamlining permit processing is not expected to cost much, and may save money through future efficiencies.
RR-CCC-12.2.1.3	Action Step	Agricultural Practices	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 salmon recovery priorities.	3	10	CDFG, Farm Bureau, NMFS, NRCS, Private Landowners, RCD						0	Soliciting cooperation not expected to cost much outside of already existing federal and state and local salaries.
RR-CCC-12.2.2	Recovery Action	Agricultural Practices	Prevent adverse alterations to riparian species composition and structure										
RR-CCC-12.2.2.1	Action Step	Agricultural Practices	Improve water temperature conditions for migrating smolts and summer rearing juveniles throughout 35% of watershed by increasing the canopy by planting native species where shade canopy is not at acceptable levels .	2	20	CDFG, NMFS, NOAA RC, NRCS, Private Landowners, RCD							Cost accounted for in other action steps.
RR-CCC-13.1	Objective	Channel Modification	Address inadequacies of regulatory mechanisms										
RR-CCC-13.1.1	Recovery Action	Channel Modification	Prevent impairment to floodplain connectivity										
RR-CCC-13.1.1.1	Action Step	Channel Modification	All proposed flood control projects should include habitat protection, and/or alternatives that minimize impacts to salmon habitat.	3		NMFS PRD, Sonoma County, USACE							
RR-CCC-13.1.1.2	Action Step	Channel Modification	Channel modifying projects should be designed to ensure potential effects to salmonid habitat are fully minimized or mitigated, and where possible, existing poor conditions should be remediated.	3		NMFS PRD, USACE							
RR-CCC-13.1.1.3	Action Step	Channel Modification	Ensure that all future and existing channel designed for flood conveyance incorporate features that enhance salmonid migration under high and low flow conditions.	3		NMFS PRD, USACE							
RR-CCC-13.1.1.4	Action Step	Channel Modification	Modify city and county regulatory and planning processes to eliminate provisions allowing new construction of permanent infrastructure that will adversely affect watershed processes, within the 100-year flood prone zones	3		City Planning, Sonoma County, USACE							

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-13.1.1.5	Action Step	Channel Modification	Develop a mitigation policy that requires in-kind replacement of removed large woody debris at a 3:1 ratio.	3	10	CalTrans, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Public, Sonoma County						TBD	Costs may vary significantly depending on level of commitment from local government and private landowners. The majority of the costs would likely include local government and consultant staff time.
RR-CCC-13.1.1.6	Action Step	Channel Modification	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	3	10	CDFG, MCRRFCD, RWQCB, Sonoma County Water Agency, State Parks						0	Costs are expected to be minimal as some of these efforts will be part of existing programs, however some technical assistance may be necessary from a variety of agencies.
RR-CCC-13.2	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-13.2.1	Recovery Action	Channel Modification	Prevent impairment to floodplain connectivity										
RR-CCC-13.2.1.1	Action Step	Channel Modification	Where feasible, remove obsolete bank stabilization structures from the channel which contribute to channel incision and reduced habitat complexity.	3	10	CalTrans, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Public, Sonoma County						TBD	Costs may vary significantly depending on level of commitment from local government and private landowners. The majority of the costs would likely include local government and consultant staff time.
RR-CCC-13.2.1.2	Action Step	Channel Modification	Evaluate undeveloped and developed floodplain property for potential function and conservation easement and/or acquisition potential.	3		RCD, Sonoma County						TBD	Cost accounted for in FLOODPLAIN CONNECTIVITY.
RR-CCC-13.2.1.3	Action Step	Channel Modification	Conduct rehabilitation activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows, (see FLOODPLAIN for specific actions).	2		CDFG, NOAA RC, NRCS, Private Landowners, Sonoma County, USACE							
RR-CCC-13.2.1.4	Action Step	Channel Modification	Promote bio-engineering solutions as appropriate (e.g. carefully evaluate feasibility where critical infrastructure is located) for bank hardening projects.	3		CDFG, NMFS PRD, USACE							
RR-CCC-13.2.1.5	Action Step	Channel Modification	Set-back existing levees in strategic areas to increase flood-flow detention and promote flood-tolerant land uses.	3	60	USACE						TBD	Estimating cost is difficult at this time since the extent of work is unknown.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-16.1	Objective	Fishing/Collecting	Address the overutilization for commercial, recreational, scientific or educational purposes										
RR-CCC-16.1.1	Recovery Action	Fishing/Collecting	Prevent reduced density, abundance, and diversity										
RR-CCC-16.1.1.1	Action Step	Fishing/Collecting	Work with CDFG to improve the Fishing Regulation manual to clearly identify differences in body morphology of all potentially present adult salmonids with color photos of diagnostic features (e.g., caudal fin spotting, caudal fin shape, coloration of lower jaw, peduncle width, etc.).	3	20	CDFG, Counties, FishNet 4C, NMFS, Private Landowners, Sonoma County Water Agency						In-Kind	
RR-CCC-16.1.1.2	Action Step	Fishing/Collecting	Install/construct permanent signs at major public fishing access points along the Russian River (below Dry Creek) that clearly identify differences in body morphology of all potentially present adult salmonids with color photos (e.g., caudal fin spotting, caudal fork shape, coloration of lower jaw, peduncle width, etc.).	3	2	CalFire, CDFG, NMFS						In-Kind	Cost is currently being covered by Sonoma County Fish and Wildlife Commission and other agencies.
RR-CCC-16.2	Objective	Fishing/Collecting	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-16.2.1	Recovery Action	Fishing/Collecting	Prevent reduced density, abundance, and diversity										
RR-CCC-16.2.1.1	Action Step	Fishing/Collecting	Minimize interception of CCC coho salmon during the trout and steelhead freshwater sport fishing season.	2	60	CDFG, NMFS						TBD	Minimal cost to recreational fishery is expected.
RR-CCC-16.2.1.2	Action Step	Fishing/Collecting	NMFS and CDFG will work to improve the California Freshwater Sport Fishing Regulations to minimize interception of adult salmonids.	2	2	CDFG, NMFS PRD, Public						In-Kind	Cost expected to be minimal.
RR-CCC-16.2.1.3	Action Step	Fishing/Collecting	NMFS will work with CDFG to modify low flow restrictions under Article 4. Supplemental Regulations, Section 8.00 (a).	2	20	CDFG, Counties, FishNet 4C, NMFS, Private Landowners, Sonoma County Water Agency						TBD	Level of promotion that would be effective needs to be determined for accurate cost estimates.
RR-CCC-16.2.1.4	Action Step	Fishing/Collecting	NMFS and CDFG will work to improve the marking strategy of the coho captive broodstock recovery program to decrease confusion with allowable harvested hatchery steelhead.	2	1	CDFG, NMFS						TBD	Cost not determined.
RR-CCC-16.2.1.5	Action Step	Fishing/Collecting	Promote CalTip to discourage poaching (CDFG 2004).	3	10	CDFG, FishNet 4C, NOAA RC, NRCS, Private Landowners, RCD						TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-17.1	Objective	Hatcheries	Address other natural or manmade factors affecting the species' continued existence										
RR-CCC-17.1.1	Recovery Action	Hatcheries	Increase spatial structure and diversity										
RR-CCC-17.1.1.1	Action Step	Hatcheries	Continue the operation of the Captive Broodstock Program										
RR-CCC-17.1.1.2	Action Step	Hatcheries	Utilize the hatchery criteria and assessment guidance provided in Spence et al. 2008 when evaluating the risks and benefits of proposed and ongoing hatchery operations										
RR-CCC-17.1.1.3	Action Step	Hatcheries	Preserve the remaining genetic and phenotypic characteristics that promote life history variability through captive broodstock, supplementation, and gene-bank programs to reduce risk of extirpation.										
RR-CCC-17.1.1.4	Action Step	Hatcheries	Utilize resources to increase genetic variability in Captive Programs as well as for adult re-introduction efforts in barren Marin and Sonoma County streams (Walker and Salmon Creek Programs are models for others)										
RR-CCC-18.1	Objective	Livestock	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-18.1.1	Recovery Action	Livestock	Prevent adverse alterations to riparian species composition and structure										
RR-CCC-18.1.1.1	Action Step	Livestock	Support grazing practices that minimize impacts to riparian and instream habitat: livestock exclusion, rotational grazing, etc.	2	60	RCD, RWQCB						TBD	
RR-CCC-18.2	Objective	Livestock	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-18.2.1	Recovery Action	Livestock	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
RR-CCC-18.2.1.1	Action Step	Livestock	Encourage riparian restoration to regain riparian corridors damaged from livestock and other causes.	2	30	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
RR-CCC-18.2.1.2	Action Step	Livestock	To minimize gully initiation, grazing should be kept at relatively low intensities on steeper slopes	2	60	NRCS, RCD						TBD	
RR-CCC-18.2.1.3	Action Step	Livestock	Where necessary, establish predetermined stream crossings when herding cattle between pastures.	3	60	NRCS, RCD						TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-18.2.1.4	Action Step	Livestock	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	2	20	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
RR-CCC-18.2.2	Recovery Action	Livestock	Prevent impairment to stream hydrology (impaired water flow)										
RR-CCC-18.2.2.1	Action Step	Livestock	Aid landowners willing to fence off riparian areas with development of offstream alternative water sources	3	30	NRCS, RCD						TBD	
RR-CCC-18.2.2.2	Action Step	Livestock	Increase the use of water storage and catchment systems that collect rainwater in the winter for use during the dry summer and fall seasons.	3	30	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
RR-CCC-18.2.3	Recovery Action	Livestock	Prevent adverse alterations to riparian species composition and structure										
RR-CCC-18.2.3.1	Action Step	Livestock	Provide funding assistance to landowners willing to fence riparian and other sensitive areas (areas prone to erosion) to exclude cattle and sheep. Calf/cow operations should take first priority for riparian fencing programs over steer operations.	3	60	NRCS, RCD						TBD	
RR-CCC-18.2.3.2	Action Step	Livestock	Encourage develop and fund riparian restoration projects to regain riparian corridors damaged from livestock and other causes.	2	30	NRCS, RCD						TBD	
RR-CCC-18.2.3.3	Action Step	Livestock	Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff. Short term, seasonal and long term rest from grazing in overgrazed areas would improve soil conditions for native revegetation and land values as well.	3	60	NRCS, RCD						TBD	
RR-CCC-18.2.3.4	Action Step	Livestock	Manage rotational grazing to aid in the reduction of noxious weeds.	3	60	NRCS, RCD						TBD	
RR-CCC-18.2.3.5	Action Step	Livestock	Fence riparian areas within the Dry Creek watershed from grazing by using fencing standards that excludes cattle but allows other wildlife to access the stream. High priority stream reaches include Pechaco Creek (reach 1 and 2) and Pena Creek (reach 3) (CDFG stream survey reports).	2								TBD	
RR-CCC-18.2.3.6	Action Step	Livestock	Fence riparian areas within the Mark West watershed from grazing by using fencing standards that allow other wildlife to access the stream.	2								TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-18.2.3.7	Action Step	Livestock	Fence riparian areas within the Maacama Creek watershed from grazing by using fencing standards that allow other wildlife to access the stream. Combine fencing with appropriate riparian regeneration projects when possible. High priority streams include Bear, Ingall, McDonnell, Lower Briggs, Little Briggs, and Coon Creek (Laurel Marcus and Associates 2004).	2									
RR-CCC-18.2.3.8	Action Step	Livestock	Exclusion fencing and off-stream water development should be explored and implemented within the McDonnell Creek watershed to address livestock damage in riparian areas.	2									
RR-CCC-19.1	Objective	Logging	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-19.1.1	Recovery Action	Logging	Prevent future impacts to habitat complexity										
RR-CCC-19.1.1.1	Action Step	Logging	Acquire key large tracts of forestlands identified as a priority by Federal, State, local government, and non-governmental organizations	3	60	CDFG, NMFS, RCD, Sonoma County, State Parks						TBD	Impossible to anticipate where and how much land will come available for purchase in the future.
RR-CCC-19.1.1.2	Action Step	Logging	Encourage forest management which allows for optimal levels of natural LWD recruitment of larger older trees into stream channels	3	60	Board of Forestry, NMFS, Private Landowners, Sonoma County, State Parks, US EPA						In-Kind	Recruitment of LWD to the stream is critical. This action is mainly a policy issue, with little or no direct costs.
RR-CCC-19.1.1.3	Action Step	Logging	Conserve and manage forestlands for older forest stages.	3	60	Board of Forestry, CDFG, NMFS, Sonoma County, State Parks, USEPA						TBD	Costs cannot be determined at this time, due to an unknown number of variables and research priorities.
RR-CCC-19.1.1.4	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).	3	50	CalFire, CDFG, NMFS						In-Kind	Cost is minimal because NMFS/DFG already participate in meetings the Board of Forestry.
RR-CCC-19.1.1.5	Action Step	Logging	Establish greater oversight and post-harvest monitoring by the permitting agency for operations within high value habitat areas	3	10	NMFS						In-Kind	
RR-CCC-19.2	Objective	Logging	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
RR-CCC-19.2.1	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-19.2.1.1	Action Step	Logging	Develop a Transportation Plan and adequately upgrade necessary roads, and relocate and/or decommission riparian or unnecessary roads (see ROADS for specific actions/areas)	3	5							TBD	
RR-CCC-19.2.1.2	Action Step	Logging	Develop a Road Sediment Reduction Plan that prioritizes problem sites and outlines implementation and a timeline of necessary actions.	3	5	Board of Forestry, CalFire, CDFG, Private Landowners, RCD						TBD	
RR-CCC-19.2.1.3	Action Step	Logging	Utilize BMP's to properly construct roads for stormproofing and Avoid the construction of roads in the riparian zone	3									
RR-CCC-20.1	Objective	Mining	Address the present or threatened destruction, modification or curtailment of the species habitat or range.										
RR-CCC-20.1.1	Recovery Action	Mining	Prevent impairment to instream habitat complexity (altered pool complexity and/or pool riffle ratio)										
RR-CCC-20.1.1.1	Action Step	Mining	Utilize NMFS guidelines and geomorphic considerations in developing sustainable mining practices which create and promote habitat development and maintenance	2		CDFG, County Planning, NMFS HCD, Private Consultants, Private Landowners						TBD	
RR-CCC-22.1	Objective	Residential/Commercial Development	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-22.1.1	Recovery Action	Residential/Commercial Development	Prevent impairment to watershed hydrology										
RR-CCC-22.1.1.1	Action Step	Residential/Commercial Development	Modify Federal, State, local processes, and County General Plans, to eliminate provisions allowing new construction in undeveloped areas within the 100-year flood prone zone	3	60	California Geological Survey, CalTrans, City of Healdsburg, City of Santa Rosa, City of Ukiah, Mendocino County, NMFS, Private Landowners, Public, Sonoma County						TBD	Effective and consistent implementation of these policies are anticipated to have little cost. Modification of policies may be controversial and costs may be high.
RR-CCC-22.1.1.2	Action Step	Residential/Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential in undeveloped areas.	3	60	City Planning, Mendocino County, Sonoma County						In-Kind	This action encourages implementation of many existing policies.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-22.1.1.3	Action Step	Residential/Commercial Development	Standards and recommendations regarding development should apply to all jurisdictions, including school districts and other special districts not subject to county and/or state related ordinances or policies.	3	10	Sonoma County						TBD	This action is basically a policy issue, however additional authorities may be developed to implement the action fully.
RR-CCC-22.1.1.4	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	25	RWQCB, Sonoma County, Sonoma County Water Agency						TBD	Costs depend on extents and type of mitigation and/or detention proposed, and cannot be determined at this time.
RR-CCC-22.1.2	Recovery Action	Residential/Commercial Development	Prevent impairment to water quality										
RR-CCC-22.1.2.1	Action Step	Residential/Commercial Development	Implement performance standards in Stormwater Management Plans.	3	30	RWQCB, Sonoma County						In-Kind	
RR-CCC-22.1.2.2	Action Step	Residential/Commercial Development	Disperse discharge from commercial and residential areas into a spatially distributed network rather than a few point discharges.	3		City Planning, Public Works, Water Agencies						TBD	
RR-CCC-22.1.2.3	Action Step	Residential/Commercial Development	Improve water quality where necessary by addressing residential and commercial pollutant sources.	3	10	Private Landowners, Public Works, RCD, RWQCB						tbd	
RR-CCC-22.1.2.4	Action Step	Residential/Commercial Development	Implement performance standards in Stormwater Management Plans.	3	30	CalTrans, City of Healdsburg, City of Santa Rosa, City of Ukiah, Mendocino County, RWQCB, Sonoma County						TBD	
RR-CCC-22.1.3	Recovery Action	Residential/Commercial Development	Prevent adverse alterations to riparian species composition and structure										
RR-CCC-22.1.3.1	Action Step	Residential/Commercial Development	Develop riparian setbacks/buffers where they do not currently occur, and enforce requirements of local regulations where they do	3		City Planning, Sonoma County							
RR-CCC-22.1.3.2	Action Step	Residential/Commercial Development	Enforce requirements of local regulations and riparian/setbacks	2		City Planning, Sonoma County							
RR-CCC-22.1.3.3	Action Step	Residential/Commercial Development	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	3		Board of Forestry, CalFire, CDFG, City Planning, Sonoma County							

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-22.1.3.4	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.	3		Sonoma County, Sonoma County Water Agency							
RR-CCC-22.1.3.5	Action Step	Residential/Commercial Development	Address failing septic systems in rural areas	3	10	City Planning, County Planning, RWQCB						tbd	
RR-CCC-22.2	Objective	Residential/Commercial Development	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
RR-CCC-22.2.1	Recovery Action	Residential/Commercial Development	Prevent adverse alterations to riparian species composition and structure										
RR-CCC-22.2.1.1	Action Step	Residential/Commercial Development	Utilize native plants when landscaping and discourage the use of exotic invasives	3		Private Landowners, UC Extension						In-Kind	This recommendation should be considered standard practice.
RR-CCC-22.2.1.2	Action Step	Residential/Commercial Development	Identify areas at high risk of conversion, and develop incentives and alternatives for landowners that discourage conversion.	3		Private Landowners, Sonoma County							
RR-CCC-22.2.1.3	Action Step	Residential/Commercial Development	Explore the use of conservation easements to provide incentives for private landowners to preserve riparian corridors	3		CDFG, Land Trusts, Private Consultants, Private Landowners						TBD	
RR-CCC-22.2.2	Recovery Action	Residential/Commercial Development	Prevent impairment to watershed hydrology										
RR-CCC-22.2.2.1	Action Step	Residential/Commercial Development	Encourage the use and provide incentives for rooftop water storage and other conservation devices	2		Private Consultants, Private Landowners, Sonoma County							
RR-CCC-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
RR-CCC-23.1.1.1	Action Step	Roads/Railroads	Assess and redesign transportation network to minimize road density and maximize transportation efficiency.	3	10	CalTrans						TBD	Costs associated with assessment and redesign cannot be determined at this time, however some assessment has already been conducted.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-23.1.1.2	Action Step	Roads/Railroads	In the Russian River watershed, implement results of existing sediment source surveys, and assess remaining watershed road networks to eliminate high priority and high sediment yield sources. Upgrade and decommission sites and road networks where appropriate. These actions include outcropping roads, ditch relief culverts, and installing rolling dips.	2		Private Consultants, Private Landowners, Public Works, RCD, State Parks						TBD	Cost accounted for in SEDIMENT.
RR-CCC-23.1.1.3	Action Step	Roads/Railroads	Establish adequate spoils storage sites throughout the watershed so material from landslides and road maintenance can be stored safely away from watercourses. Coordinate these efforts with all landowners in the watershed.	2		Private Landowners, Public Works							
RR-CCC-23.1.1.4	Action Step	Roads/Railroads	Implement DS level recommendations	3									
RR-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to watershed hydrology										
RR-CCC-23.1.2.1	Action Step	Roads/Railroads	Utilize best management practices for road construction (e.g. Fishnet 4C, 2004; Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3		Private Landowners, Public Works							
RR-CCC-23.1.2.2	Action Step	Roads/Railroads	Reduce riparian road densities by 10 percent over the next 10 years, prioritizing high risk areas in Core CCC coho salmon watersheds.	3	60	CalFire, City of Healdsburg, City of Santa Rosa, City of Ukiah, Mendocino County, Private Landowners, Sonoma County, State Parks							Cost accounted for in SEDIMENT.
RR-CCC-23.2	Objective	Roads/Railroads	Address the inadequacy of existing regulatory mechanism										
RR-CCC-23.2.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
RR-CCC-23.2.1.1	Action Step	Roads/Railroads	Establish a moratorium on new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.	3	25	Mendocino County, Sonoma County						In-Kind	Costs associated with policy development are expected to be minimal.
RR-CCC-24.1	Objective	Severe Weather Patterns	Address the inadequacy of existing regulatory mechanisms										
RR-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to hydrology										
RR-CCC-24.1.1.1	Action Step	Severe Weather Patterns	Work with CDFG, County of Sonoma, State Parks, municipalities, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.	3	20	Cities, Sonoma County, State Parks						TBD	

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							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-24.1.1.2	Action Step	Severe Weather Patterns	Land use zoning should be appropriate to the site and be tolerant to anticipated conditions (e.g., tolerant to frequent flooding).	3	60	Bodega Land Trust, CalFire, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Landowners, RWQCB						TBD	Costs will vary significantly depending on site specific conditions and landowner willingness to have roads addressed.
RR-CCC-24.1.1.3	Action Step	Severe Weather Patterns	Work with local governments to incorporate protection of CCC coho salmon in any flood management activity (CDFG 2004).	3	10	CDFG, Cities, FEMA, Gold Ridge RCD, NMFS, Sonoma County, USACE						In-Kind	Outreach and education are ongoing, and additional costs are expected to be minimal.
RR-CCC-24.2	Objective	Severe Weather Patterns	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
RR-CCC-24.2.1	Recovery Action	Severe Weather Patterns	Prevent impairment to hydrology										
RR-CCC-24.2.1.1	Action Step	Severe Weather Patterns	Minimize water use and seek alternatives during droughts.	2	20	Cities, Private Landowners, Sonoma County						TBD	
RR-CCC-24.2.1.2	Action Step	Severe Weather Patterns	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.	3	20	Gold Ridge RCD, Private Landowners, Sonoma County						TBD	
RR-CCC-24.2.1.3	Action Step	Severe Weather Patterns	Pursue opportunities to acquire or lease water, or acquire water rights from willing sellers, for coho salmon recovery purposes. Develop incentives for water right holders to dedicate instream flows for the protection of coho salmon (CDFG 2004)(Water Code § 1707).	3	10	CDFG, MCRRFCD, RWQCB, Sonoma County Water Agency, State Parks						In-Kind	Costs are expected to be minimal as some of these efforts will be part of existing programs, however some technical assistance may be necessary from a variety of agencies.
RR-CCC-24.2.2	Recovery Action	Severe Weather Patterns	Prevent impairment to water quality (impaired instream temperature)										
RR-CCC-24.2.2.1	Action Step	Severe Weather Patterns	Maintain canopy levels at desirable levels in all streams and restore canopy levels to desirable levels in high value habitat areas (See WATER QUALITY for specific actions/areas	2		CDFG, NOAA RC, Private Landowners, RCD							
RR-CCC-25.1	Objective	Water Diversion/Impoundment	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
RR-CCC-25.1.1	Recovery Action	Water Diversion/Impoundment	Prevent impairment to stream hydrology (impaired water flow)										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
RR-CCC-25.1.1.1	Action Step	Water Diversion/Impoundment	Promote the use of reclaimed water for agricultural or other uses.	3	10	Gold Ridge RCD, Private Landowners, RWQCB, Sonoma County, Sonoma County Water Agency						TBD	
RR-CCC-25.1.1.2	Action Step	Water Diversion/Impoundment	Promote water conservation by the public, water agencies, agriculture, private industry, and the citizenry.	3									
RR-CCC-25.1.1.3	Action Step	Water Diversion/Impoundment	Promote off-channel storage to reduce impacts of water diversion (e.g., storage tanks for rural residential users).	2	20	CDFG, MCRRFCD, Mendocino County, Private Landowners, RCD, RWQCB, Sonoma County Water Agency						TBD	Costs are minimal to promote. Costs for implementation will depend on the number of participants.
RR-CCC-25.1.1.4	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 §1707 (CDFG 2004).	3	10	CDFG, MCRRFCD, RWQCB, Sonoma County Water Agency						In-Kind	Costs are expected to be minimal as some of these efforts will be part of existing programs, however some technical assistance may be necessary from a variety of agencies.
RR-CCC-25.1.1.5	Action Step	Water Diversion/Impoundment	Improve coordination between agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and their habitats, and avoidance of adverse impacts caused by water diversion (CDFG 2004).	3	60	CDFG, MCRRFCD, RCD, Sonoma County Water Agency, State Parks						In-Kind	Costs associated with promoting use of reclaimed water is expected to be minimal.
RR-CCC-25.1.1.6	Action Step	Water Diversion/Impoundment	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	3	30	MCRRFCD, NMFS, RCD, RWQCB, Sonoma County Water Agency						In-Kind	Costs to promote this action are expected to be minimal.
RR-CCC-25.1.1.7	Action Step	Water Diversion/Impoundment	Promote the use of reclaimed water for agricultural or other uses.	3	60	CDFG, MCRRFCD, RCD, Sonoma County Water Agency, State Parks						In-Kind	Costs associated with promoting use of reclaimed water is expected to be minimal.
RR-CCC-25.1.1.8	Action Step	Water Diversion/Impoundment	Promote water conservation best practices such as drip irrigation for vineyards.	3	20	CDFG, Farm Bureau, MCRRFCD, NRCS, Sonoma County Water Agency						In-Kind	Promoting water conservation best practices is not expected to result in additional costs.

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RR-CCC-25.1.2	Recovery Action	Water Diversion/Impoundment	Prevent impairment to estuary		10	CDFG, NMFS HCD, SWRCB						TBD	
RR-CCC-25.1.2.1	Action Step	Water Diversion/Impoundment	Identify upstream pollution sources which contribute to poor water quality conditions in the estuary	2		County Planning, SWRCB, Water Agencies						TBD	
RR-CCC-25.1.3	Recovery Action	Water Diversion/Impoundment	Prevent reduced density, abundance, and diversity										
RR-CCC-25.1.3.1	Action Step	Water Diversion/Impoundment	Adequately screen water diversions to prevent juvenile salmonid mortalities.	2									