

Redwood Creek



Location	• Marin County
Watershed Area	• 9.0 Square Miles
Potential Habitat	• 6.8 Stream Miles
Vegetation	• 31% Coniferous, 32% Shrubland, 18% Riparian or Montane Forest, 12% Grassland
Erodability	• Low to Moderate
Ownership Patterns	• 5% Private; 95% Public
Dominant Land Uses	• Recreational
Housing Density	• Low
TMDL Pollutants	• None



Redwood Creek Photo provided by KRIS Information System, and is used with permission

Redwood Creek Coho Salmon: Nearly Extirpated



Recovery Goals

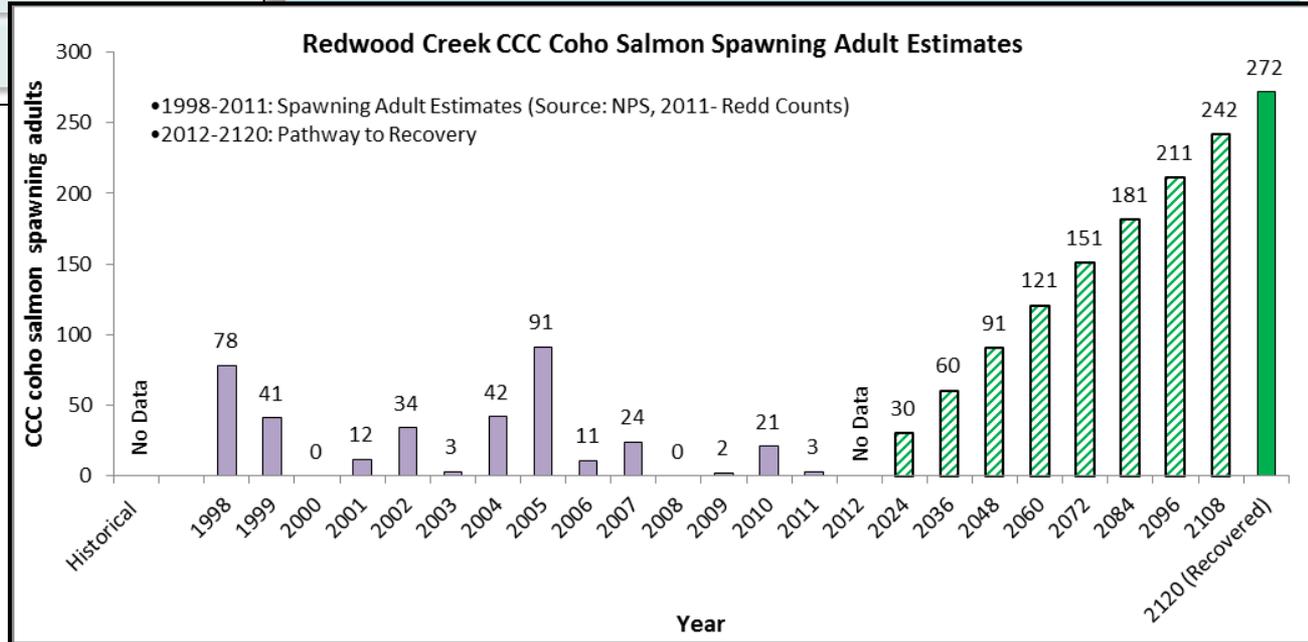
- ✓ Conduct monitoring to track population response to recovery action implementation

Redwood Creek Adult Spawner Targets

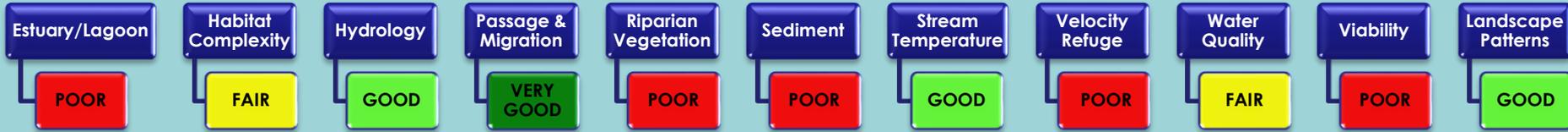
Downlisting to Threatened
136

Recovery
272

STEELHEAD: YES
CHINOOK SALMON: NO



Current Instream, Watershed and Population Conditions



Preventing Extinction & Improving Conditions

Priority 1: Immediate Restoration Actions

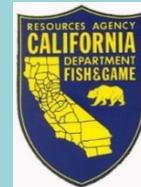
- Develop a plan to re-establish abundance, while minimizing departure from the genetic profile that historically existed in the population
- Evaluate supplementation strategies utilizing the existing population, or locally adapted nearby populations within the Coastal Diversity Stratum.

Priority 2 & 3: Long-Term Restoration Actions

- 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
- Promote off-channel storage to reduce impacts of water diversion
- Promote conjunctive use of water with water projects whenever possible
- Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream)
- Decommission, upgrade, or re-locate riparian roads to upslope locations
- Evaluate and reduce nutrient and pathogen loading from upstream areas to minimize oxygen demand



Recovery Partners



Future Threats



Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- Restore habitat complexity in modified channel areas
- Implement relevant high priority treatments from the PWA assessment, and make new recommendations for treatment. Encourage decommissioning where feasible.
- Support efforts to remove levees on the Banducci property to create backwater and alcove habitat



A volunteer planting riparian vegetation along Redwood Creek. Photo provided by KRIS Information System, and is used with permission

Priority 2 & 3: Long-Term Threat Abatement Actions

- Recreational trails should be set back from the creek and built to reduce erosion and minimize stream crossings
- Eliminate horse access to creeks for watering or as fords
- Remove levees along Big Lagoon and Pacific Way. Address issues with culverts, road network, and development within the Big Lagoon Area
- Work with NPS and State Parks on emergency drought operations and contingency plans
- Work with water managers on regulated streams and other diverters to assure adequate and proper consideration is given to fish needs.
- Adequately screen water diversions to prevent juvenile salmonid mortalities

Conservation Highlights

- Estuary and floodplain restoration activities
- Agricultural Best Management Practices have been developed and implemented in the watershed
- Acquisition of key areas for the conservation of habitat
- Annual juvenile abundance surveys conducted by National Park Service provides important population data on coho salmon in the Redwood Creek watershed

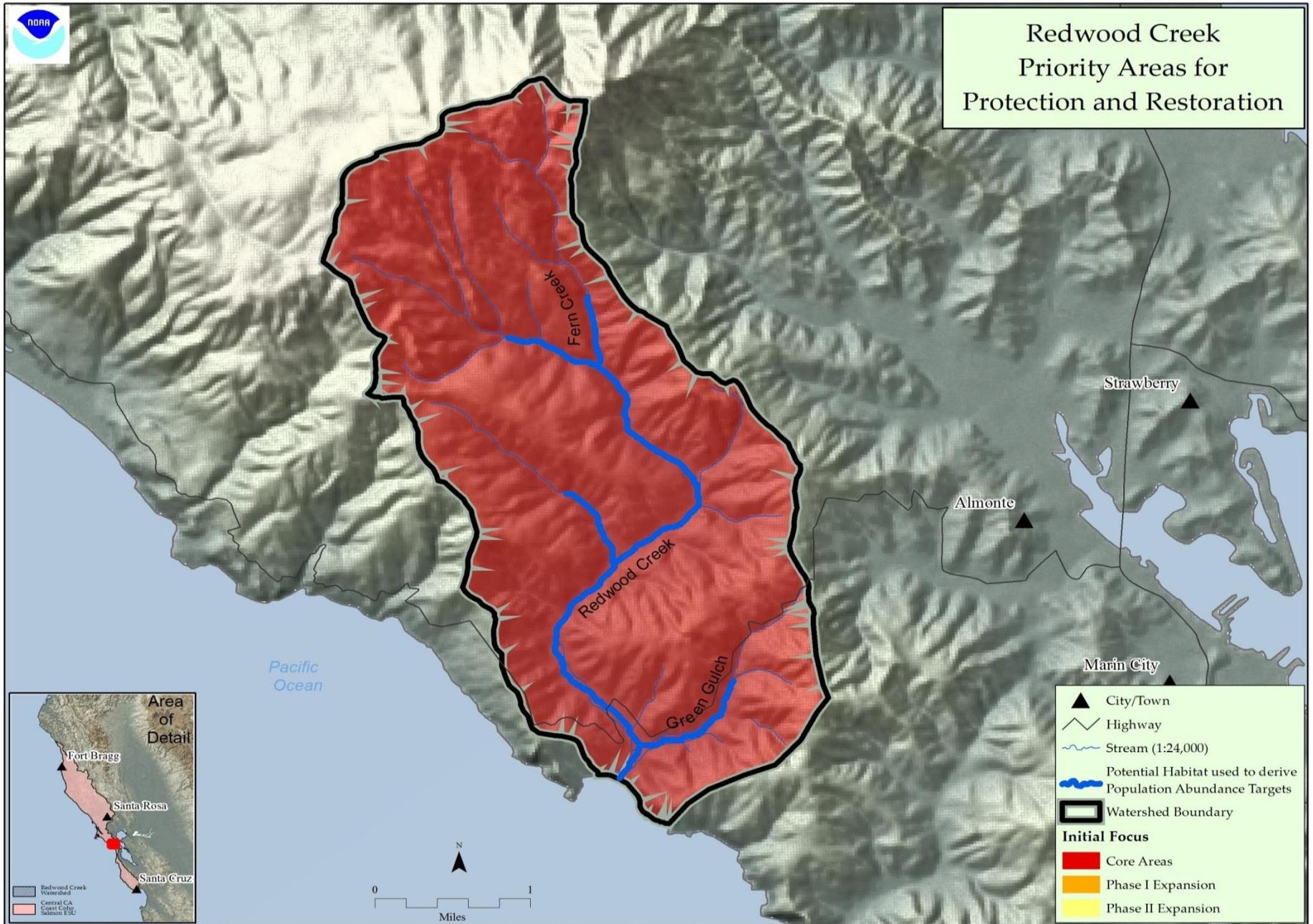


Figure 1: Map of Redwood Creek
Redwood Creek

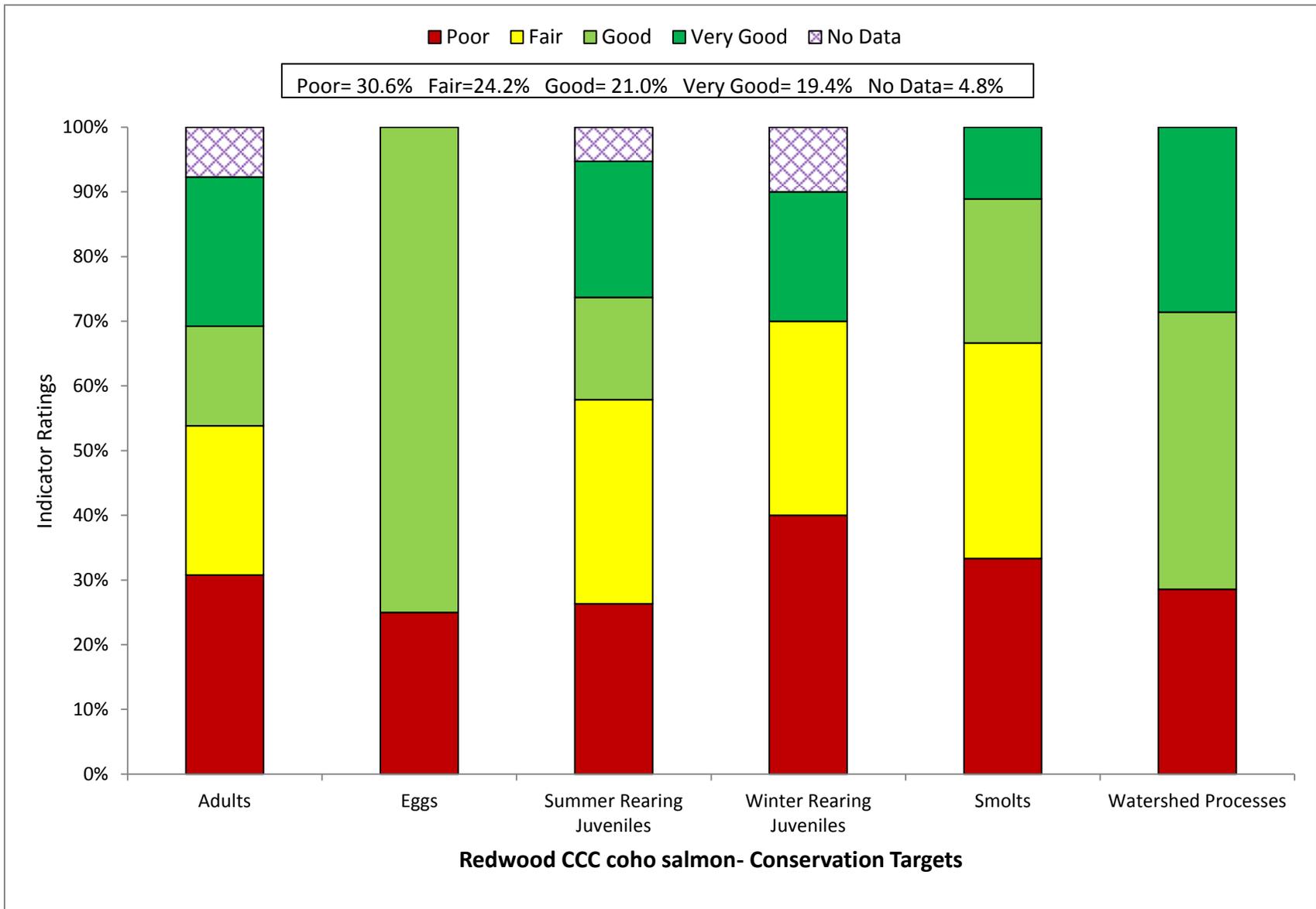


Figure 2: Viability Results by Lifestage

Table 1: CAP Viability Results ~ Redwood Creek

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	14.6 Key Pieces/100m	Very Good	NMFS Expert Estuary/Lagoon Panel	6 to 11 key pcs/100m
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	ND	0	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	50% to 74% of streams/ IP-km (>30% Pools; >20% Riffles)	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	<50% of streams/ IP-km (>80 stream average)	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>80 stream average)
Adults	Hydrology	Passage Flows	Risk Factor Score =50	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Adults	Passage/Migration	Passage at Mouth or Confluence	100% of IP-km accessible	Very Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Passage/Migration	Physical Barriers	100% of IP-km accessible	Very Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	0% Class 5 & 6 across IP-km	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	75% of IP-km to 90% of IP-km	Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	<50% Response Reach Connectivity	Poor	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Adults	Water Quality	Toxicity	Sublethal or Chronic	Fair	SEC Analysis/CDFG Data	No Acute or Chronic
Adults	Water Quality	Turbidity	50% to 74% of streams/ IP-km maintains severity score of 3 or lower	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Adults	Viability	Density	<1 spawner per IP-km	Poor	SEC Analysis/CDFG Data	low risk spawner density per Spence (2008)
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	Risk Factor Score =42	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	Risk Factor Score =50	Good	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)	0% streams 0% IP-km (>50% stream average scores of 1 & 2)	Poor	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)	14.6 Key Pieces/100m	Very Good	NMFS Instream Flow Analysis	6 to 11 key pcs/100m
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	ND	0	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	0% streams 0% IP-km (>50% stream average scores of 1 & 2)	Fair	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	50% to 74% of streams/ IP-km (>30% Pools; >20% Riffles)	Fair	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	<50% of streams/ 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 =51-75	Fair	NMFS Instream Flow Analysis	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	Risk Factor Score =42	Good	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	8.76 Diversions/10 IP-km	Poor	NMFS Watershed Characterization	0.01 - 1 Diversions/10 IP km
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	100% of IP-km accessible	Very Good	NMFS Watershed Characterization	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	100% 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	96% of streams/ IP-km (>85% average stream canopy)	Very Good	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)	0% 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)	50% to 74% of streams/ 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)	75 to 89% IP-km (<16 C MWMT)	Good	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	75% to 90% of streams/ IP-km maintains severity score of 3 or lower	Good	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)	14.6 Key Pieces/100m	Very Good	NMFS Watershed Characterization/CWHR	6 to 11 key pcs/100m
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	ND	0	NMFS Watershed Characterization/CWHR	1.3 to 4 Key Pieces/100 meters
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	50% to 74% of streams/ IP-km (>30% Pools; >20% Riffles)	Fair	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	<50% of streams/ 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	100% 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)	0% 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)	50% to 74% of streams/ 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% of streams/ IP-km maintains severity score of 3 or lower	Poor	NMFS Watershed Characterization	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower

Smols	Estuary/Lagoon	Quality & Extent	Impaired but functioning	Fair	SEC Analysis/CDFG Data	Properly Functioning Condition
Smols	Habitat Complexity	Shelter Rating	<50% of streams/ IP-km (>80 stream average)	Poor	Population Profile	75% to 90% of streams/ IP-Km (>80 stream average)
Smols	Hydrology	Number, Condition and/or Magnitude of Diversions	1.1 - 5 Diversions/10 IP-km	Fair	Population Profile	0.01 - 1 Diversions/10 IP km
Smols	Hydrology	Passage Flows	Risk Factor Score =50	Good	TRT Spence (2008)	NMFS Flow Protocol: Risk Factor Score 35-50
Smols	Passage/Migration	Passage at Mouth or Confluence	100% of IP-km accessible	Very Good	TRT Spence (2008)	75% of IP-Km to 90% of IP-km
Smols	Smolification	Temperature	75-90% IP-km (>6 and <16 C)	Good	TRT Spence (2008)	75-90% IP-Km (>6 and <16 C)
Smols	Water Quality	Toxicity	Sublethal or Chronic	Fair	TRT Spence (2008)	No Acute or Chronic
Smols	Water Quality	Turbidity	<50% of streams/ IP-km maintains severity score of 3 or lower	Poor	EPA/RWQCB/NMFS Criteria	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Smols	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	1.3% of Watershed in Impervious Surfaces	Very Good	SEC Analysis	3-6% of Watershed in Impervious Surfaces
Watershed Processes	Landscape Patterns	Agriculture	0.88% of Watershed in Agriculture	Very Good	EPA/RWQCB/NMFS Criteria	10-19% of Watershed in Agriculture
Watershed Processes	Landscape Patterns	Timber Harvest	25-15% of Watershed in Timber Harvest	Good	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	9% of watershed >1 unit/20 acres	Good	EPA/RWQCB/NMFS Criteria	8-11% of watershed >1 unit/20 acres
Watershed Processes	Riparian Vegetation	Species Composition	51-74% Intact Historical Species Composition	Good	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	4.1 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)	4.9 Miles/Square Mile	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

Table 2: CAP Threats Results ~ Redwood Creek

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	Low	Medium	Medium	Medium	Medium	High	Medium
2	Channel Modification	High	Medium	Medium	High	Medium	High	High
3	Disease, Predation and Competition	Medium	-	Medium	Medium	Low	Low	Medium
4	Fire, Fuel Management and Fire Suppression	Low	Low	Medium	Medium	Low	Medium	Medium
5	Fishing and Collecting	Medium	-	Low	-	Low	-	Low
6	Hatcheries and Aquaculture	-	-	-	-	-	-	-
7	Livestock Farming and Ranching	Medium	Medium	Medium	Medium	Medium	Medium	Medium
8	Logging and Wood Harvesting	Low	Low	Low	Low	Low	Medium	Low
9	Mining	Low	Low	Low	Low	Low	Medium	Low
10	Recreational Areas and Activities	Low	Low	Medium	Medium	Low	Low	Medium
11	Residential and Commercial Development	Medium	Medium	High	High	Medium	Medium	High
12	Roads and Railroads	Medium	High	Medium	High	High	High	High
13	Severe Weather Patterns	Medium	Medium	High	High	Medium	High	High
14	Water Diversion and Impoundments	Medium	Low	High	Medium	Medium	Medium	Medium
Threat Status for Targets and Project		High	High	High	High	High	High	High

Central CA Coast Coho Salmon ~ Redwood Creek

ACTIONS FOR RESTORING HABITATS

1. Restoration- Estuary

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

1.1.1. **Recovery Action:** Improve the quality and extent of freshwater lagoon habitat

1.1.1.1. **Action Step:** Enhance and restore estuary function by improving complex habitat features.

1.1.1.2. **Action Step:** Continue restoration efforts on Big Lagoon to benefit coho salmon during all life stages and seasons.

1.1.1.3. **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.

1.1.1.4. **Action Step:** Support efforts of NPS to restore functional floodplain and lagoon habitat in the lower portion of the watershed.

2. Restoration- Floodplain Connectivity

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

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

2.1.1.1. **Action Step:** Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.

2.1.1.2. **Action Step:** Existing areas with floodplains or off channel habitats should be protected from future urban development of any kind.

2.1.1.3. **Action Step:** Purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities.

2.1.1.4. **Action Step:** Evaluate, develop solutions and implement immediate needs to address problems resulting from channelization.

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:** Target habitat restoration and enhancement that will function between winter base flow and flood stage.

2.2.1.3. **Action Step:** Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.

- 2.2.1.4. **Action Step:** Identify potential sites for construction/restoration of alcoves, backwaters, etc. based on land use and geomorphic constraints.
- 2.2.1.5. **Action Step:** Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NMFS and/or CDFG geomorphologist on design features and implementation techniques.
- 2.2.1.6. **Action Step:** Restore connectivity and enhance habitat in Green Gulch.
- 2.2.1.7. **Action Step:** Remove riprap and gabion rock at lowest end of watershed.
- 2.2.1.8. **Action Step:** Continue to monitor restored reaches in the “Bowling Alley” and “Upper Alley” sections to promote off channel habitat formation. Consult with NMFS and or CDFG geomorphologist before and during the design and implementation phase.

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:** Incorporate large woody material into stream bank protection projects, where appropriate. Do not use aqua logs (cylindrical concrete rip rap).

3.1.1.2. **Action Step:** Place unsecured LWD in the stream and monitor how it is distributed in the watershed.

3.1.1.3. **Action Step:** Install properly sized large woody debris to appropriate viability table targets.

3.1.1.4. **Action Step:** Assess and prioritize restoration of channelized sections to enhance pool depths in Redwood Creek through Muir Woods while maintaining the historic resource to the greatest degree possible.

3.1.1.5. **Action Step:** Engage in riprap removal and LWD placement to restore channel processes within the Muir Woods National Monument as per Kimbell and Kondolf, 2002.

3.1.2. **Recovery Action:** Improve habitat complexity

3.1.2.1. **Action Step:** Evaluate the potential and specific locations (e.g. State and Federal lands) for the re-location and re-introduction of beaver populations

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

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

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

3.2.1. **Recovery Action:** Prevent the loss of habitat complexity

- 3.2.1.1. **Action Step:** Educate landowners, land managers, and County and municipal staffs on the importance of LWD to coho survival and recovery, and watershed processes.
- 3.2.1.2. **Action Step:** Implement education programs and modify policies and procedures to improve riparian corridor protection, maintain channel integrity, implement alternatives to hard bank protection, and retain large woody debris.
- 3.2.1.3. **Action Step:** Fully implement the Programmatic Section 7 consultation for restoration projects administered by the NOAA Restoration Center that permits placement of instream large woody debris.

4. Restoration- Hydrology

- 4.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range
 - 4.1.1. **Recovery Action:** Improve flow conditions (baseflow conditions)
 - 4.1.1.1. **Action Step:** Assess and map water diversions (CDFG 2004).
 - 4.1.1.2. **Action Step:** Establish a comprehensive stream flow evaluation program to determine instream flow needs for coho salmon.
 - 4.1.1.3. **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).
 - 4.1.2. **Recovery Action:** Improve passage flows
- 4.2. **Objective:** Address the inadequacy of existing regulatory mechanisms
 - 4.2.1. **Recovery Action:** Improve flow conditions (baseflow conditions)
 - 4.2.1.1. **Action Step:** Maintain water operations agreements between NPS, CDFG, and MBCSD to operate in a manner that does not alter summer surface flow
 - 4.2.1.2. **Action Step:** Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).
 - 4.2.1.3. **Action Step:** Promote conjunctive use of water with water projects whenever possible to maintain or restore coho salmon habitat.
 - 4.2.1.4. **Action Step:** Identify and eliminate depletion of summer base flows from unauthorized water uses.
 - 4.2.1.5. **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).
 - 4.2.2. **Recovery Action:** Improve passage flows
 - 4.2.2.1. **Action Step:** Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).

4.2.2.2. **Action Step:** Evaluate requests for on-stream dams above coho migratory reaches for effects on the natural hydrograph and the supply of spawning gravel for recruitment downstream (CDFG 2004).

4.2.2.3. **Action Step:** Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.

5. Restoration- Landscape Patterns

No species-specific actions were developed.

6. Restoration- Passage

No species-specific actions were developed.

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 canopy cover

8.1.1.1. **Action Step:** Assess riparian canopy and impacts of exotic vegetation (e.g., *Arundo donax*, etc.), prioritize and develop riparian habitat reclamation and enhancement programs (CDFG 2004).

8.1.1.2. **Action Step:** Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream).

8.1.1.3. **Action Step:** Locate water sources away from riparian areas.

8.1.1.4. **Action Step:** Plant native vegetation to promote streamside shade.

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

8.1.2. **Recovery Action:** Improve tree diameter

8.1.2.1. **Action Step:** Increase tree diameter within 55% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 tree)

8.1.2.2. **Action Step:** Improve the structure and composition of riparian areas to provide shade, large woody debris input, nutrient input, bank stabilization, and other CCC coho salmon needs.

8.1.2.3. **Action Step:** Encourage programs to purchase land/conservation easements to re-establish and enhance natural riparian communities.

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

8.2.1. **Recovery Action:** Protect existing riparian areas

- 8.2.1.1. **Action Step:** Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).
- 8.2.1.2. **Action Step:** Review and develop preferred protocols for Pierce's Disease Control that would maintain a native riparian corridor and develop an outreach program (CDFG 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:** Improve instream gravel quality

9.1.1.1. **Action Step:** Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity.

9.1.1.2. **Action Step:** Address high and medium priority sediment delivery sites

9.1.1.3. **Action Step:** Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).

9.1.1.4. **Action Step:** Establish and/or maintain continuous native riparian buffers.

9.1.1.5. **Action Step:** Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream).

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

9.2.1. **Recovery Action:** Improve instream gravel quality

9.2.1.1. **Action Step:** Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.

9.2.1.2. **Action Step:** Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).

10. Restoration- Viability

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:** Develop a plan to re-establish abundance, while minimizing departure from the genetic profile that historically existed in the population.

10.1.1.2. **Action Step:** Evaluate supplementation strategies utilizing the existing population, or locally adapted nearby populations within the DS, while minimizing departure from the genetic profile that historically existed in the population.

10.1.2. **Recovery Action:** Monitor population status.

10.1.2.1. **Action Step:** Conduct upslope watershed assessments to define limiting factors. Encourage all major landowners to participate

10.1.2.2. **Action Step:** Conduct an instream habitat assessment to develop restoration recommendations

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

10.1.3.1. **Action Step:** Develop and implement a monitoring program to evaluate the performance of recovery efforts.

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

10.1.4.1. **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

10.1.4.2. **Action Step:** Utilize broodstock from Marin County to repopulate remaining extirpated streams within the watershed.

10.1.4.3. **Action Step:** Conduct outreach with landowners to expand broodstock releases within core areas, and remaining extirpated streams within the watershed

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 water quality conditions

11.1.1.1. **Action Step:** Conduct conifer release to promote growth of larger diameter trees where appropriate.

11.1.1.2. **Action Step:** Improve riparian and instream conditions in rearing habitats by establishing riparian protection zones that extend the distance of a site potential tree height from the outer edge of a channel, and by adding LWD.

11.1.1.3. **Action Step:** Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).

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

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

11.2.1.1. **Action Step:** Evaluate and reduce nutrient and pathogen loading from upstream areas to minimize oxygen demand in lower Redwood Creek.

THREAT ABATEMENT ACTIONS

12. Threat- Agricultural Practices

No species-specific actions were developed.

13. Threat- Channel Modification

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

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

13.1.1.1. **Action Step:** Conduct education with public works staff in this area relative to Fishnet 4C Roads Manual

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

13.1.1.3. **Action Step:** Prevent additional channel modification or utilize BMP's to address flood control or bank stabilization issue

13.1.1.4. **Action Step:** Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Identify and target remediation of watershed process disruption as an overall priority.

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

13.1.1.6. **Action Step:** Restore habitat complexity in modified channel areas

14. Threat- Disease/Predation/Competition

No species-specific actions were developed.

15. Threat- Fire/Fuel Management

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

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

15.1.1.1. **Action Step:** Identify historical fire frequency, intensities and durations and manage fuel loads in a manner consistent with historical parameters.

15.1.1.2. **Action Step:** Conduct fuel load monitoring and compare the results to estimated historical fuel loads.

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

15.1.2.1. **Action Step:** Avoid use of aerial fire retardants and foams within 300 feet of riparian areas throughout the current range of CCC coho salmon.

15.1.3. **Recovery Action:** Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)

15.1.3.1. **Action Step:** Immediately implement appropriate sediment control measures following completion of fire suppression while firefighters and equipment are on site.

16. Threat- Fishing/Collecting

No species-specific actions were developed.

17. Threat- Hatcheries

No species-specific actions were developed.

18. Threat- Livestock

No species-specific actions were developed.

19. Threat- Logging

No species-specific actions were developed.

20. Threat- Mining

No species-specific actions were developed.

21. Threat- Recreation

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

21.1.1. **Recovery Action:** Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)

21.1.1.1. **Action Step:** Evaluate trail crossings to ensure bridges are constructed to support horses.

21.1.1.2. **Action Step:** Eliminate horse access to creeks for watering or as fords.

21.1.1.3. **Action Step:** Increase education to the equestrian community regarding impacts to riparian and instream habitat from horse manure and hooves.

21.1.1.4. **Action Step:** Recreational trails should be set back from the creek and built to reduce erosion and minimize stream crossings.

22. Threat- Residential/Commercial Development

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

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

22.1.1.1. **Action Step:** Implement actions in ROADS and RAILROADS

22.1.1.2. **Action Step:** Implement DS level Actions

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

22.1.2.1. **Action Step:** Implement actions in FLOODPLAIN

22.1.2.2. **Action Step:** Implement DS level actions

22.1.3. **Recovery Action:** Prevent impairment to riparian species and composition

22.1.3.1. **Action Step:** Implement actions in RIPARIAN

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

22.1.4.1. **Action Step:** Implement actions in WATER DIVERSIONS

22.1.4.2. **Action Step:** Implement DS level actions

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

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

22.2.1.1. **Action Step:** Implement DS level actions and BMP's

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 alterations to sediment transport (road condition/density, dams, etc.)

23.1.1.1. **Action Step:** Reevaluate the high priority treatment recommendations for unpaved roads from the PWA assessment, and implement recommended treatments if they are still relevant. If not, reassess and make new recommendations for treatment. Push for decommissioning when feasible.

23.1.1.2. **Action Step:** Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.

23.1.2. **Recovery Action:** Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)

23.1.2.1. **Action Step:** NMFS and other stakeholders will work with RCD or NRCS to encourage hiring of consultants to conduct road assessments (first for subwatersheds in Core areas, then for Phase I areas).

23.1.2.2. **Action Step:** Address sediment sources from road networks and other actions that deliver sediment to stream channels.

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

23.1.3. **Recovery Action:** Prevent impairment to the estuary (impaired quality and extent)

23.1.3.1. **Action Step:** Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NMFS and/or CDFG geomorphologist on design features and implementation techniques.

23.1.3.2. **Action Step:** Remove levees along Big Lagoon and Pacific Way. Address issues with culverts, road network, and development within the Big Lagoon Area.

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

23.2.1. **Recovery Action:** Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)

23.2.1.1. **Action Step:** Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).

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 NPS and State Parks on emergency drought operations and contingency plans (i.e. fish rescues etc.)

24.1.1.2. **Action Step:** Work with CDFG, Counties, other agencies, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.

24.1.1.3. **Action Step:** Work with water managers on regulated streams to assure adequate and proper consideration is given to fish needs. Develop agreements, which will minimize water-use conflicts and impacts on fish and wildlife resources during drought conditions.

24.1.1.4. **Action Step:** Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.

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:** Work with the Muir Beach CSD and Green Gulch farm to eliminate water diversions that affect flow within Redwood Creek.

25.1.1.2. **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).

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

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

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

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

25.2.1.1. **Action Step:** Support SWRCB in regulating the use of streamside wells and groundwater.

25.2.1.2. **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).

25.2.1.3. **Action Step:** Identify and work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams.

26. Threat- Watershed Process

No species-specific actions were developed.

Table 3: Implementation Table ~ Redwood Creek

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			
ReC-CCC-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range											
ReC-CCC-1.1.1	Recovery Action	Estuary	Improve the quality and extent of freshwater lagoon habitat											
ReC-CCC-1.1.1.1	Action Step	Estuary	Enhance and restore estuary function by improving complex habitat features.	2	10	Marin County, NPS	163.50	163.50				327	Cost based on treating 10% of 12 acres of estuarine habitat at a rate of \$272,120/acre.	
ReC-CCC-1.1.1.2	Action Step	Estuary	Continue restoration efforts on Big Lagoon to benefit coho salmon during all life stages and seasons.	2	10	NPS	2,500	2,500				5,000	Cost could be incorporated with above action step.	
ReC-CCC-1.1.1.3	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.	2	60	NPS							TBD	
ReC-CCC-1.1.1.4	Action Step	Estuary	Support efforts of NPS to restore functional floodplain and lagoon habitat in the lower portion of the watershed.	2	60	Marin County, Marin RCD, NPS							In-Kind	
ReC-CCC-2.1	Objective	Floodplain Connectivity	Address the inadequacy of existing regulatory mechanisms											
ReC-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Prevent impairment to floodplain connectivity.											
ReC-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.	2	60	Marin County, NPS							TBD	Cost difficult to determine because of willingness of landowner participation.
ReC-CCC-2.1.1.2	Action Step	Floodplain Connectivity	Existing areas with floodplains or off channel habitats should be protected from future urban development of any kind.	2	60	Marin County, NPS							In-Kind	This recommendation should be considered standard practice.
ReC-CCC-2.1.1.3	Action Step	Floodplain Connectivity	Purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities.	3	60	CDFG, NMFS, NPS, USFWS							TBD	Cost difficult to determine because of fair market value and rate of turnover.
ReC-CCC-2.1.1.4	Action Step	Floodplain Connectivity	Evaluate, develop solutions and implement immediate needs to address problems resulting from channelization.	3	10	Marin County, Marin RCD, NPS	36.00	36.00					72	Cost based on riparian monitoring estimated at \$71,436/project.

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		
ReC-CCC-2.2	Objective	Floodplain Connectivity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-2.2.1	Recovery Action	Floodplain Connectivity	Increase and enhance velocity refuge										
ReC-CCC-2.2.1.1	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	20	NPS							Cost accounted for in above action steps.
ReC-CCC-2.2.1.2	Action Step	Floodplain Connectivity	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	2	60	CDFG, Marin County, Marin RCD, NMFS, NPS							Cost accounted for in above action steps.
ReC-CCC-2.2.1.3	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	60	Marin County, Marin RCD, NPS						TBD	Cost accounted for in above action steps.
ReC-CCC-2.2.1.4	Action Step	Floodplain Connectivity	Identify potential sites for construction/restoration of alcoves, backwaters, etc. based on land use and geomorphic constraints.	2	60	Marin County, Marin RCD, NPS						TBD	Cost accounted for in above action steps.
ReC-CCC-2.2.1.5	Action Step	Floodplain Connectivity	Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NMFS and/or CDFG geomorphologist on design features and implementation techniques.	2	10	Marin County, NPS	5,000	5,000				10,000	
ReC-CCC-2.2.1.6	Action Step	Floodplain Connectivity	Restore connectivity and enhance habitat in Green Gulch.	2	10	CDFG, NOAA RC, Private Landowners	200.00	200.00				400	
ReC-CCC-2.2.1.7	Action Step	Floodplain Connectivity	Remove riprap and gabion rock at lowest end of watershed.	3	20	Marin County, Marin RCD, NPS						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			
ReC-CCC-2.2.1.8	Action Step	Floodplain Connectivity	Continue to monitor restored reaches in the "Bowling Alley" and "Upper Alley" sections to promote off channel habitat formation. Consult with NMFS and or CDFG geomorphologist before and during the design and implementation phase.	3	20	NPS	125.00	125.00	125.00	125.00		500		
ReC-CCC-3.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range											
ReC-CCC-3.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency (BFW 0-10 meters)											
ReC-CCC-3.1.1.1	Action Step	Habitat Complexity	Incorporate large woody material into stream bank protection projects, where appropriate. Do not use aqua logs (cylindrical concrete rip rap).	3	60	Marin County, Marin RCD, NPS, State Parks							TBD	
ReC-CCC-3.1.1.2	Action Step	Habitat Complexity	Place unsecured LWD in the stream and monitor how it is distributed in the watershed.	2	10	Marin County, Marin RCD, NPS, State Parks	125.00	125.00					250	Cost based on treating 10 miles (assume 1 project/mile in 50% of High IP) at a rate of \$25,000/mile.
ReC-CCC-3.1.1.3	Action Step	Habitat Complexity	Install properly sized large woody debris to appropriate viability table targets.	2	20	Marin County, Marin RCD, NPS, State Parks							TBD	Cost encumbered in place unsecured LWD in the stream.
ReC-CCC-3.1.1.4	Action Step	Habitat Complexity	Assess and prioritize restoration of channelized sections to enhance pool depths in Redwood Creek through Muir Woods while maintaining the historic resource to the greatest degree possible.	2	10		56.00	56.00					112	Cost based on fish/habitat restoration effectiveness monitoring estimated at \$111,192/project.
ReC-CCC-3.1.1.5	Action Step	Habitat Complexity	Engage in riprap removal and LWD placement to restore channel processes within the Muir Woods National Monument as per Kimbell and Kondolf, 2002.	2	10	NPS, State Parks							In-Kind	
ReC-CCC-3.1.2	Recovery Action	Habitat Complexity	Improve habitat complexity											
ReC-CCC-3.1.2.1	Action Step	Habitat Complexity	Evaluate the potential and specific locations (e.g. State and Federal lands) for the re-location and re-introduction of beaver populations	2	10		5.00	5.00					10	Cost based on beaver reintroduction estimated at \$10,000/beaver family translocation.

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		
ReC-CCC-3.1.3	Recovery Action	Habitat Complexity	Improve shelter rating										
ReC-CCC-3.1.3.1	Action Step	Habitat Complexity	Increase shelter ratings in 75% of streams across the watershed to improve conditions for adults, and winter/summer rearing juveniles	2	20							TBD	Cost likely accounted for in increase pools, riffles, and LWD frequency.
ReC-CCC-3.2	Objective	Habitat Complexity	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-3.2.1	Recovery Action	Habitat Complexity	Prevent the loss of habitat complexity										
ReC-CCC-3.2.1.1	Action Step	Habitat Complexity	Educate landowners, land managers, and County and municipal staffs on the importance of LWD to coho survival and recovery, and watershed processes.	3	20	Marin County, Marin RCD, NPS, Private Landowners, State Parks						In-Kind	
ReC-CCC-3.2.1.2	Action Step	Habitat Complexity	Implement education programs and modify policies and procedures to improve riparian corridor protection, maintain channel integrity, implement alternatives to hard bank protection, and retain large woody debris.	3	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-3.2.1.3	Action Step	Habitat Complexity	Fully implement the Programmatic Section 7 consultation for restoration projects administered by the NOAA Restoration Center that permits placement of instream large woody debris.	3	60	Marin County, Marin RCD, NMFS PRD, NOAA RC, NPS, State Parks						In-Kind	
ReC-CCC-4.1	Objective	Hydrology	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-4.1.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)										
ReC-CCC-4.1.1.1	Action Step	Hydrology	Assess and map water diversions (CDFG 2004).	2	5	Marin County, Marin RCD, NPS, State Parks						TBD	Cost accounted for in action step below.

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		
ReC-CCC-4.1.1.2	Action Step	Hydrology	Establish a comprehensive stream flow evaluation program to determine instream flow needs for coho salmon.	2	10	CDFG, DWR, Marin County, Marin RCD, NMFS, NPS, RWQCB, State Parks, SWRCB	31.50	31.50				63	Cost for stream flow model estimated at \$63,005/project. This recommendation should also map and identify water diversions.
ReC-CCC-4.1.1.3	Action Step	Hydrology	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).	2	60	CDFG, DWR, RWQCB, State Parks, SWRCB						TBD	Cost difficult to determine because of landowner participation.
ReC-CCC-4.1.2	Recovery Action	Hydrology	Improve passage flows										
ReC-CCC-4.2	Objective	Hydrology	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-4.2.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)										
ReC-CCC-4.2.1.1	Action Step	Hydrology	Maintain water operations agreements between NPS, CDFG, and MBCSD to operate in a manner that does not alter summer surface flow	2	60	CDFG, MBCSD, NPS, State Parks						In-Kind	
ReC-CCC-4.2.1.2	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	Cost difficult to determine because of landowner participation and extent of off-channel storage needed to reduce impacts. Stream flow model should address this concern.
ReC-CCC-4.2.1.3	Action Step	Hydrology	Promote conjunctive use of water with water projects whenever possible to maintain or restore coho salmon habitat.	2	60	Marin County, Marin RCD, NPS, NRCS, State Parks						In-Kind	
ReC-CCC-4.2.1.4	Action Step	Hydrology	Identify and eliminate depletion of summer base flows from unauthorized water uses.	2	30	CDFG, DWR, Marin County, Marin RCD, NMFS, RWQCB, SWRCB						TBD	Cost accounted for in stream flow model.

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		
ReC-CCC-4.2.1.5	Action Step	Hydrology	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	CA Coastal Commission, CDFG, DWR, Farm Bureau, Marin County, Marin RCD, NPS, RWQCB, State Parks, SWRCB						In-Kind	
ReC-CCC-4.2.2	Recovery Action	Hydrology	Improve passage flows										
ReC-CCC-4.2.2.1	Action Step	Hydrology	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (CDFG 2004).	2	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-4.2.2.2	Action Step	Hydrology	Evaluate requests for on-stream dams above coho migratory reaches for effects on the natural hydrograph and the supply of spawning gravel for recruitment downstream (CDFG 2004).	3	60	CDFG, DWR, NMFS PRD, RWQCB, SWRCB						In-Kind	
ReC-CCC-4.2.2.3	Action Step	Hydrology	Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.	3	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-8.1	Objective	Riparian	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
ReC-CCC-8.1.1	Recovery Action	Riparian	Improve canopy cover										
ReC-CCC-8.1.1.1	Action Step	Riparian	Assess riparian canopy and impacts of exotic vegetation (e.g., Arundo donax, etc.), prioritize and develop riparian habitat reclamation and enhancement programs (CDFG 2004).	3	20	State Parks	792	792	792	792		3,166	Cost for riparian monitoring accounted for in above action steps. Cost to treat 1 mile of exotic vegetation (assume 80 acres/mile in 5% High IP with a 1 mile minimum) at a rate of \$39,574/acre.
ReC-CCC-8.1.1.2	Action Step	Riparian	Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream).	2	20	Marin County, Marin RCD, NPS, State Parks	250.00	250.00	250.00	250.00		1,000	

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		
ReC-CCC-8.1.1.3	Action Step	Riparian	Locate water sources away from riparian areas.	2	60	Marin County, NPS, State Parks						In-Kind	
ReC-CCC-8.1.1.4	Action Step	Riparian	Plant native vegetation to promote streamside shade.	3	20	Marin County, Marin RCD, NPS, State Parks	402.50	402.50	402.50	402.50		1,610	Cost based on treating 1 mile (assume 80 acres/mile in 5% High IP with a 1 mile minimum) at a rate of \$20,057/acre.
ReC-CCC-8.1.1.5	Action Step	Riparian	Promote bio-engineering solutions as appropriate (e.g. where critical infrastructure is located) for bank hardening projects.	3	60	CDFG, Marin County, Marin RCD, NMFS, NPS, State Parks						In-Kind	
ReC-CCC-8.1.2	Recovery Action	Riparian	Improve tree diameter										
ReC-CCC-8.1.2.1	Action Step	Riparian	Increase tree diameter within 55% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 tree)	2	30	Marin County, MMWD						TBD	Cost likely accounted for in above action steps.
ReC-CCC-8.1.2.2	Action Step	Riparian	Improve the structure and composition of riparian areas to provide shade, large woody debris input, nutrient input, bank stabilization, and other CCC coho salmon needs.	2	20	Marin County, MMWD						TBD	Cost likely accounted for in above action steps.
ReC-CCC-8.1.2.3	Action Step	Riparian	Encourage programs to purchase land/conservation easements to re-establish and enhance natural riparian communities.	2	10	Marin RCD, MMWD						In-Kind	
ReC-CCC-8.2	Objective	Riparian	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-8.2.1	Recovery Action	Riparian	Protect existing riparian areas										
ReC-CCC-8.2.1.1	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	3	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-8.2.1.2	Action Step	Riparian	Review and develop preferred protocols for Pierce's Disease Control that would maintain a native riparian corridor and develop an outreach program (CDFG 2004).	3	60	Marin County, NPS, State Parks						In-Kind	

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		
ReC-CCC-9.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-9.1.1	Recovery Action	Sediment	Improve instream gravel quality										
ReC-CCC-9.1.1.1	Action Step	Sediment	Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity.	2	5	Marin County, Marin RCD, NPS, State Parks	48.00					48	Cost for road inventory estimated at \$927/mile (assume 75% of road network) and sediment assessment (assume 25% of total watershed acres) estimated at \$12/acre.
ReC-CCC-9.1.1.2	Action Step	Sediment	Address high and medium priority sediment delivery sites	2	20	Marin County, Marin RCD, NPS, State Parks							Cost likely accounted for in sediment assessment.
ReC-CCC-9.1.1.3	Action Step	Sediment	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).	2	10	Marin County, Marin RCD, NPS, State Parks	42.00	42.00				84	Cost based on decommissioning 7 miles of riparian road at a rate of \$12,000/mile.
ReC-CCC-9.1.1.4	Action Step	Sediment	Establish and/or maintain continuous native riparian buffers.	3	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-9.1.1.5	Action Step	Sediment	Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream).	3	30	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-CCC-9.2	Objective	Sediment	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-9.2.1	Recovery Action	Sediment	Improve instream gravel quality										
ReC-CCC-9.2.1.1	Action Step	Sediment	Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.	3	60	Marin County, NPS, State Parks						In-Kind	
ReC-CCC-9.2.1.2	Action Step	Sediment	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	

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		
ReC-CCC-10.1	Objective	Viability	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
ReC-CCC-10.1.1	Recovery Action	Viability	Increase abundance										
ReC-CCC-10.1.1.1	Action Step	Viability	Develop a plan to re-establish abundance, while minimizing departure from the genetic profile that historically existed in the population.	1		CDFG, NMFS PRD, NPS, State Parks						In-Kind	This recommendation will require coordination with partners.
ReC-CCC-10.1.1.2	Action Step	Viability	Evaluate supplementation strategies utilizing the existing population, or locally adapted nearby populations within the DS, while minimizing departure from the genetic profile that historically existed in the population.	1		CDFG, NPS, State Parks, Tomales Bay Watershed Council						In-Kind	
ReC-CCC-10.1.2	Recovery Action	Viability	Monitor population status.										
ReC-CCC-10.1.2.1	Action Step	Viability	Conduct upslope watershed assessments to define limiting factors. Encourage all major landowners to participate	2	20	CDFG, NPS							Cost accounted for in above action steps.
ReC-CCC-10.1.2.2	Action Step	Viability	Conduct an instream habitat assessment to develop restoration recommendations	2	60	NPS						TBD	Cost accounted for fish/habitat monitoring.
ReC-CCC-10.1.3	Recovery Action	Viability	Increase spawner density										
ReC-CCC-10.1.3.1	Action Step	Viability	Develop and implement a monitoring program to evaluate the performance of recovery efforts.										
ReC-CCC-10.1.4	Recovery Action	Viability	Increase spatial structure and diversity										
ReC-CCC-10.1.4.1	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, MMWD, NMFS						In-Kind	Existing operations
ReC-CCC-10.1.4.2	Action Step	Viability	Utilize broodstock from Marin County to repopulate remaining extirpated streams within the watershed.	1	10	CDFG, USACE						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		
ReC-CCC-10.1.4.3	Action Step	Viability	Conduct outreach with landowners to expand broodstock releases within core areas, and remaining extirpated streams within the watershed	2	5	CDFG, Marin RCD, NMFS						In-Kind	
ReC-CCC-11.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-11.1.1	Recovery Action	Water Quality	Improve stream water quality conditions										
ReC-CCC-11.1.1.1	Action Step	Water Quality	Conduct conifer release to promote growth of larger diameter trees where appropriate.	3	10	NPS, State Parks	57.00	57.00				114	Cost based on treating 1 mile (assume 80 acres/mile in 15% High IP with 1 mile minimum) at a rate of \$1,422/acre.
ReC-CCC-11.1.1.2	Action Step	Water Quality	Improve riparian and instream conditions in rearing habitats by establishing riparian protection zones that extend the distance of a site potential tree height from the outer edge of a channel, and by adding LWD.	2	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-11.1.1.3	Action Step	Water Quality	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (CDFG 2004).	3	60	Marin County, NPS, State Parks						In-Kind	
ReC-CCC-11.2	Objective	Water Quality	Address the inadequacy of existing regulatory mechanisms.										
ReC-CCC-11.2.1	Recovery Action	Water Quality	Improve stream water quality conditions										
ReC-CCC-11.2.1.1	Action Step	Water Quality	Evaluate and reduce nutrient and pathogen loading from upstream areas to minimize oxygen demand in lower Redwood Creek.	2	2	NPS	3.30					3	Cost to conduct water quality monitoring estimated at \$657/site. Assume minimum of 5 sites for High IP. Cost does not account for data management or reporting requirements.
ReC-CCC-13.1	Objective	Channel Modification	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-13.1.1	Recovery Action	Channel Modification	Prevent impairment of floodplain connectivity										

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		
ReC-CCC-13.1.1.1	Action Step	Channel Modification	Conduct education with public works staff in this area relative to Fishnet 4C Roads Manual	2	20	FishNet 4C						In-Kind	
ReC-CCC-13.1.1.2	Action Step	Channel Modification	Where feasible, remove obsolete bank stabilization structures from the channel which contribute to channel incision and reduced habitat complexity.	3	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-CCC-13.1.1.3	Action Step	Channel Modification	Prevent additional channel modification or utilize BMP's to address flood control or bank stabilization issue	3	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-13.1.1.4	Action Step	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Identify and target remediation of watershed process disruption as an overall priority.	3	20	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-13.1.1.5	Action Step	Channel Modification	Promote bio-engineering solutions as appropriate (e.g. except where critical infrastructure is located) for bank hardening projects.	3	20	Marin County						In-Kind	
ReC-CCC-13.1.1.6	Action Step	Channel Modification	Restore habitat complexity in modified channel areas	2	10	Marin County, Marin RCD, NPS, State Parks	37.50	37.50				75	Cost based on treating 50% of IP at a rate of \$25,000/mile.
ReC-CCC-15.1	Objective	Fire/Fuel Management	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-15.1.1	Recovery Action	Fire/Fuel Management	Prevent adverse alterations to riparian species composition and structure										
ReC-CCC-15.1.1.1	Action Step	Fire/Fuel Management	Identify historical fire frequency, intensities and durations and manage fuel loads in a manner consistent with historical parameters.	3	60	NPS, State Parks						In-Kind	
ReC-CCC-15.1.1.2	Action Step	Fire/Fuel Management	Conduct fuel load monitoring and compare the results to estimated historical fuel loads.	3	10	NPS, State Parks	41.50	41.50				83	Cost for effects of wildfire on ecosystem process estimated at \$83,153/project.
ReC-CCC-15.1.2	Recovery Action	Fire/Fuel Management	Prevent impairment to water quality										

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		
ReC-CCC-15.1.2.1	Action Step	Fire/Fuel Management	Avoid use of aerial fire retardants and foams within 300 feet of riparian areas throughout the current range of CCC coho salmon.	2	50							In-Kind	
ReC-CCC-15.1.3	Recovery Action	Fire/Fuel Management	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ReC-CCC-15.1.3.1	Action Step	Fire/Fuel Management	Immediately implement appropriate sediment control measures following completion of fire suppression while firefighters and equipment are on site.	2	100	NPS, State Parks						In-Kind	
ReC-CCC-21.1	Objective	Recreation	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
ReC-CCC-21.1.1	Recovery Action	Recreation	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ReC-CCC-21.1.1.1	Action Step	Recreation	Evaluate trail crossings to ensure bridges are constructed to support horses.	2	50	NPS, State Parks						In-Kind	
ReC-CCC-21.1.1.2	Action Step	Recreation	Eliminate horse access to creeks for watering or as fords.	2	20	NPS, State Parks						TBD	Cost are difficult to determine without knowledge of number of access points.
ReC-CCC-21.1.1.3	Action Step	Recreation	Increase education to the equestrian community regarding impacts to riparian and instream habitat from horse manure and hooves.	3		NPS, State Parks						In-Kind	
ReC-CCC-21.1.1.4	Action Step	Recreation	Recreational trails should be set back from the creek and built to reduce erosion and minimize stream crossings.	2	50	NPS, State Parks						In-Kind	
ReC-CCC-22.1	Objective	Residential/Commercial Development	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
ReC-CCC-22.1.1	Recovery Action	Residential/Commercial Development	Prevent impairment to watershed hydrology										
ReC-CCC-22.1.1.1	Action Step	Residential/Commercial Development	Implement actions in ROADS and RAILROADS	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		
ReC-CCC-22.1.1.2	Action Step	Residential/Commercial Development	Implement DS level Actions	3									
ReC-CCC-22.1.2	Recovery Action	Residential/Commercial Development	Prevent impairment to floodplain connectivity										
ReC-CCC-22.1.2.1	Action Step	Residential/Commercial Development	Implement actions in FLOODPLAIN	2									
ReC-CCC-22.1.2.2	Action Step	Residential/Commercial Development	Implement DS level actions	3									
ReC-CCC-22.1.3	Recovery Action	Residential/Commercial Development	Prevent impairment to riparian species and composition										
ReC-CCC-22.1.3.1	Action Step	Residential/Commercial Development	Implement actions in RIPARIAN	2									
ReC-CCC-22.1.4	Recovery Action	Residential/Commercial Development	Prevent impairment to stream hydrology (impaired water flow)										
ReC-CCC-22.1.4.1	Action Step	Residential/Commercial Development	Implement actions in WATER DIVERSIONS	2									
ReC-CCC-22.1.4.2	Action Step	Residential/Commercial Development	Implement DS level actions	3									
ReC-CCC-22.2	Objective	Residential/Commercial Development	Address the inadequacy of existing regulatory mechanisms.										
ReC-CCC-22.2.1	Recovery Action	Residential/Commercial Development	Prevent increased landscape disturbance										
ReC-CCC-22.2.1.1	Action Step	Residential/Commercial Development	Implement DS level actions and BMP's	3									
ReC-CCC-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
ReC-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent alterations to sediment transport (road condition/density, dams, etc.)										

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		
ReC-CCC-23.1.1.1	Action Step	Roads/Railroads	Reevaluate the high priority treatment recommendations for unpaved roads from the PWA assessment, and implement recommended treatments if they are still relevant. If not, reassess and make new recommendations for treatment. Push for decommissioning when feasible.	2	10		235.00	235.00				470	Cost based on treating 14 miles of road network at \$21,000/mile. Cost to decommission road network to viability targets is \$168,000.
ReC-CCC-23.1.1.2	Action Step	Roads/Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.	3	50							In-Kind	
ReC-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ReC-CCC-23.1.2.1	Action Step	Roads/Railroads	NMFS and other stakeholders will work with RCD or NRCS to encourage hiring of consultants to conduct road assessments (first for subwatersheds in Core areas, then for Phase I areas).	2	50							In-Kind	
ReC-CCC-23.1.2.2	Action Step	Roads/Railroads	Address sediment sources from road networks and other actions that deliver sediment to stream channels.	2	50							TBD	Cost accounted for in other action steps.
ReC-CCC-23.1.2.3	Action Step	Roads/Railroads	Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in historical habitats or Core CCC coho salmon watersheds.	3	10		22.00	22.00				44	Cost based on decommissioning 4 miles of road network at \$12,000/mile.
ReC-CCC-23.1.3	Recovery Action	Roads/Railroads	Prevent impairment to the estuary (impaired quality and extent)										
ReC-CCC-23.1.3.1	Action Step	Roads/Railroads	Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NMFS and/or CDFG geomorphologist on design features and implementation techniques.	2	30							In-Kind	

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		
ReC-CCC-23.1.3.2	Action Step	Roads/Railroads	Remove levees along Big Lagoon and Pacific Way. Address issues with culverts, road network, and development within the Big Lagoon Area.	2	10		555	555				1,110	Cost based on treating 1,500 linear feet of levee at \$70/linear foot plus road treatment at a cost of \$21,000/mile.
ReC-CCC-23.2	Objective	Roads/Railroads	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-23.2.1	Recovery Action	Roads/Railroads	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
ReC-CCC-23.2.1.1	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3	100							In-Kind	
ReC-CCC-24.1	Objective	Severe Weather Patterns	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to hydrology										
ReC-CCC-24.1.1.1	Action Step	Severe Weather Patterns	Work with NPS and State Parks on emergency drought operations and contingency plans (i.e. fish rescues etc.)	2	60	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-24.1.1.2	Action Step	Severe Weather Patterns	Work with CDFG, Counties, other agencies, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.	3	100	Marin County, Marin RCD, NPS, State Parks						In-Kind	
ReC-CCC-24.1.1.3	Action Step	Severe Weather Patterns	Work with water managers on regulated streams to assure adequate and proper consideration is given to fish needs. Develop agreements, which will minimize water-use conflicts and impacts on fish and wildlife resources during drought conditions.	2	60	CDFG, DWR, Marin County, Marin RCD, NPS, RWQCB, State Parks, SWRCB						In-Kind	
ReC-CCC-24.1.1.4	Action Step	Severe Weather Patterns	Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.	3	60	Marin County, Marin RCD, NPS, State Parks, SWRCB						In-Kind	

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		
ReC-CCC-25.1	Objective	Water Diversion/Impoundment	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
ReC-CCC-25.1.1	Recovery Action	Water Diversion/Impoundment	Prevent impairment to stream hydrology (impaired water flow)										
ReC-CCC-25.1.1.1	Action Step	Water Diversion/Impoundment	Work with the Muir Beach CSD and Green Gulch farm to eliminate water diversions that affect flow within Redwood Creek.	2	20							TBD	
ReC-CCC-25.1.1.2	Action Step	Water Diversion/Impoundment	Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and §1707 (CDFG 2004).	3	50							TBD	
ReC-CCC-25.1.2	Recovery Action	Water Diversion/Impoundment	Prevent reduced density, abundance, and diversity										
ReC-CCC-25.1.2.1	Action Step	Water Diversion/Impoundment	Adequately screen water diversions to prevent juvenile salmonid mortalities.	2	100							In-Kind	This recommendation should be considered standard practice.
ReC-CCC-25.2	Objective	Water Diversion/Impoundment	Address the inadequacy of existing regulatory mechanisms										
ReC-CCC-25.2.1	Recovery Action	Water Diversion/Impoundment	Prevent impairment to stream hydrology (impaired water flow)										
ReC-CCC-25.2.1.1	Action Step	Water Diversion/Impoundment	Support SWRCB in regulating the use of streamside wells and groundwater.	3	100							In-Kind	
ReC-CCC-25.2.1.2	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	100							In-Kind	
ReC-CCC-25.2.1.3	Action Step	Water Diversion/Impoundment	Identify and work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses. Coordinated efforts by Federal and State, and County law enforcement agencies to remove illegal diversions from streams.	3	100							In-Kind	