Soquel Creek

Location	•Santa Cruz County
Watershed Area	•42.0 Square Miles
Potential Habitat	•31.9 Stream Miles
Vegetation	•64% Coniferous, 20% Shrubland, 16% Urban, Riparian, or Agriculture
Erodability	•Moderate to High
Ownership Patterns	•88% Private; 12% Public
Dominant Land Uses	•Urban, Rural Residential, Timber
Housing Density	•Moderate to High
TMDL Pollutants	•Pathogens, Sediment

Soquel Creek
Photo by USGS

Soquel Creek Coho Salmon: Nearly Extirpated

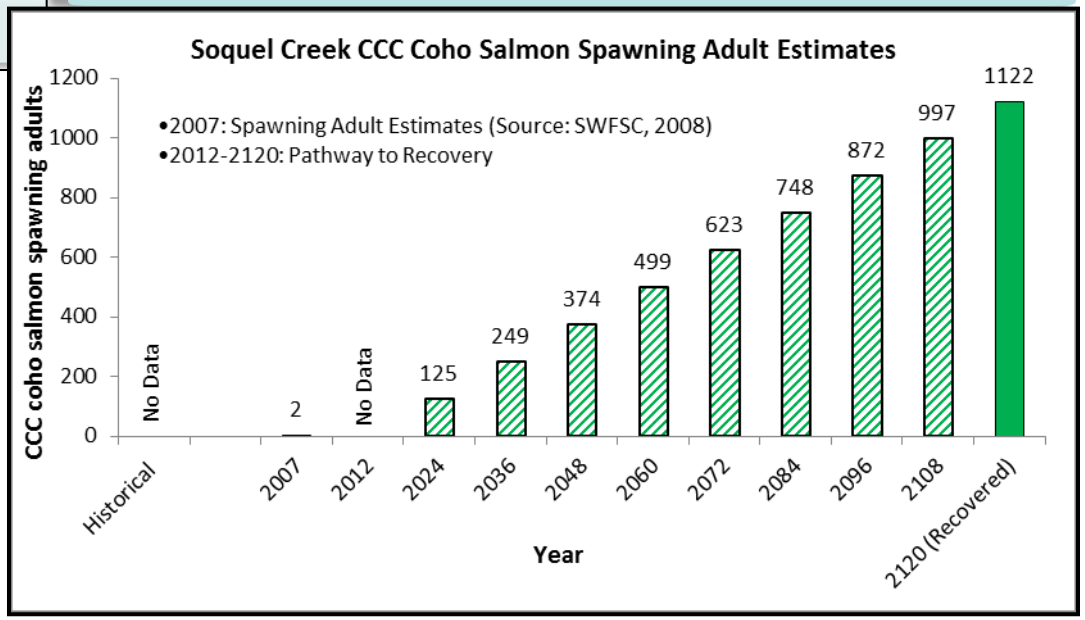
Recovery Goals

- ✓ Implement a monitoring program to evaluate presence and the performance of recovery efforts
- ✓ Conduct periodic, standardized juvenile and spawning adult surveys in the watershed

Soquel Creek
Adult Spawner Targets

Downlisting to Threatened
561

Recovery
1,122



STEELHEAD: YES
CHINOOK SALMON: NO

Soquel Creek

Potential Habitat: 31.9 miles
Recovery Target: 1,122 Spawning Adult Coho Salmon

Current Instream, Watershed and Population Conditions

Estuary/Lagoon	Habitat Complexity	Hydrology	Passage & Migration	Riparian Vegetation	Sediment	Stream Temperature	Velocity Refuge	Water Quality	Viability	Landscape Patterns
FAIR	POOR	POOR	GOOD	GOOD	POOR	FAIR	FAIR	FAIR	POOR	GOOD

Preventing Extinction & Improving Conditions

Priority 1: Immediate Restoration Actions

- Delineate reaches possessing both potential winter rearing habitat and floodplain areas
- Implement a long term study project in Soquel Demonstration State Forest to demonstrate effective LWD projects to citizens of Santa Cruz County
- Promote conjunctive use of water for water projects whenever possible
- Provide incentives to water rights holders willing to convert some or all of their water right to instream use
- Re-establish a naturally reproducing run of coho salmon

Priority 2 & 3: Long-Term Restoration Actions

- Install structures to enhance scour to increase residual pool depths in the estuary
- Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats
- Promote off-channel storage and conservation measures to reduce impacts of summer and early fall water diversion
- Promote irrigation efficiency projects for ongoing agricultural practices
- Remediate slides and gullies delivering sediment to fish bearing streams

Recovery Partners
Cal Fire Soquel Demonstration State Forest

Photo courtesy from left to right: Campbell Timberland, David Hines, NMFS, Campbell Timberland, Eli Asarian and Morgan Bond, SWFSC

Soquel Creek

Potential Habitat: 31.9 miles
Recovery Target: 1,122 Spawning Adult Coho Salmon

Future Threats

Agriculture	Channel Modification	Disease & Predation	Fire & Fuel Management	Fishing & Collecting	Hatcheries & Aquaculture	Livestock & Ranching	Logging	Mining	Recreation	Urban Development	Roads & Railroads	Severe Weather	Diversions & Impoundment
MEDIUM	HIGH	MEDIUM	HIGH	HIGH	NA	MEDIUM	HIGH	MEDIUM	MEDIUM	VERY HIGH	VERY HIGH	VERY HIGH	VERY HIGH

Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- New development should meet a zero net increase in storm-water runoff, changes in duration, or magnitude of peak flows, and allowed to meander
- Develop water education and conservation programs to reduce water use
- Ensure water diversions do not impair water temperatures in Soquel Creek
- Appoint and adequately fund a Water Master to carry out the adjudication of water rights

Priority 2 & 3: Long-Term Threat Abatement Actions

- Wet weather and/or winter timber operations should be discouraged
- All roads, landings, and skid trails associated with timber operations should be hydrologically disconnected
- Monitor quarry operations to ensure compliance
- Sediment from existing and future commercial and urban development should be reduced to magnitudes appropriate to the geological setting
- Discourage new construction in undeveloped areas within the 100-year flood prone zones
- Implement water conservation strategies

Soquel Lagoon
Photo by Michelle Leicester, CDFG

Conservation Highlights

- The City of Capitola has an active lagoon management program
- NMFS recently issued a final rule extending the range of CCC coho salmon to include Soquel Creek.
- Soquel Demonstration State Forest has implemented actions to improve habitat complexity
- NOAA SWFSC recently document first successful coho spawning in East Branch Soquel Creek

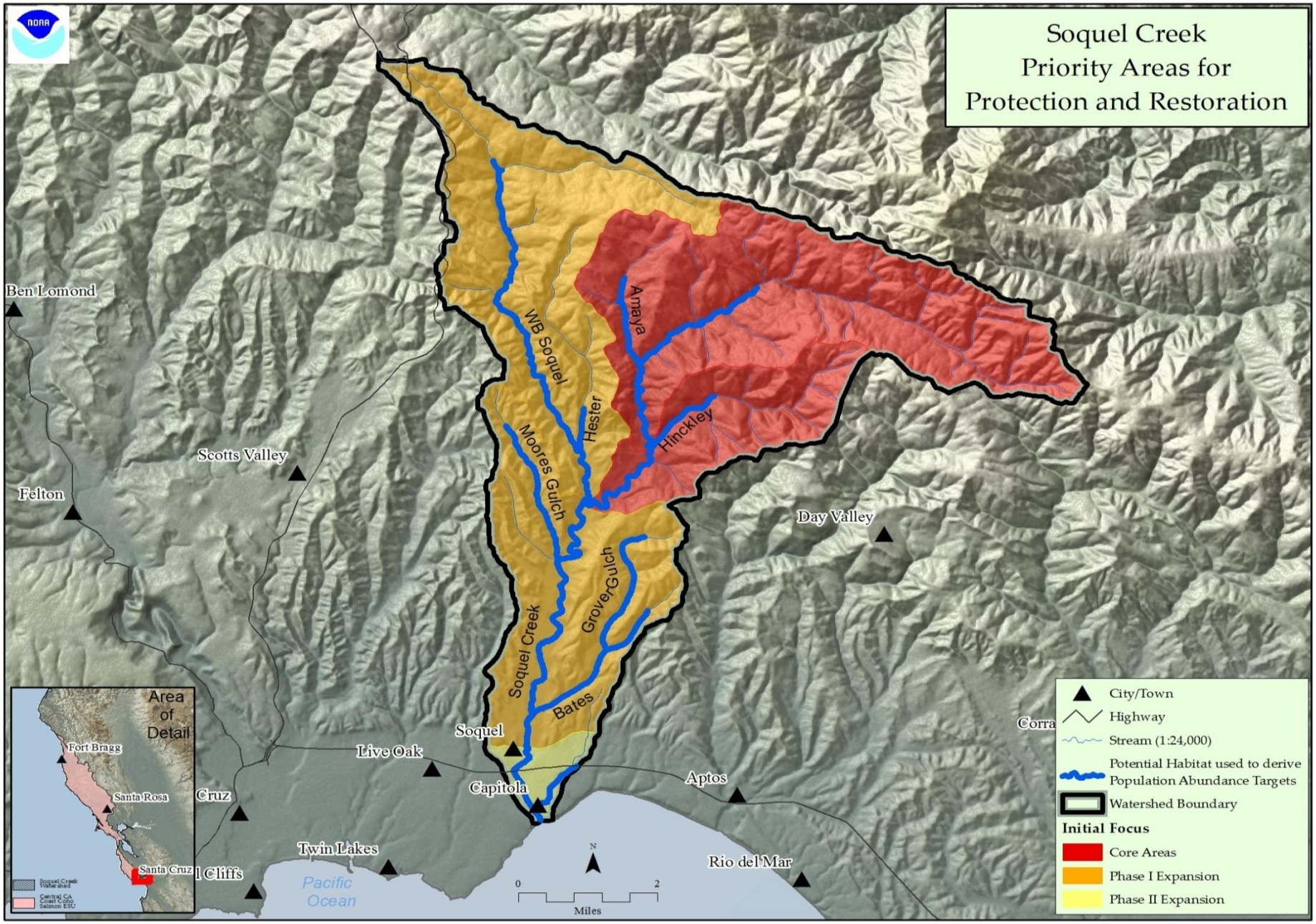


Figure 1: Map of Soquel Creek

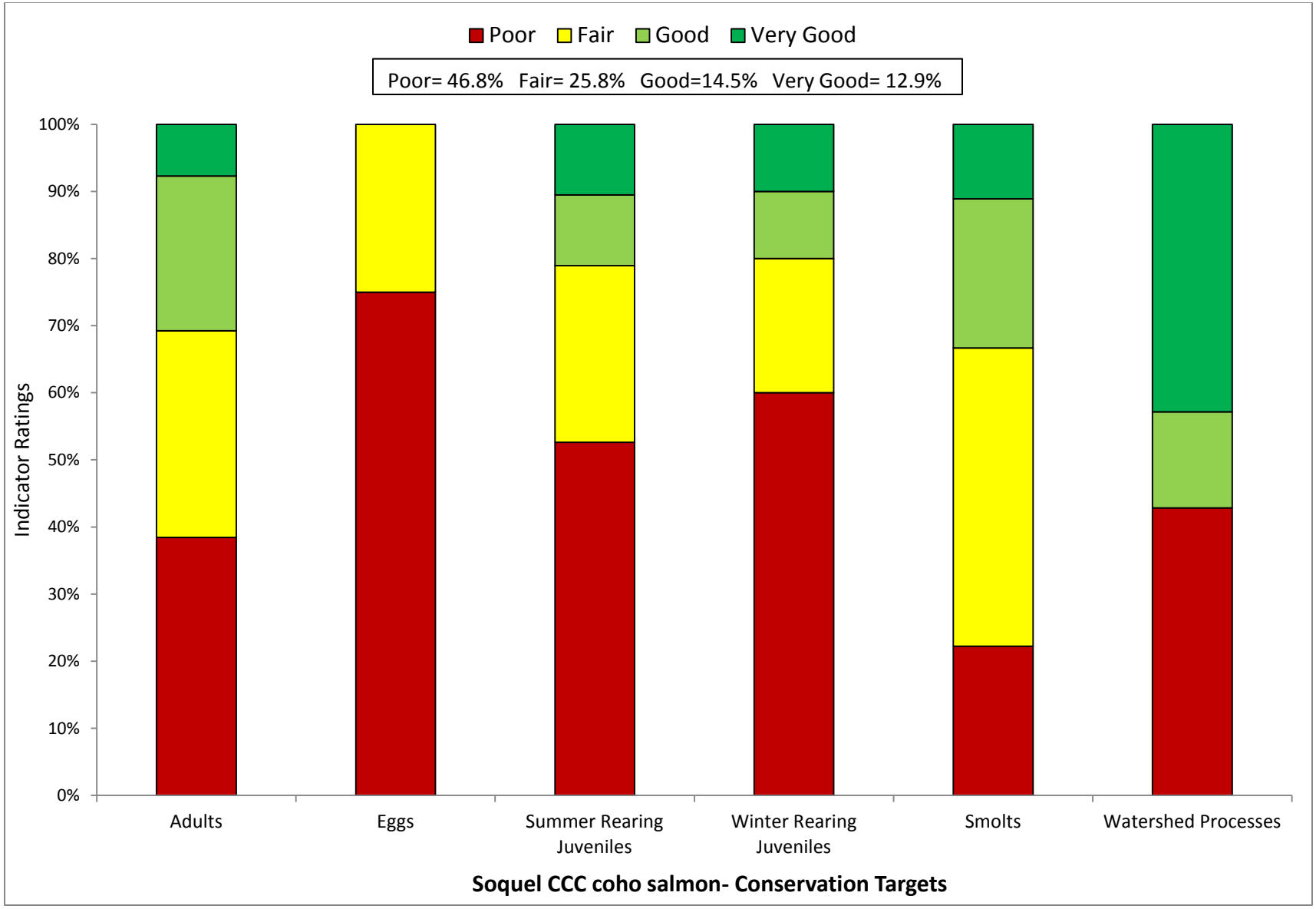


Figure 2: Viability Results by Lifestage

Table 1: CAP Viability Results ~ Soquel Creek

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	**<4 Key Pieces/100m**	Poor	NMFS Expert Estuary/Lagoon Panel	6 to 11 key pcs/100m
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	**0.55 Key Pieces/100m**	Poor	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**29% streams 16% IP-km (>30% Pools; >20% Riffles)**	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	**0% 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 = <35**	Very Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Adults	Passage/Migration	Passage at Mouth or Confluence	**75% of IP-km to 90% of IP-km accessible**	Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Passage/Migration	Physical Barriers	**78% of IP-km accessible**	Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	**NA**	0	SEC Analysis/CDFG Data	55 - 69% Class 5 & 6 across IP-km
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	**≥80% Density rating "D" across IP-km**	Good	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Adults	Sediment	Quantity & Distribution of Spawning Gravels	**50% of IP-km to 74% of IP-km accessible**	Fair	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	**50-80% Response Reach Connectivity**	Fair	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 = 51-75**	Fair	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	**Risk Factor Score = >75**	Poor	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50

Eggs	Sediment	Gravel Quality (Bulk)	**>17% (0.85mm) and >30% (6.4mm)**	Poor	NMFS Instream Flow Analysis	12-14% (0.85mm) and <30% (6.4mm)
Eggs	Sediment	Gravel Quality (Embeddedness)	**29% streams 25% 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 but functioning**	Fair	NMFS Instream Flow Analysis	Properly Functioning Condition
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	**<4 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)	**0.55 Key Pieces/100m**	Poor	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	**29% streams 75% 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	**29% streams 16% 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	**0% 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 = >75**	Poor	NMFS Instream Flow Analysis	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor Score = >75**	Poor	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	**4.84 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	**75% of IP-km to 90% of IP-km accessible**	Good	NMFS Watershed Characterization	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	**95.2% 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	**100% streams 100% 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)	**NA**	0	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	**≥80% Density rating "D" across IP-km**	Good	SEC or PAD/CDFG Data	≥80% Density rating "D" across IP-km
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	**29% streams 25% IP-km (>50% stream average scores of 1 & 2)**	Poor	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 to 74% IP km (<16 C MWMT)**	Fair	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% of Historical Range**	Poor	NMFS Watershed Characterization/CWHR	75-90% of Historical Range
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	**<4 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)	**0.55 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	**29% streams 16% 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	**0% 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	**95.2% 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)	**NA**	0	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	**≥80% Density rating "D" across IP-km**	Good	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	**29% streams 25% IP-km (>50% stream average scores of 1 & 2)**	Poor	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	Properly Functioning Condition
Smolts	Habitat Complexity	Shelter Rating	**0% of streams/ 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	**4.84 Diversions/10 IP-km**	Fair	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	**Risk Factor Score = <35**	Good	TRT Spence (2008)	NMFS Flow Protocol: Risk Factor Score 35-50
Smolts	Passage/Migration	Passage at Mouth or Confluence	**>90% of IP-km accessible**	Very Good	TRT Spence (2008)	75% of IP-Km to 90% of IP-km
Smolts	Smoltification	Temperature	**75-90% IP-Km (>6 and <16 C)**	Good	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	**2.5% of Watershed in Impervious Surfaces**	Very Good	SEC Analysis	3-6% of Watershed in Impervious Surfaces
Watershed Processes	Landscape Patterns	Agriculture	**1.26% of Watershed in Agriculture**	Very Good	EPA/RWQCB/NMFS Criteria	10-19% of Watershed in Agriculture
Watershed Processes	Landscape Patterns	Timber Harvest	**7% of Watershed in Timber Harvest**	Very Good	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	**59% of watershed >1 unit/20 acres**	Poor	EPA/RWQCB/NMFS Criteria	8-11% of watershed >1 unit/20 acres
Watershed Processes	Riparian Vegetation	Species Composition	**51-74% 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)	**4.0 Miles/Square Mile**	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

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

Central CA Coast Coho Salmon ~ Soquel 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:** Reduce toxicity and pollutants

1.1.1.1. **Action Step:** Re-direct storm drains away from Soquel lagoon during summer.

1.1.1.2. **Action Step:** Screen the railroad trestle to discourage roosting and nesting by rock doves.

1.1.1.3. **Action Step:** Sediment and grease traps leading into lower Soquel Creek should be annually inspected and cleaned.

1.1.2. **Recovery Action:** Increase freshwater lagoon elevation during seasonal closures

1.1.2.1. **Action Step:** Ensure flume is properly maintained throughout the summer low flow season.

1.1.2.2. **Action Step:** Secure flume boards at all times to prevent their removal by vandals or bay back-flushing.

1.1.3. **Recovery Action:** Reduce adverse impacts associated with exotic and pest species.

1.1.3.1. **Action Step:** Continue to use gull-proof lids on refuse cans at and around the lagoon and beach.

1.1.3.2. **Action Step:** Install bird deterrents on Esplanade roofs to deter gulls and other sea birds.

1.1.4. **Recovery Action:** Improve the quality of each estuarine habitat zone

1.1.4.1. **Action Step:** Remove and replace exotic tree and understory species in the stream reaches above the lagoon.

1.1.4.2. **Action Step:** Maintain existing pilings along the eastern margin downstream of Stockton Avenue Bridge where restaurants are still on pilings.

1.1.4.3. **Action Step:** Plant tules in the Soquel Creek estuary.

1.1.4.4. **Action Step:** Plant redwoods in upslope areas of the western estuary to increase lagoon shading.

1.1.5. **Recovery Action:** Increase and enhance estuarine habitat complexity features

1.1.5.1. **Action Step:** Install structures designed to enhance scour to increase residual pool depth and shelter for smolt transition and feeding during the spring.

1.1.5.2. **Action Step:** Allow large instream wood to remain in the lagoon/estuary as potential scour objects and fish cover, unless it is jammed on the Stockton Avenue Bridge.

2. Restoration- Floodplain Connectivity

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

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

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

2.1.2. **Recovery Action:** Rehabilitate and enhance floodplain connectivity

2.1.2.1. **Action Step:** Institutionalize programs to purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities.

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

2.1.2.3. **Action Step:** De-commission elevated road alignments through riparian zones or adjacent to stream channels which functionally limit seasonal floodplain access.

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.

3.1.1.1. **Action Step:** Identify historical CCC coho salmon habitats lacking in channel complexity and initiate restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover.

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

3.1.1.3. **Action Step:** Implement a long term study project in Soquel Demonstration State Forest to demonstrate effective LWD projects to residents of the Santa Cruz County and region.

3.1.1.4. **Action Step:** Educate landowners, land managers, and County and municipal staffs on the importance of LWD for recovery and re-establishment of properly functioning instream conditions.

3.1.1.5. **Action Step:** If log jams are modified for fish passage, retain LWD for instream enhancement projects that address poor shelter rating for juveniles and smolts.

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

3.1.2.1. **Action Step:** Increase shelter ratings to optimal conditions (>80 pool shelter value) in mainstem Soquel Creek.

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

3.1.3.1. **Action Step:** Increase 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).

3.1.4. **Recovery Action:** Increase frequency of primary pools

3.1.4.1. **Action Step:** Excavate sediment and build up channel bars.

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:** Promote irrigation efficiency projects for agricultural practices.

4.1.1.2. **Action Step:** Promote off-channel storage and conservation measures to reduce impacts of summer and early fall water diversions (e.g. storage tanks for rural residential users).

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.

4.1.1.4. **Action Step:** Promote conjunctive use of water for water projects whenever possible to maintain or restore salmonid habitat.

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

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

5. Restoration- Landscape Patterns

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

5.1.1. **Recovery Action:** Reduce adverse impacts to watershed processes associated with urbanization

5.1.1.1. **Action Step:** Residential landowners should utilize BMP's from Basins Of Relations: A Citizen's Guide to Protecting and Restoring Our Watersheds (OAEC, 2007), Slow it. Spread it. Sink it! (Santa Cruz Resource Conservations District, 2009) to conserve water resources

6. Restoration- Passage

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

6.1.1. **Recovery Action:** Improve access of spawning adults and juveniles

6.1.1.1. **Action Step:** Evaluate the two natural falls at the Girl Scout Camp on West Branch Soquel and determine the benefits of providing passage for coho salmon into upper reaches.

6.1.1.2. **Action Step:** Evaluate the Soquel Creek Water District Weir for potential impacts to coho migration on East Branch Soquel.

7. Restoration- Pool Habitat

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

8. Restoration- Riparian

No species-specific actions were developed.

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 sediment source surveys to identify existing sources of high sediment yield using accepted protocols and develop and implement recommendations to address sources of detrimental sediment input.

9.1.1.2. **Action Step:** Remediate slides and gullies delivering sediment to fish bearing streams.

9.1.1.3. **Action Step:** Initiate education program for landowners in the watershed regarding practices to minimize sediment input.

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

9.1.2.1. **Action Step:** Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.

9.1.2.2. **Action Step:** Permitting and funding agencies (State, Federal, and local) should evaluate all authorized erosion control measures during the winter period.

10. Restoration- Viability

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

10.1.1. **Recovery Action:** Increase abundance

10.1.1.1. **Action Step:** Re-establish a naturally reproducing run of coho salmon.

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

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

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

10.2.1. **Recovery Action:** Increase abundance

10.2.1.1. **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.

10.2.1.2. **Action Step:** Conduct periodic, standardized juvenile surveys in the watershed. Surveys should include all three cohorts.

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

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

10.2.2.1. **Action Step:** Implement standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas. Encourage all major landowners to develop similar assessment methods.

11. Restoration- Water Quality

No species-specific actions were developed.

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:** For riparian roads, promote road relocation as a preferred alternative to bank stabilization.

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

13.1.2.1. **Action Step:** Evaluate whether proposed stabilization projects will lead to additional instability either up- or downstream.

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

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

13.2.1.1. **Action Step:** Eliminate the use of gabion baskets and undersized rock within the bankfull channel.

13.2.1.2. **Action Step:** Protect existing areas that provide winter refuge and seasonal habitats for juvenile salmonids from channelization projects.

13.2.1.3. **Action Step:** Modify Federal, State, city and county regulatory and planning processes to eliminate provisions allowing new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all historical CCC coho salmon watersheds.

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 increased landscape disturbance

15.1.1.1. **Action Step:** Establish fire contingency plan developed by experts from CalFire, local fire districts, Santa Cruz RCD, and regulatory agencies with expertise in fisheries issues.

15.1.1.2. **Action Step:** Disseminate plan to all local firefighting agencies.

15.1.1.3. **Action Step:** Encourage CalFire to provide plan to all non-County firefighters when providing firefighting assistance in the Soquel Creek watershed (and all other watersheds in the County).

15.1.2. **Recovery Action:** Prevent impairment to instream substrate/food productivity

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

15.1.2.2. **Action Step:** Avoid use of aerial fire retardants and foams within 300 feet of riparian areas.

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

15.1.3.1. **Action Step:** Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.

15.2. **Objective:** Address the inadequacies of regulatory mechanisms

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

15.2.1.1. **Action Step:** Use non-toxic retardants. Avoid dropping fire retardant into streams. To the maximum extent feasible, orient air drops so that the drop goes perpendicular to streams as opposed to parallel.

15.2.1.2. **Action Step:** In the event of a wildfire, we recommend CalFire Resource Advisors inform the resource agencies for ESA consultation (or technical assistance) about the incident.

16. Threat- Fishing/Collecting

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

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

16.1.1.1. **Action Step:** Reduce poaching of adult coho salmon by increasing law enforcement.

16.1.1.2. **Action Step:** Work with CDFG to modify Section 8.00 (b) (1) low flow minimum flow closure for Soquel Creek.

16.1.1.3. **Action Step:** Install/construct permanent signs at all major public access points along Soquel 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.).

17. Threat- Hatcheries

No species-specific actions were developed.

18. Threat- Livestock

No species-specific actions were developed.

19. Threat- Logging

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

19.1.1. **Recovery Action:** Prevent impairment to floodplain connectivity (impaired quality & extent)

19.1.1.1. **Action Step:** Timber harvest planning should evaluate and avoid or minimize adverse impacts to offchannel habitats, floodplains, ponds, and oxbows.

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

19.1.2.1. **Action Step:** Evaluate road surface treatment options to halt or minimize impacts from water drafting and diversion during droughts and summer low flow periods.

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

19.1.3.1. **Action Step:** Retain the largest trees in all riparian zones (including intermittent and ephemeral streams) for bank stability and long-term wood recruitment.

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

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

19.1.4.1. **Action Step:** Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.

19.1.4.2. **Action Step:** Protect headwater channels with larger buffers to minimize sediment delivery downstream.

19.1.4.3. **Action Step:** Wet weather and/or winter operations should be discouraged in areas with high erosion potential.

19.1.4.4. **Action Step:** For areas with high or very high erosion hazard, extend the monitoring period and upgrade road maintenance for timber operations.

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

19.1.5.1. **Action Step:** Manage riparian areas for their site potential composition and structure.

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

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

19.1.6.2. **Action Step:** Encourage low impact timber harvest techniques such as full-suspension cable yarding (to improve canopy cover; reduce sediment input, etc).

19.1.7. **Recovery Action:** Prevent alterations to sediment transport (road condition/density, dams, etc.)

19.1.7.1. **Action Step:** To the maximum extent practicable, all roads, landings, and skid trails associated with timber operations should be hydrologically disconnected to prevent sediment runoff and delivery to streams.

19.1.7.2. **Action Step:** Avoid new road construction in riparian zones (< 100 feet).

19.1.7.3. **Action Step:** Avoid road construction near headwater channels.

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

19.1.8.1. **Action Step:** Encourage wider riparian buffer zones in areas where stream temperatures or riparian canopy are found limiting.

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

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

19.2.1.1. **Action Step:** Until no-take rules are developed or the State has a secured HCP or GCP, assign NMFS staff to conduct THP reviews and provide no-take recommendations by using revised "Guidelines for NMFS staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS draft, 2004) or "Short Term HCP Guidelines" (NMFS 1999).

19.2.1.2. **Action Step:** Encourage a watershed-wide HCP/GCP/Natural Community Conservation Plan or other procedures for multiple forest landowners within the Soquel Creek watershed to pool resources as a means to facilitate long-term survival and recovery for coho salmon and their habitat.

19.2.1.3. **Action Step:** Encourage timber landowners to implement restoration projects as part of their ongoing timber management practices in Core area stream reaches where large woody material is deficient.

19.2.1.4. **Action Step:** Discourage Santa Cruz County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).

19.2.1.5. **Action Step:** Establish greater oversight and post-harvest monitoring by the permitting agency for operations within Core CCC coho salmon areas.

19.2.1.6. **Action Step:** Erosion control measures and road maintenance should be maintained during the entire period between re-entrys.

19.2.1.7. **Action Step:** Review "fire-safe" exemptions to prevent illegal conversions, riparian corridor impacts and other watershed impacts.

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

19.2.2.1. **Action Step:** Increase buffer widths on Class II streams.

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 water quality (increased turbidity, suspended sediment, and/or toxicity)

20.1.1.1. **Action Step:** Monitor quarry operations to ensure compliance with County and State policies.

21. Threat- Recreation

No species-specific actions were developed.

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 stream hydrology (impaired water flow)

22.1.1.1. **Action Step:** Develop an incentive program for a roof runoff collection system for detaining runoff and providing for landscape irrigation.

22.1.1.2. **Action Step:** Incorporate rain harvesting, storm-water wetland catchment basins, and pervious surfaces into existing and new development.

22.1.1.3. **Action Step:** Disperse discharge from new or upgraded commercial and residential areas into a spatially distributed network rather than a few point discharges, which can result in locally severe erosion and disruption of riparian vegetation and instream habitat.

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

22.1.2.1. **Action Step:** Maintain intact and properly functioning riparian buffers to filter and prevent fine sediment input from entering streams.

22.1.2.2. **Action Step:** Sediment from existing and future commercial and urban development should be reduced to magnitudes appropriate to the geological setting of the watershed, resulting in no net increase in sedimentation over natural limits.

22.1.2.3. **Action Step:** Design new developments to avoid unstable slopes, and wetlands areas of high habitat value, and similarly constrained sites.

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

22.1.3.1. **Action Step:** Encourage Santa Cruz to develop property easement acquisition funds and acquire grant monies to purchase eroding private properties in riparian corridors or properties subject to frequent flooding though a buyout program.

22.1.3.2. **Action Step:** Design new development to allow streams to meander in historical patterns. Protecting riparian zones and their floodplains or channels migration zones to avert future bank erosion controls projects.

22.1.3.3. **Action Step:** Encourage establishment of conservation easements on floodplain habitat in key stream reaches.

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

22.1.4.1. **Action Step:** Assess efficacy and necessity of ongoing stream maintenance practices and avoid, minimize and/or mitigate their impacts to rearing and migrating CCC coho salmon.

22.1.4.2. **Action Step:** Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.

22.1.4.3. **Action Step:** Remove non-native riparian vegetation via thinning and removal programs.

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

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

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

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

22.1.6.1. **Action Step:** Design and implement education programs to promote public awareness of salmonid habitats within urban creek settings and life history requirements.

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

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

22.2.1.1. **Action Step:** Encourage county and city planning departments to designate special assessment districts for properties with infrastructure located in high risk flood prone zones. Revenue generated should be used to raise or relocate infrastructure away from high risk flood zones.

22.2.1.2. **Action Step:** Encourage Santa Cruz County to improve riparian ordinances to be more protective of watershed processes in regard to pre-existing development and allowances for riparian exemptions.

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

22.2.2.1. **Action Step:** Support the development and implementation of regulations for activities that adversely impact groundwater recharge.

22.2.2.2. **Action Step:** New development in all historical CCC coho salmon watersheds should meet a zero net increase in storm-water runoff, changes in duration, or magnitude of peak flow.

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

22.2.3.1. **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.

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

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

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

22.2.4.1. **Action Step:** Santa Cruz County should continue policies that discourage new construction in undeveloped areas within the 100-year flood prone zones.

22.2.4.2. **Action Step:** Minimize redevelopment within the 100 year floodplain.

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

23.1.1.1. **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).

23.1.1.2. **Action Step:** Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with a road survey focused on inner gorge roads followed by roads in other settings.

23.1.1.3. **Action Step:** Develop a private road improvement fund to share costs and encourage private road associations to upgrade poorly constructed or improperly located roads.

23.1.1.4. **Action Step:** Evaluate and remove roadside berms that lead to increased runoff velocities and result in increased sediment discharge.

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

23.1.1.6. **Action Step:** Establish adequate spoils storage sites throughout the watershed so that material from landslides and road maintenance can be stored safely away from coho streams. Coordinate these efforts with all landowners in the watershed, CalTrans, and county road maintenance staff as appropriate.

23.1.1.7. **Action Step:** Install and maintain adequate energy dissipaters for culverts and other drainage pipe outlets where needed.

23.1.1.8. **Action Step:** Evaluate stream crossings for their potential to impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.

23.1.1.9. **Action Step:** Educate road associations and informal road maintenance collectives regarding the benefit of integrating into the Santa Cruz County Service Area process.

23.1.1.10. **Action Step:** Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas in historical habitats or Core CCC coho salmon watersheds.

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

23.1.2.1. **Action Step:** Size culverts to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure.

23.1.3. **Recovery Action:** Prevent impairment to passage and migration

23.1.3.1. **Action Step:** Evaluate SCCRCD (2003) recommendations for passage improvements and prioritize accordingly.

23.1.3.2. **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.

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

23.1.4.1. **Action Step:** Encourage ongoing implementation of the County of Santa Cruz's Integrated Vegetation Management Plan for Roads Near Perennial Waters (URS Corporation, 2008) regarding roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.

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

23.2.1. **Recovery Action:** Prevent impairment to instream substrate

23.2.1.1. **Action Step:** Encourage Redwood Empire and State Parks to address wetted road crossings and sediment runoff from their riparian roads located on Hinckley Creek, tributary to East Branch Soquel.

23.2.1.2. **Action Step:** Licensed engineering geologists should review and approve grading on inner gorge slopes.

23.2.1.3. **Action Step:** Improve enforcement of Erosion Control Ordinance for private roads. The current Santa Cruz Erosion Control Ordinance has provisions requiring the responsible parties to repair and alleviate erosion problems that are deemed severe. Santa Cruz Planning should create new erosion control staff positions to help coordinate the County's cooperative efforts, but also to conduct inspections and enforcement actions as necessary.

23.2.1.4. **Action Step:** Close unauthorized (pioneer) trails and conduct appropriate decommissioning practices. Hydrologically disconnect trails from associated waterways.

23.2.1.5. **Action Step:** Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads where appropriate.

23.2.1.6. **Action Step:** Encourage appropriate restrictions for winter use of unsurfaced roads along rural utility easements; and establish best management practices for clearance within riparian corridors.

23.2.2. **Recovery Action:** Prevent impairment to floodplain connectivity (impaired quality & extent)

23.2.2.1. **Action Step:** Avoid 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 present or threatened destruction, modification, or curtailment of the species habitat or range

24.1.1. **Recovery Action:** Prevent impairment to the estuary

24.1.1.1. **Action Step:** Design estuary restoration projects to include subtidal habitats and natural bioengineering techniques that buffer wave action and increase sediment deposition to minimize shoreline and wetland erosion.

24.1.2. **Recovery Action:** Prevent impairment to stream hydrology.

24.1.2.1. **Action Step:** Implement water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.

24.1.2.2. **Action Step:** If predicted flows are below a level considered critical to maintain viable rearing habitat for salmonids, measures to reduce water consumption should be initiated by municipal water suppliers and other users in the watershed through conservation programs.

24.1.2.3. **Action Step:** Patterns of water runoff, including surface and subsurface drainage, should match, to the greatest extent possible, the natural hydrologic pattern for the watershed in timing, quantity, and quality.

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

24.2.1. **Recovery Action:** Prevent impairment to instream habitat complexity (reduced large wood and/or shelter)

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

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

24.2.2.1. **Action Step:** Protect high-risk shallow-seated landslide areas and surfaces prone to erosion from being mobilized by intense storm events.

24.2.3. **Recovery Action:** Prevent impairment to stream hydrology.

24.2.3.1. **Action Step:** Agencies and landowners should develop contingencies for, drought conditions in a manner compatible with CCC coho salmon recovery needs.

24.2.3.2. **Action Step:** CDFG, SWRCB, RWQCB, CalFire, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust

control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon during droughts.

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

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

24.2.3.5. **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).

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

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

24.3.1.1. **Action Step:** Increase enforcement patrols by CDFG and NMFS OLE in sensitive spawning and rearing 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 the estuary (impaired quality and extent)

25.1.1.1. **Action Step:** Ensure current and future water diversions (surface and groundwater) do not further impair water quality conditions for rearing juvenile salmonids.

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

25.1.2.1. **Action Step:** Ensure water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.

25.1.2.2. **Action Step:** Develop water education programs to reduce water use directed at both municipal water users and those with riparian and appropriative water rights.

25.1.2.3. **Action Step:** Work with water diverters in the lower West Branch of Soquel to evaluate and modify diversions that may impact rearing habitat quality.

25.1.2.4. **Action Step:** Coordinate timing of water diversions to minimize the likelihood of fish stranding and stream dewatering.

25.1.2.5. **Action Step:** Install passive flow bypass devices designed to allow diversion of water only when minimum streamflow requirements are exceeded.

25.1.2.6. **Action Step:** Encourage programs and entrepreneurial efforts by private organizations to purchase easements on water rights for maintenance of adequate surface flows.

25.1.2.7. **Action Step:** Encourage riparian water users that were assigned Class 2 water rights at the time of the adjudication to lease their water right portion to the City of Capitola.

25.1.2.8. **Action Step:** Evaluate recycling waste water as a supplemental supply for irrigation and possibly groundwater recharge.

25.1.3. **Recovery Action:** Prevent impairment to passage and migration

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

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

25.1.4.1. **Action Step:** Ensure water diversions do not impair water temperatures in Soquel Creek.

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:** Appoint and adequately fund a Water Master to carry out the adjudication of water rights on Soquel Creek.

25.2.1.2. **Action Step:** Establish a comprehensive stream flow evaluation program to determine instream flow needs for salmonids throughout the watershed.

25.2.1.3. **Action Step:** Install gauging devices to acquire hydrologic data on stream flows.

25.2.1.4. **Action Step:** Request the SWRCB to conduct interagency consultation with the California Department of Fish and Game, and seek technical assistance from NMFS on the issuance, perfection, or changes to water rights permits.

25.2.1.5. **Action Step:** Identify and work with the SWRCB to address depletion of summer base flows from authorized and unauthorized water uses. Coordinated efforts by Federal, State, and County law enforcement agencies to remove illegal diversions from all streams in the Soquel Creek watershed.

25.2.1.6. **Action Step:** Prohibit new or increased surface water diversions, or groundwater pumping that depletes surface flows, for existing permit holders in Soquel Creek.

25.2.1.7. **Action Step:** Evaluate and monitor 1600 program compliance related to all water diversions (CDFG 2004) in Soquel Creek.

25.2.1.8. **Action Step:** Encourage SWRCB to bring illegal water diverters (those unpermitted and permitted but out-of-compliance with permit terms) into compliance with State law.

25.2.1.9. **Action Step:** Evaluate major groundwater diversions for impacts to surface flow.

26. Threat- Watershed Process

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

26.1.1. **Recovery Action:** Reduce adverse impacts to watershed processes associated with urbanization.

26.1.1.1. **Action Step:** Conserve open space in contiguous landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.

Table 3: Implementation Schedule ~ Soquel Creek

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	
SoC-CCC-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
SoC-CCC-1.1.1	Recovery Action	Estuary	Reduce toxicity and pollutants										
SoC-CCC-1.1.1.1	Action Step	Estuary	Re-direct storm drains away from Soquel lagoon during summer.	3	100	City of Capitola							
SoC-CCC-1.1.1.2	Action Step	Estuary	Screen the railroad trestle to discourage roosting and nesting by rock doves.	3	10	CDFG, City of Capitola, RWQCB							
SoC-CCC-1.1.1.3	Action Step	Estuary	Sediment and grease traps leading into lower Soquel Creek should be annually inspected and cleaned.	3	100	City of Capitola, RWQCB, Santa Cruz County							
SoC-CCC-1.1.2	Recovery Action	Estuary	Increase freshwater lagoon elevation during seasonal closures										
SoC-CCC-1.1.2.1	Action Step	Estuary	Ensure flume is properly maintained throughout the summer low flow season.	3	100	CDFG, City of Capitola							
SoC-CCC-1.1.2.2	Action Step	Estuary	Secure flume boards at all times to prevent their removal by vandals or bay back-flushing.	1	100	City of Capitola						In-Kind	
SoC-CCC-1.1.3	Recovery Action	Estuary	Reduce adverse impacts associated with exotic and pest species.										
SoC-CCC-1.1.3.1	Action Step	Estuary	Continue to use gull-proof lids on refuse cans at and around the lagoon and beach.	3	100	City of Capitola							
SoC-CCC-1.1.3.2	Action Step	Estuary	Install bird deterrents on Esplanade roofs to deter gulls and other sea birds.	3	100	City of Capitola							
SoC-CCC-1.1.4	Recovery Action	Estuary	Improve the quality of each estuarine habitat zone										
SoC-CCC-1.1.4.1	Action Step	Estuary	Remove and replace exotic tree and understory species in the stream reaches above the lagoon.	3	100	City of Capitola, IWRP, Santa Cruz County							Residents on the eastern margin have expressed concerns over attempts to re-establish riparian trees due to negative attitudes towards anything that might obstruct their views of the lagoon or Monterey Bay. Ongoing education and monitoring would be needed to successfully implement this recommendation.

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	
SoC-CCC-1.1.4.2	Action Step	Estuary	Maintain existing pilings along the eastern margin downstream of Stockton Avenue Bridge where restaurants are still on pilings.	2	100	CA Coastal Commission, CDFG, City of Capitola, Santa Cruz County, USACE						In-Kind	This area provides backwater and overwintering shelter for fish during winter stormflows and provides summer rearing and shelter. This is the only backwater habitat in the lower estuary and should be protected from further development.
SoC-CCC-1.1.4.3	Action Step	Estuary	Plant tules in the Soquel Creek estuary.	3	5	CDFG, City of Capitola, IWRP, Santa Cruz RCD	5.00					5	Tules could be planted in the cove on the east side of the estuary, downstream of the Stockon Avenue Bridge and in the cove on the eastern margin under the railroad trestle to enhance summer fishery habitat.
SoC-CCC-1.1.4.4	Action Step	Estuary	Plant redwoods in upslope areas of the western estuary to increase lagoon shading.	3	10	City of Capitola, IWRP, Santa Cruz RCD	171.50	171.50				343	This action may ultimately help reduce water temperature of inflows to the lagoon and within the lagoon. Cost based on treating 0.75 miles of riparian habitat at a rate of $11,432/acre (assume treating only one side of riparian corridor).
SoC-CCC-1.1.5	Recovery Action	Estuary	Increase and enhance estuarine habitat complexity features										
SoC-CCC-1.1.5.1	Action Step	Estuary	Install structures designed to enhance scour to increase residual pool depth and shelter for smolt transition and feeding during the spring.	3	10	, CA Coastal Commission, CDFG, City of Capitola, IWRP, Santa Cruz RCD	136.50	136.50				273	Costs may vary depending on the total number of structures and necessary engineering. Permitting costs are anticipated to be negligible to likely use of programmatic permits. The most appropriate location is likely near the railroad trestle under overhanging trees on the west side. The trestle may retain more saline water from tidal influxes. Any scour objects must be positioned so as not to undermine existing bulkheads or collect floating debris. Evaluate the installation of a series of J-hook vanes. The goals should be to scour two holes with dimensions at least six to ten feet wide, 30-40 feet long and four to six feet deeper than the present bed elevation. Cost for treating 1 acre (assume 10% of total estuarine habitat) at a rate of $272,120/acre.
SoC-CCC-1.1.5.2	Action Step	Estuary	Allow large instream wood to remain in the lagoon/estuary as potential scour objects and fish cover, unless it is jammed on the Stockton Avenue Bridge.	2	100	CDFG, City of Capitola, Santa Cruz County, USACE							
SoC-CCC-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
SoC-CCC-2.1.1	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)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SoC-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	20	CDFG, City of Capitola, FEMA, NMFS, NRCS, Private Landowners, Santa Cruz County, Santa Cruz RCD						TBD	A lack of available winter refuge habitat, in part from lack of access to inundated floodplain or off-channel habitats is likely a limiting factor for salmonids in Soquel Creek. The lower mainstem Soquel Creek may have been a relatively un-confined, low gradient channel, with low terraces and floodplains providing refuge habitat for salmonids during high flows. These areas are largely lost due to past agricultural practices, rural residential and urban encroachment. Efforts should be made to assess the mainstem channel and low gradient stream reaches in tributaries to target opportunities to restore floodplain connectivity. Restoring these existing areas could disproportionately benefit the salmonid populations by providing key winter refuge habitats. Costs will vary depending on site specific conditions and degree of landowner participation. Some of these areas have urban infrastructure which increases the importance of those remaining floodplain areas in Soquel. Cost accounted for in action steps below.
SoC-CCC-2.1.2	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
SoC-CCC-2.1.2.1	Action Step	Floodplain Connectivity	Institutionalize programs to purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities.	2	50	Santa Cruz County, Santa Cruz County Land Trust						TBD	The floodplain limitations currently present in the Soquel watershed are primarily due to urbanization and existing roads. The associated effects of these landuse practices to channel confinement have resulted in riparian encroachment, channel degradation, and floodplain/stream channel disconnection. FEMA flood zone maps show significant overlap of areas designated as 100-year flood prone zones and areas with high housing and commercial density. Due to the high amount of development in these areas the overall degraded condition of important floodplain habitat is expected to persist and likely worsen in the future.
SoC-CCC-2.1.2.2	Action Step	Floodplain Connectivity	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	2	10	CalFire, CDFG, Santa Cruz County, Santa Cruz County Land Trust, Santa Cruz RCD, USACE	102.50	102.50				205	Cost for treating 5 miles (assume 1 project/mile in 25% High IP) at a rate of $41,092/mile.

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	
SoC-CCC-2.1.2.3	Action Step	Floodplain Connectivity	De-commission elevated road alignments through riparian zones or adjacent to stream channels which functionally limit seasonal floodplain access.	3	30	CalFire, CDFG, City of Capitola, IWRP, Redwood Empire, Santa Cruz RCD, Soquel Demonstration State Forest						TBD	Cost accounted for in ROADS/RAILROADS.
SoC-CCC-3.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
SoC-CCC-3.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency.										
SoC-CCC-3.1.1.1	Action Step	Habitat Complexity	Identify historical CCC coho salmon habitats lacking in channel complexity and initiate restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover.	2	10	CDFG, City of Capitola, Private Landowners, Public, Santa Cruz County, Santa Cruz RCD	63.50	63.50				127	Restoration actions in Soquel Creek would likely benefit from an updated habitat typing effort. However, restoration should not be delayed while awaiting results from habitat typing. Areas of high potential include the lower mainstem from Bates Creek confluence to Moores Gulch Confluence, the lower mainstem from Nob Hill to Soquel Drive Bridge, and East Branch Soquel Creek. The mainstem locations should be assessed for current complexity. Cost for fish/habitat monitoring estimated at $126,758/project.
SoC-CCC-3.1.1.2	Action Step	Habitat Complexity	Install properly sized large woody debris to appropriate viability table targets.	2	10	City of Capitola, IWRP, NRCS, Private Landowners, Redwood Empire, Santa Cruz County Land Trust, Santa Cruz RCD, State Parks	315.00	315.00				630	Cost based on treating 22 miles of stream at a rate of $28,500/mile. Soquel Creek is bordered by rural residential properties in many areas. Due to the extensive amount of infrastructure in some reaches and development in the lower watershed it is likely that the majority of structures will need to be anchored. Unanchored and properly sized large wood structures could likely be installed in upper East Branch Soquel Creek. Anchored wood will likely be necessary in the upper mainstem above Moore's Gulch. Transport of large woody material to downstream reaches is less likely due extensive channel meanders in these areas. Restoration activities should carefully evaluate summer flow conditions prior to proceeding to ensure adequate water is available for projects designed to increase summer rearing habitat. Prior to installation, instream conditions should be carefully assessed for effectiveness in Bates Creek, Hinckley Creek, Amaya Creek, and Hester Creek. Summer flow assessment should be focus in mainstem areas below the Moore's Gulch.

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	
SoC-CCC-3.1.1.3	Action Step	Habitat Complexity	Implement a long term study project in Soquel Demonstration State Forest to demonstrate effective LWD projects to residents of the Santa Cruz County and region.	1	10	CalFire, CDFG, IWRP, NOAA SWFSC, Santa Cruz County, Santa Cruz RCD, Soquel Demonstration State Forest						TBD	Cost accounted for in above action steps. Effectiveness should evaluate the biological response of salmonids to LWD supplementation as well as fate of the structures over time.
SoC-CCC-3.1.1.4	Action Step	Habitat Complexity	Educate landowners, land managers, and County and municipal staffs on the importance of LWD for recovery and re-establishment of properly functioning instream conditions.	1	10	IWRP, Public, Santa Cruz County, Santa Cruz RCD						In-Kind	Initial efforts should be directed at landowners in the reach near the West Branch and East Branch confluence and then expanded to other areas. Large wood is reportedly removed in these stream reaches. Loss of wood in these reaches adversely affects downstream pool formation. County of Santa Cruz implemented a large wood evaluation program in 2009. The program has been largely successful. Additional outreach and education are needed with private landowners in Soquel watershed. Many streamside landowners cut up the large wood material without regulatory permits. These unsanctioned actions have resulted in a significant diminishment of rearing habitat quality. Education programs could consist of fliers, workshops, public service announcements, etc.
SoC-CCC-3.1.1.5	Action Step	Habitat Complexity	If log jams are modified for fish passage, retain LWD for instream enhancement projects that address poor shelter rating for juveniles and smolts.	2	100	CDFG, City of Capitola, FEMA, Santa Cruz County, Soquel Demonstration State Forest, USACE						In-Kind	
SoC-CCC-3.1.2	Recovery Action	Habitat Complexity	Improve shelter rating										
SoC-CCC-3.1.2.1	Action Step	Habitat Complexity	Increase shelter ratings to optimal conditions (>80 pool shelter value) in mainstem Soquel Creek.	2	20	CDFG, City of Capitola, IWRP, NMFS, NRCS, Santa Cruz County, Santa Cruz RCD, Soquel Creek Water District, Soquel Demonstration State Forest							An increase in shelter rating would largely occur as a consequence of other instream enhancement actions.
SoC-CCC-3.1.3	Recovery Action	Habitat Complexity	Improve pool/riffle/flatwater ratios (hydraulic diversity)										

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	
SoC-CCC-3.1.3.1	Action Step	Habitat Complexity	Increase 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).	2	10		25.00	25.00				50	The most appropriate technique to increase pool frequency in Soquel Creek will likely involve installation of large woody material. Other instream habitat elements could include boulder installation into responsive stream reaches. Cost based on treating 2 miles of stream at a rate of $25,000/mile for LWD placement. If constructing ELJ, assume 10/mile at a rate of 115,276/ELJ for a total of 2,305,000.
SoC-CCC-3.1.4	Recovery Action	Habitat Complexity	Increase frequency of primary pools										
SoC-CCC-3.1.4.1	Action Step	Habitat Complexity	Excavate sediment and build up channel bars.	2	10		37.50	37.50				75	Using an excavator/backhoe, remove sediment from incipient pools or adjacent to incipient bars, and place the sediment on incipient bars. Grade the placed sediment to contoured form and attach to banks, mimicking alternate bars in general shapes. Bars should confine the active channel approximately 50% in width. This rough design estimate should be refined by results from field survey and hydraulic model analysis. Place LWD and available coarse sediment on bar surfaces to increase resistance to erosion.
SoC-CCC-4.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
SoC-CCC-4.1.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)										
SoC-CCC-4.1.1.1	Action Step	Hydrology	Promote irrigation efficiency projects for agricultural practices.	3	20	Farm Bureau, IWRP, NRCS, Santa Cruz RCD						TBD	
SoC-CCC-4.1.1.2	Action Step	Hydrology	Promote off-channel storage and conservation measures to reduce impacts of summer and early fall water diversions (e.g. storage tanks for rural residential users).	2	30	CDFG, IWRP, NRCS, Private Landowners, Santa Cruz County, Santa Cruz RCD, Soquel Creek Water District, Trout Unlimited						TBD	Costs are difficult to predict due to uncertainties regarding landowner participation.
SoC-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.	1	20	CDFG, Santa Cruz County, Soquel Creek Water District, SWRCB, Trout Unlimited						TBD	

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	
SoC-CCC-4.1.1.4	Action Step	Hydrology	Promote conjunctive use of water for water projects whenever possible to maintain or restore salmonid habitat.	1	20	City of Capitola, Santa Cruz County, Soquel Creek Water District, SWRCB						TBD	Conjunctive water use involves utilization of multiple water sources, usually both surface and groundwater sources, in a way that maximizes water storage and availability under different climatic conditions. One of the guiding goals of a conjunctive water effort is to ensure increased summer stream flows for fish habitat.
SoC-CCC-4.1.2	Recovery Action	Hydrology	Minimize redd scour										
SoC-CCC-4.1.2.1	Action Step	Hydrology	Install properly sized large woody debris to appropriate viability table targets.	1	5		749					749	Redd scour is likely a limiting factor in some reaches, particularly during high flow events. Portions of the stream bed are prone to scour; in some areas, the existing geology contributes finer (sandy) sediments that are more prone to mobilization during higher flow events than stream reaches with well sorted stream gravels. Reduced instream habitat complexity (i.e., a lack of LWD that helps hold gravels in place), increases the likelihood of redd scour during high flow events. It was not known if scour is widespread or whether it is a significant cause of coho egg and alevin mortality. Cost based on $115,276/mile of Engineered Log Jam for 6.5 miles of high IP. If placement of LWD used in replacement of Engineered Log Jam, cost would equal $182,250 for treating 6.5 miles of high IP. Co-related to habitat complexity.
SoC-CCC-5.1	**Objective**	**Landscape Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
SoC-CCC-5.1.1	Recovery Action	Landscape Patterns	Reduce adverse impacts to watershed processes associated with urbanization										
SoC-CCC-5.1.1.1	Action Step	Landscape Patterns	Residential landowners should utilize BMP's from Basins Of Relations: A Citizen's Guide to Protecting and Restoring Our Watersheds (OAEC, 2007), Slow it. Spread it. Sink it! (Santa Cruz Resource Conservations District, 2009) to conserve water resources	2	100							In-Kind	
SoC-CCC-6.1	**Objective**	**Passage**	**Address other natural or manmade factors affecting the species' continued existence**										
SoC-CCC-6.1.1	Recovery Action	Passage	Improve access of spawning adults and juveniles										

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	
SoC-CCC-6.1.1.1	Action Step	Passage	Evaluate the two natural falls at the Girl Scout Camp on West Branch Soquel and determine the benefits of providing passage for coho salmon into upper reaches.	3	10	CDFG, IWRP, NMFS HCD, Santa Cruz RCD	145.00	145.00				290	If modification is feasible (this recommendation may conflict with some existing policies) the benefits of the upstream habitat should be accessed. Areas where there is less disturbance and a greater probability of spawning and rearing success, should be carefully considered in light of the status of the species in the Santa Cruz Mountains Diversity Stratum. The West Branch reach above Girl Scout Falls II has 3-4 miles of low gradient potential coho habitat. Cost estimate is for evaluation only. Cost based on treating two natural falls at a rate of $143,640/unit. Cost could be lower if minimal modifications are needed.
SoC-CCC-6.1.1.2	Action Step	Passage	Evaluate the Soquel Creek Water District Weir for potential impacts to coho migration on East Branch Soquel.	2	5	CDFG, Soquel Creek Water District							
SoC-CCC-9.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
SoC-CCC-9.1.1	Recovery Action	Sediment	Improve instream gravel quality										
SoC-CCC-9.1.1.1	Action Step	Sediment	Conduct sediment source surveys to identify existing sources of high sediment yield using accepted protocols and develop and implement recommendations to address sources of detrimental sediment input.	3	10	CalFire, IWRP, NRCS, Santa Cruz County, Santa Cruz RCD	47.00	47.00				94	Cost for erosion assessment estimated at $13.90/acre (assume 25% of total watershed acres).
SoC-CCC-9.1.1.2	Action Step	Sediment	Remediate slides and gullies delivering sediment to fish bearing streams.	3	30	IWRP, NRCS, Santa Cruz County, Santa Cruz RCD							The ultimate causes of slope and stream bank instability should be addressed where practicable and financially feasible. In some circumstances remediation in the Soquel Creek watershed may not be practicable due to geologic constraints and instability in some stream reaches. Stabilization techniques should involve appropriate bioengineering practices as the first priority. Areas of high interest include a large older landslide upstream of Girl Scott Falls II and the Highland Way Slide on East Branch Soquel Creek. Protection of streambanks below unconsolidated deposits of large rotation landslides should be considered priorities for threat abatement and restoration.
SoC-CCC-9.1.1.3	Action Step	Sediment	Initiate education program for landowners in the watershed regarding practices to minimize sediment input.	3	10	City of Capitola, IWRP, NRCS, Santa Cruz County, Santa Cruz RCD	10.00	10.00				20	Existing material could be used rather than tailoring an education program to constraints and issues within Soquel Creek. Education should be ongoing with frequent workshops (yearly).

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	
SoC-CCC-9.1.2	Recovery Action	Sediment	Reduce turbidity and suspended sediment										
SoC-CCC-9.1.2.1	Action Step	Sediment	Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.	3	20	CalFire, CalTrans, NRCS, Santa Cruz County Department of Public Works, Santa Cruz RCD	10.00	10.00	10.00	10.00		40	This cost estimate does not include long-term maintenance obligations.
SoC-CCC-9.1.2.2	Action Step	Sediment	Permitting and funding agencies (State, Federal, and local) should evaluate all authorized erosion control measures during the winter period.	1	100	CalFire, CDFG, NRCS, Santa Cruz County, Santa Cruz RCD, USACE						In-Kind	This should be considered a standard business practice for all permitting agencies.
SoC-CCC-10.1	**Objective**	**Viability**	**Address the present or threatened destruction of the species habitat or range**										
SoC-CCC-10.1.1	Recovery Action	Viability	Increase abundance										
SoC-CCC-10.1.1.1	Action Step	Viability	Re-establish a naturally reproducing run of coho salmon.	1	10	CDFG, Monterey Bay Salmon and Trout Project, NMFS, NOAA SWFSC, Private Landowners							Re-establishment should only occur in stream reaches where water diversions have not limited rearing habitat. Instream habitat should also be evaluated and enhanced where necessary to increase survival success. East Branch Soquel may be the most appropriate location for initial reintroduction efforts. Efforts should occur in close coordination with NOAA SWFSC, CDFG, landowners, and NMFS.
SoC-CCC-10.1.2	Recovery Action	Viability	Increase spawner density										
SoC-CCC-10.1.2.1	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed. Surveys should include all three cohorts.	3	21		28.57	28.57	28.57	28.57	5.71	120	Periodic monitoring should have sufficient funding to document size of all three cohorts and should occur concurrently with smolt monitoring to the maximum extent possible. Cost for annual spawner surveys in Santa Cruz Mtns. diversity stratum estimated at $56,470/year.
SoC-CCC-10.2	**Objective**	**Viability**	**Address the inadequacy of existing regulatory mechanisms.**										
SoC-CCC-10.2.1	Recovery Action	Viability	Increase abundance										

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	
SoC-CCC-10.2.1.1	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	9	CDFG, IWRP, NMFS	292.22	233.78				526	Periodic surveys are likely the preferred alternative in Soquel (a Dependent watershed) due to the other monitoring already occurring in other Dependent watersheds in the Santa Cruz Mtn. Diversity Stratum. Costs will vary depending on sampling intensity, duration, and location. Survey effort should include all three cohorts. Cost for smolt outmigration monitoring estimated at $58,404/year.
SoC-CCC-10.2.1.2	Action Step	Viability	Conduct periodic, standardized juvenile surveys in the watershed. Surveys should include all three cohorts.	2	10	CDFG, Private Consultants, Santa Cruz County, Soquel Creek Water District, Soquel Demonstration State Forest	95.00	95.00				190	Cost for annual juvenile distribution surveys estimated at $18,823/year for Santa Cruz Mtns.
SoC-CCC-10.2.1.3	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed. Surveys should include all three cohorts.	2	9	CDFG, NMFS, NOAA SWFSC, Private Consultants	283.33	226.67				510	Periodic surveys (redd surveys may be the most viable survey method in Soquel) are likely the preferred alternative in Soquel (a Dependent watershed) due to the other adult monitoring already occurring in other Dependent watersheds in the Santa Cruz Mtn. Diversity Stratum. Cost for annual spawner ground surveys estimated at $56,470/year for Santa Cruz Mtn. Diversity Stratum.
SoC-CCC-10.2.2	Recovery Action	Viability	Increase spatial structure and diversity										
SoC-CCC-10.2.2.1	Action Step	Viability	Implement standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas. Encourage all major landowners to develop similar assessment methods.	3	10	CalFire, CDFG, IWRP, Private Consultants, Santa Cruz RCD, Soquel Demonstration State Forest, State Parks						TBD	Existing DFG habitat survey protocols may be utilized at little or no cost.
SoC-CCC-13.1	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
SoC-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)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SoC-CCC-13.1.1.1	Action Step	Channel Modification	For riparian roads, promote road relocation as a preferred alternative to bank stabilization.	2	100	CalFire, CalTrans, CDFG, City of Capitola, FEMA, NRCS, Santa Cruz County, Santa Cruz RCD, Soquel Demonstration State Forest, State Parks, USACE							Road relocation should be carefully and thoughtfully evaluated as an alternative to bank hardening prior to designing new bank stabilization measures. Road relocation in some circumstances can result in long term cost savings and significant fisheries benefits.
SoC-CCC-13.1.2	Recovery Action	Channel Modification	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
SoC-CCC-13.1.2.1	Action Step	Channel Modification	Evaluate whether proposed stabilization projects will lead to additional instability either up- or downstream.	2	100	CalFire, CalTrans, City of Capitola, FEMA, NRCS, Santa Cruz County, Santa Cruz RCD, USACE						In-Kind	This should be considered a standard practice for all individuals, agencies, and companies engaged in instream work. The Soquel watershed consists of three distinctive geologic blocks separated by the San Andreas and Zayante fault zones (SCCRCD 2003). The distribution and activity of the major fault zones has contributed to a large number of landslides, which have periodically dumped large quantities of sediment to the watercourse. Additionally, shorts periods of net sediment aggradation within the stream channel have been documented following major floods (SCCRCD 2003). In reaction to large sediment input events, there is a potential for future bank destabilization due to bed aggradation as pulses of sediment move through the system.
SoC-CCC-13.2	**Objective**	**Channel Modification**	**Address inadequacies of regulatory mechanisms**										
SoC-CCC-13.2.1	Recovery Action	Channel Modification	Prevent impairment to floodplain connectivity										
SoC-CCC-13.2.1.1	Action Step	Channel Modification	Eliminate the use of gabion baskets and undersized rock within the bankfull channel.	2	100	CalFire, CalTrans, City of Capitola, FEMA, NRCS, Santa Cruz County Department of Public Works, Santa Cruz RCD, Soquel Demonstration State Forest, USACE						TBD	Adoption of this standard practice will result in increased costs for some projects but will ultimately result in long term savings due to better designed and constructed projects with long term persistence.

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	
SoC-CCC-13.2.1.2	Action Step	Channel Modification	Protect existing areas that provide winter refuge and seasonal habitats for juvenile salmonids from channelization projects.	1	100	CDFG, FEMA, NRCS, Santa Cruz County, USACE							
SoC-CCC-13.2.1.3	Action Step	Channel Modification	Modify Federal, State, city and county regulatory and planning processes to eliminate provisions allowing new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all historical CCC coho salmon watersheds.	2	10	CalTrans, City of Capitola, FEMA, NMFS, Santa Cruz County, USACE							
SoC-CCC-15.1	**Objective**	**Fire/Fuel Management**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
SoC-CCC-15.1.1	Recovery Action	Fire/Fuel Management	Prevent increased landscape disturbance										
SoC-CCC-15.1.1.1	Action Step	Fire/Fuel Management	Establish fire contingency plan developed by experts from CalFire, local fire districts, Santa Cruz RCD, and regulatory agencies with expertise in fisheries issues.	3	10	CalFire, Santa Cruz County, Santa Cruz RCD						In-Kind	
SoC-CCC-15.1.1.2	Action Step	Fire/Fuel Management	Disseminate plan to all local firefighting agencies.	3	10	CalFire, Santa Cruz County, Santa Cruz RCD						In-Kind	
SoC-CCC-15.1.1.3	Action Step	Fire/Fuel Management	Encourage CalFire to provide plan to all non-County firefighters when providing firefighting assistance in the Soquel Creek watershed (and all other watersheds in the County).	3	10	CalFire, Santa Cruz County, Santa Cruz RCD						In-Kind	
SoC-CCC-15.1.2	Recovery Action	Fire/Fuel Management	Prevent impairment to instream substrate/food productivity										
SoC-CCC-15.1.2.1	Action Step	Fire/Fuel Management	Immediately implement appropriate sediment control measures following completion of fire suppression while firefighters and equipment are on site.	1	100	CalFire, Santa Cruz County						In-Kind	Sediment control is a requirement for all post firefighting actions. Immediately implementing these measures (when feasible) when equipment and crews are available will minimize mobilization costs and result in a long term cost savings.
SoC-CCC-15.1.2.2	Action Step	Fire/Fuel Management	Avoid use of aerial fire retardants and foams within 300 feet of riparian areas.	2	100	CalFire						In-Kind	
SoC-CCC-15.1.3	Recovery Action	Fire/Fuel Management	Prevent adverse alterations to riparian species composition and structure										
SoC-CCC-15.1.3.1	Action Step	Fire/Fuel Management	Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.	3	10	CalFire, Santa Cruz County						TBD	

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	
SoC-CCC-15.2	**Objective**	**Fire/Fuel Management**	**Address the inadequacies of regulatory mechanisms**										
SoC-CCC-15.2.1	Recovery Action	Fire/Fuel Management	Prevent impairment to water quality										
SoC-CCC-15.2.1.1	Action Step	Fire/Fuel Management	Use non-toxic retardants. Avoid dropping fire retardant into streams. To the maximum extent feasible, orient air drops so that the drop goes perpendicular to streams as opposed to parallel.	2	100	CalFire							
SoC-CCC-15.2.1.2	Action Step	Fire/Fuel Management	In the event of a wildfire, we recommend CalFire Resource Advisors inform the resource agencies for ESA consultation (or technical assistance) about the incident.	3	100	CalFire, CDFG, NMFS, Santa Cruz County, Santa Cruz RCD, USEPA, USFWS						In-Kind	The resource agencies can provide guidance regarding critical resources in the areas that may be impacted by firefighting actions.
SoC-CCC-16.1	**Objective**	**Fishing/Collecting**	**Address the inadequacy of existing regulatory mechanisms**										
SoC-CCC-16.1.1	Recovery Action	Fishing/Collecting	Prevent reduced density, abundance, and diversity										
SoC-CCC-16.1.1.1	Action Step	Fishing/Collecting	Reduce poaching of adult coho salmon by increasing law enforcement.	1	100	CDFG Law Enforcement, NMFS OLE							Initial focus should be directed towards the East Branch of Soquel Creek where coho salmon juveniles were detected in 2008.
SoC-CCC-16.1.1.2	Action Step	Fishing/Collecting	Work with CDFG to modify Section 8.00 (b) (1) low flow minimum flow closure for Soquel Creek.	2	5	CDFG, NMFS PRD, Public						In-Kind	Additional consideration should be given to starting the fishing season later in the year in an effort to reduce incidental bycatch of coho salmon. Low flow closures should be based on gage information from a watershed in the Santa Cruz Mountains. Consideration for extending the season to later in the year could also be evaluated so as to minimize loss of fishing days.
SoC-CCC-16.1.1.3	Action Step	Fishing/Collecting	Install/construct permanent signs at all major public access points along Soquel 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.).	2	5	CDFG, CDFG Law Enforcement, NMFS OLE, Santa Cruz County Fish and Wildlife Advisory Board	7.50					8	Cost for signs vary widely depending on materials and content. Assume $500/sign with a minimum of 15 signs.
SoC-CCC-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
SoC-CCC-19.1.1	Recovery Action	Logging	Prevent impairment to floodplain connectivity (impaired quality & extent)										

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	
SoC-CCC-19.1.1.1	Action Step	Logging	Timber harvest planning should evaluate and avoid or minimize adverse impacts to offchannel habitats, floodplains, ponds, and oxbows.	1	100	CalFire, CDFG, RPFs, RWQCB						In-Kind	
SoC-CCC-19.1.2	Recovery Action	Logging	Prevent impairment to stream hydrology (impaired water flow)										
SoC-CCC-19.1.2.1	Action Step	Logging	Evaluate road surface treatment options to halt or minimize impacts from water drafting and diversion during droughts and summer low flow periods.	2	100	CalFire, CDFG, RPFs, Santa Cruz County, SWRCB						TBD	
SoC-CCC-19.1.3	Recovery Action	Logging	Prevent future impacts to habitat complexity										
SoC-CCC-19.1.3.1	Action Step	Logging	Retain the largest trees in all riparian zones (including intermittent and ephemeral streams) for bank stability and long-term wood recruitment.	3	100	CalFire, Private Landowners, Redwood Empire, RPFs, Soquel Demonstration State Forest						In-Kind	The current Forest Practices Rules require retention of a proportion of the largest riparian trees.
SoC-CCC-19.1.3.2	Action Step	Logging	Conduct conifer release to promote growth of larger diameter trees where appropriate.	3	10	CalFire, CDFG, Santa Cruz County, Soquel Demonstration State Forest, State Parks	130.00	130.00				260	Costs will vary depending on landowner participation and site specific needs. This strategy can be implemented at relatively little costs in areas zoned for timber production as a component of future harvest plans. Cost based on treating 2 miles (assume 80 acres/mile in 15% High IP) at a rate of $1,621/acre.
SoC-CCC-19.1.4	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
SoC-CCC-19.1.4.1	Action Step	Logging	Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.	3	100	CalFire, Private Landowners, Redwood Forest Foundation, RPFs, Soquel Demonstration State Forest						In-Kind	
SoC-CCC-19.1.4.2	Action Step	Logging	Protect headwater channels with larger buffers to minimize sediment delivery downstream.	3	100	CalFire, CDFG, Private Landowners, Redwood Empire, RPFs, Santa Cruz County, Soquel Demonstration State Forest						In-Kind	This recommendation should be considered standard practice.

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	
SoC-CCC-19.1.4.3	Action Step	Logging	Wet weather and/or winter operations should be discouraged in areas with high erosion potential.	2	100	CalFire, Private Landowners, Redwood Empire, RPFs, RWQCB, Soquel Demonstration State Forest						In-Kind	
SoC-CCC-19.1.4.4	Action Step	Logging	For areas with high or very high erosion hazard, extend the monitoring period and upgrade road maintenance for timber operations.	3	100	CalFire, RPFs, Santa Cruz County							
SoC-CCC-19.1.5	Recovery Action	Logging	Prevent adverse alterations to riparian species composition and structure										
SoC-CCC-19.1.5.1	Action Step	Logging	Manage riparian areas for their site potential composition and structure.	2	100	CalFire, CDFG, Private Landowners, Public, Redwood Empire, RPFs, Santa Cruz County, Soquel Demonstration State Forest, State Parks						In-Kind	Cost of managing riparian areas is anticipated to be minimal.
SoC-CCC-19.1.6	Recovery Action	Logging	Prevent increased landscape disturbance										
SoC-CCC-19.1.6.1	Action Step	Logging	Conserve and manage forestlands for older forest stages.	2	100	CalFire, Private Landowners, Redwood Empire, RPFs, Soquel Demonstration State Forest						In-Kind	Logging was identified as a potential future threat to summer rearing juveniles due to the potential of timber management to reduce future LWD recruitment and increase instream temperatures. California Forest Practice Rules require retention of riparian trees adjacent to Class 1 fish-bearing streams, which will ameliorate the impacts of reduced LWD and over story canopy reduction (Santa Cruz County rules do not allow even-aged management). Despite these restrictions it is likely future timber management may reduce or delay the rate of future recruitment by harvesting trees that could potentially be recruited into the stream channel. This impact could be partially offset if, mitigation measures for future timber harvest plans, included a large wood augmentation program. An augmentation program would need to include an evaluation of limiting factors, including riparian canopy cover and instream temperature regimes.

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	
SoC-CCC-19.1.6.2	Action Step	Logging	Encourage low impact timber harvest techniques such as full-suspension cable yarding (to improve canopy cover; reduce sediment input, etc.).	2	25	CalFire, CDFG, RPFs, RWQCB, Santa Cruz County						In-Kind	
SoC-CCC-19.1.7	Recovery Action	Logging	Prevent alterations to sediment transport (road condition/density, dams, etc.)										
SoC-CCC-19.1.7.1	Action Step	Logging	To the maximum extent practicable, all roads, landings, and skid trails associated with timber operations should be hydrologically disconnected to prevent sediment runoff and delivery to streams.	2	100	CalFire, Private Landowners, Redwood Empire, RPFs, RWQCB, Santa Cruz County, Soquel Demonstration State Forest						In-Kind	
SoC-CCC-19.1.7.2	Action Step	Logging	Avoid new road construction in riparian zones (< 100 feet).	1	100	CalFire, CDFG, NMFS, RPFs, RWQCB, Santa Cruz County						In-Kind	
SoC-CCC-19.1.7.3	Action Step	Logging	Avoid road construction near headwater channels.	2	100	CalFire, Private Landowners, Redwood Empire, RPFs, RWQCB, Santa Cruz County, Soquel Demonstration State Forest						In-Kind	
SoC-CCC-19.1.8	Recovery Action	Logging	Prevent impairment to water quality (impaired instream temperature)										
SoC-CCC-19.1.8.1	Action Step	Logging	Encourage wider riparian buffer zones in areas where stream temperatures or riparian canopy are found limiting.	3	100	CalFire, IWRP, Private Landowners, Redwood Empire, RPFs, RWQCB, Santa Cruz County, Soquel Demonstration State Forest						In-Kind	Wider riparian zones are critical to maintaining water temperature in Soquel Creek. Lower Soquel is temperature impaired for CCC coho salmon during the summer low flow season. However canopy, while an important determinant in water temperature conditions, is likely a secondary factor when compared to the magnitude of temperature impacts resulting from surface and ground water diversions in the watershed.
SoC-CCC-19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms.**										
SoC-CCC-19.2.1	Recovery Action	Logging	Prevent increased landscape disturbance										

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	
SoC-CCC-19.2.1.1	Action Step	Logging	Until no-take rules are developed or the State has a secured HCP or GCP, assign NMFS staff to conduct THP reviews and provide no-take recommendations by using revised "Guidelines for NMFS staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS draft, 2004) or "Short Term HCP Guidelines" (NMFS 1999).	2	10	CalFire, CDFG, NMFS, Redwood Empire, RWQCB, Santa Cruz County, Soquel Demonstration State Forest						In-Kind	Initial focus for THP review should be directed at harvest actions near anadromous waters of East Branch Soquel Creek. CCC coho salmon were detected in the East Branch in 2008, and represent the southern most known population of coho salmon and should be afforded heightened oversight and protection. The need for this action may change if the California Forest Practice Rules change and reach a no-take standard.
SoC-CCC-19.2.1.2	Action Step	Logging	Encourage a watershed-wide HCP/GCP/Natural Community Conservation Plan or other procedures for multiple forest landowners within the Soquel Creek watershed to pool resources as a means to facilitate long-term survival and recovery for coho salmon and their habitat.	3	30	CDFG, City of Capitola, NMFS PRD, Private Landowners, Santa Cruz County, Santa Cruz County Land Trust, Soquel Creek Water District, Soquel Demonstration State Forest, State Parks, USFWS	200.00	200.00	200.00	200.00	200.00	1,200	The HCP should not exceed 30 years in duration and should focus on the larger landowners and water diverters. HCPs can be developed for multiple landowners engaged in multiple (otherwise legal) practices. Cost estimate is for development of the HCP. Development costs are highly variable and are contingent on proposed covered activities, regulatory agency staffing, and interpersonal dynamics during negotiations.
SoC-CCC-19.2.1.3	Action Step	Logging	Encourage timber landowners to implement restoration projects as part of their ongoing timber management practices in Core area stream reaches where large woody material is deficient.	2	100	CalFire, CDFG, Private Landowners, Redwood Empire, Santa Cruz County, Soquel Demonstration State Forest						In-Kind	
SoC-CCC-19.2.1.4	Action Step	Logging	Discourage Santa Cruz County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	1	100	Santa Cruz County						In-Kind	A significant portion of the watershed consists of small rural residential ownership parcels. Rural residential development is generally deleterious to watershed processes.
SoC-CCC-19.2.1.5	Action Step	Logging	Establish greater oversight and post-harvest monitoring by the permitting agency for operations within Core CCC coho salmon areas.	1	20	CalFire, CDFG, NMFS, RWQCB, Santa Cruz County						In-Kind	Initial focus should be directed towards proposed harvest plans in the East Branch of Soquel Creek.
SoC-CCC-19.2.1.6	Action Step	Logging	Erosion control measures and road maintenance should be maintained during the entire period between re-entrys.	2	100	CalFire, CDFG, Redwood Empire, RPFs, RWQCB						In-Kind	
SoC-CCC-19.2.1.7	Action Step	Logging	Review "fire-safe" exemptions to prevent illegal conversions, riparian corridor impacts and other watershed impacts.	2	100	CalFire, Santa Cruz County						In-Kind	

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	
SoC-CCC-19.2.2	Recovery Action	Logging	Prevent impairment to water quality (impaired instream temperature)										
SoC-CCC-19.2.2.1	Action Step	Logging	Increase buffer widths on Class II streams.	2	10	Board of Forestry, CalFire, Private Landowners, RPFs, RWQCB							Increasing buffer width (to be consistent with CFPR standards throughout the rest of the CCC ESU) to a 30 foot no-harvest buffer will ensure water temperatures are protected to downstream reaches critical for coho salmon rearing.
SoC-CCC-20.1	**Objective**	**Mining**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**										
SoC-CCC-20.1.1	Recovery Action	Mining	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
SoC-CCC-20.1.1.1	Action Step	Mining	Monitor quarry operations to ensure compliance with County and State policies.	2	100	RWQCB, Santa Cruz County						TBD	Mining was considered a potential future threat due to existing sediment controls potentially failing during a major storm event. Only one quarry is present in the watershed, but its configuration and proximity to the East Branch Soquel Creek (the only location in the watershed where coho salmon were recently detected) appears to place the stream channel at risk for major sediment input if containment devices should fail. Particular focus should be directed at water retention facilities and check dams during periods of high rainfall to ensure proper operation and that no unauthorized occurrences of turbidity or sediment input enter fish bearing watercourses. Cost are difficult to determine because of timing and extent of occurrences of turbidity are unknown at this time.
SoC-CCC-22.1	**Objective**	**Residential/Commercial Development**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
SoC-CCC-22.1.1	Recovery Action	Residential/Commercial Development	Prevent impairment to stream hydrology (impaired water flow)										
SoC-CCC-22.1.1.1	Action Step	Residential/Commercial Development	Develop an incentive program for a roof runoff collection system for detaining runoff and providing for landscape irrigation.	3	10	Santa Cruz County, Santa Cruz RCD, Soquel Creek Water District						In-Kind	
SoC-CCC-22.1.1.2	Action Step	Residential/Commercial Development	Incorporate rain harvesting, storm-water wetland catchment basins, and pervious surfaces into existing and new development.	3	100	City of Capitola, Private Landowners, Santa Cruz County						In-Kind	

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	
SoC-CCC-22.1.1.3	Action Step	Residential/Commercial Development	Disperse discharge from new or upgraded commercial and residential areas into a spatially distributed network rather than a few point discharges, which can result in locally severe erosion and disruption of riparian vegetation and instream habitat.	3	100	City of Capitola, Private Landowners, Santa Cruz County						TBD	Cost to upgrade stormwater discharge points cannot be determined at this time, but it may be significant.
SoC-CCC-22.1.2	Recovery Action	Residential/Commercial Development	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
SoC-CCC-22.1.2.1	Action Step	Residential/Commercial Development	Maintain intact and properly functioning riparian buffers to filter and prevent fine sediment input from entering streams.	2	100	City of Capitola, Private Landowners, RWQCB, Santa Cruz County						In-Kind	
SoC-CCC-22.1.2.2	Action Step	Residential/Commercial Development	Sediment from existing and future commercial and urban development should be reduced to magnitudes appropriate to the geological setting of the watershed, resulting in no net increase in sedimentation over natural limits.	2	100	City of Capitola, Private Landowners, RWQCB, Santa Cruz County						TBD	Cost may vary significantly. In more urbanized areas costs will likely be absorbed into SWMP requirements per the RWQCB. Costs in rural areas where these storm water plans are not required may be significant on a project by project basis.
SoC-CCC-22.1.2.3	Action Step	Residential/Commercial Development	Design new developments to avoid unstable slopes, and wetlands areas of high habitat value, and similarly constrained sites.	2	100	CalTrans, City of Capitola, Private Landowners, RWQCB, Santa Cruz County						In-Kind	Stringent review by permitting agencies is expected to reduce costs associated with poorly planned and poorly located developments.
SoC-CCC-22.1.3	Recovery Action	Residential/Commercial Development	Prevent impairment to floodplain connectivity.										
SoC-CCC-22.1.3.1	Action Step	Residential/Commercial Development	Encourage Santa Cruz to develop property easement acquisition funds and acquire grant monies to purchase eroding private properties in riparian corridors or properties subject to frequent flooding though a buyout program.	3	20	FEMA, Private Landowners, Santa Cruz County, Santa Cruz County Land Trust						TBD	This recommendation may be difficult to implement unless Santa Cruz realizes a cost savings (due to reduced flood fighting, etc.). A financial analysis will likely be needed.
SoC-CCC-22.1.3.2	Action Step	Residential/Commercial Development	Design new development to allow streams to meander in historical patterns. Protecting riparian zones and their floodplains or channels migration zones to avert future bank erosion controls projects.	1	100	City of Capitola, FEMA, Private Landowners, Public, RWQCB, Santa Cruz County, USACE						In-Kind	
SoC-CCC-22.1.3.3	Action Step	Residential/Commercial Development	Encourage establishment of conservation easements on floodplain habitat in key stream reaches.	2	100	CalTrans, CDFG, Santa Cruz County Land Trust, USACE						TBD	Cost will vary depending on location and desirability of parcel for future development.

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	
SoC-CCC-22.1.4	Recovery Action	Residential/Commercial Development	Prevent adverse alterations to riparian species composition and structure										
SoC-CCC-22.1.4.1	Action Step	Residential/Commercial Development	Assess efficacy and necessity of ongoing stream maintenance practices and avoid, minimize and/or mitigate their impacts to rearing and migrating CCC coho salmon.	2	5	CDFG, FEMA, NMFS PRD, Santa Cruz County, USACE						In-Kind	The purpose of this recommendation is to ensure that any stream maintenance that continues to occur is not the result of the legacy of past management practices but is in fact occurring for a demonstrable benefit to public/private property. Actions that have no or minimal benefit to public/private property should be discontinued.
SoC-CCC-22.1.4.2	Action Step	Residential/Commercial Development	Encourage the use of native vegetation in new landscaping to reduce the need for watering and application of herbicides, pesticides, and fertilizers.	3	100	City of Capitola, Santa Cruz RCD, Soquel Creek Water District							
SoC-CCC-22.1.4.3	Action Step	Residential/Commercial Development	Remove non-native riparian vegetation via thinning and removal programs.	3	20	City of Capitola, IWRP, Private Landowners, Santa Cruz RCD	792	792	792	792		3,166	Non native vegetation is most problematic in the urbanized lower reaches of Soquel Creek. Cost based on treating 1 mile (assume 80 acres/mile in 5% High IP with a 1 mile minimum) at a rate of $39,574/acre.
SoC-CCC-22.1.5	Recovery Action	Residential/Commercial Development	Prevent increased landscape disturbance										
SoC-CCC-22.1.5.1	Action Step	Residential/Commercial Development	Encourage infill and high density developments over dispersal of low density rural residential in undeveloped areas.	2	100	City of Capitola, Santa Cruz County							
SoC-CCC-22.1.5.2	Action Step	Residential/Commercial Development	Identify areas at high risk of conversion, and develop incentives and alternatives for landowners that discourage conversion.	2	100	City of Capitola, Santa Cruz County							
SoC-CCC-22.1.6	Recovery Action	Residential/Commercial Development	Prevent reduced density, abundance, and diversity										
SoC-CCC-22.1.6.1	Action Step	Residential/Commercial Development	Design and implement education programs to promote public awareness of salmonid habitats within urban creek settings and life history requirements.	2	10	City of Capitola, IWRP, Santa Cruz County, Santa Cruz RCD						In-Kind	Education programs could consist of fliers, workshops, public service announcements, etc. Some of these materials have been developed by the Santa Cruz RCD and County of Santa Cruz and should be used in initial efforts to promote public awareness.
SoC-CCC-22.2	**Objective**	**Residential/Commercial Development**	**Address the inadequacy of existing regulatory mechanisms.**										

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	
SoC-CCC-22.2.1	Recovery Action	Residential/Commercial Development	Prevent adverse alterations to riparian species composition and structure										
SoC-CCC-22.2.1.1	Action Step	Residential/Commercial Development	Encourage county and city planning departments to designate special assessment districts for properties with infrastructure located in high risk flood prone zones. Revenue generated should be used to raise or relocate infrastructure away from high risk flood zones.	3	10	City of Capitola, Santa Cruz County						In-Kind	
SoC-CCC-22.2.1.2	Action Step	Residential/Commercial Development	Encourage Santa Cruz County to improve riparian ordinances to be more protective of watershed processes in regard to pre-existing development and allowances for riparian exemptions.	2	5	Santa Cruz County						In-Kind	Santa Cruz County should develop incentives to promote private landowners to pull back from riparian zones. Exemption process for riparian development should be made more stringent.
SoC-CCC-22.2.2	Recovery Action	Residential/Commercial Development	Prevent impairment to watershed hydrology										
SoC-CCC-22.2.2.1	Action Step	Residential/Commercial Development	Support the development and implementation of regulations for activities that adversely impact groundwater recharge.	2	10	Santa Cruz County, Soquel Creek Water District							
SoC-CCC-22.2.2.2	Action Step	Residential/Commercial Development	New development in all historical CCC coho salmon watersheds should meet a zero net increase in storm-water runoff, changes in duration, or magnitude of peak flow.	1	100	RWQCB, Santa Cruz County, USACE, USEPA						TBD	Cost may vary significantly. In more urbanized areas costs will likely be absorbed into SWMP requirements per the RWQCB. Costs in rural areas where these storm water plans are not required may be significant on a project by project basis.
SoC-CCC-22.2.3	Recovery Action	Residential/Commercial Development	Prevent increased landscape disturbance										
SoC-CCC-22.2.3.1	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	100	FEMA, HUD, Santa Cruz County, USACE						In-Kind	
SoC-CCC-22.2.3.2	Action Step	Residential/Commercial Development	Enforce existing building permit programs to minimize unpermitted construction.	3	100	Santa Cruz County							
SoC-CCC-22.2.3.3	Action Step	Residential/Commercial Development	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	2	100	CalFire, Santa Cruz County						In-Kind	

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	
SoC-CCC-22.2.4	Recovery Action	Residential/Commercial Development	Prevent impairment to floodplain connectivity.										
SoC-CCC-22.2.4.1	Action Step	Residential/Commercial Development	Santa Cruz County should continue policies that discourage new construction in undeveloped areas within the 100-year flood prone zones.	2	100	Santa Cruz County						In-Kind	Remaining undeveloped floodplains provide critical high water refugia for listed salmonids. These habitats are typically converted to landuses incompatible with salmonid life history requisites. Costs should be minimal if incorporated into updated general plan. Significant cost savings would result due to avoidance of emergency response and repair on part of local, Federal, and state governments. Evaluate effectiveness of the policies and update to augment provisions as necessary in General Plan updates.
SoC-CCC-22.2.4.2	Action Step	Residential/Commercial Development	Minimize redevelopment within the 100 year floodplain.	2	100	Santa Cruz County							The County of Santa Cruz currently prohibits new development in 100 year floodplains and riparian zones. The prohibition should be expanded to include upgrades, additions, and in some situations, bank protection.
SoC-CCC-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
SoC-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate										
SoC-CCC-23.1.1.1	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).	2	100	CalFire, California Department of Mines and Geology, CalTrans, CDFG, City of Capitola, NRCS, Redwood Empire, RWQCB, Santa Cruz County, Santa Cruz RCD, Soquel Demonstration State Forest, State Parks						In-Kind	

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	
SoC-CCC-23.1.1.2	Action Step	Roads/Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with a road survey focused on inner gorge roads followed by roads in other settings.	2	15	IWRP, Santa Cruz RCD							Plan should establish areas for prioritization and implementation timelines. Road densities are high throughout the watershed and are estimated at 4.1 miles of road per square mile of watershed area, and at 4.0 miles per square mile of riparian area. Many of these roads are poorly situated, constructed, and improperly maintained. Even though chronic fine sediment production decreases as the roads become vegetated, roads can deteriorate with age, becoming more susceptible to many forms of erosion, including culvert plugging and subsequent stream crossing failure, stream diversion and gullying, as well as failure of both road and landing fills (Environmental Science Associates 2004). Legacy roads from past logging activity, having been adopted as year-round roads and recreational trails, continue to impact the Soquel watershed. On many roads, located on both public and private lands, periodic maintenance occurs without any attempt to address chronic, localized erosion problems. In these circumstances, grading poorly drained roads and repairing failed fills and stream crossings can continue, and even exacerbate, the rate of fine sediment delivery into streams. Additionally, paved and unpaved roads parallel many of the waterways within Soquel Creek, likely constraining natural channel migration.
SoC-CCC-23.1.1.3	Action Step	Roads/Railroads	Develop a private road improvement fund to share costs and encourage private road associations to upgrade poorly constructed or improperly located roads.	3	30	City of Capitola, RWQCB, Santa Cruz County, Santa Cruz RCD	16.67	16.67	16.67	16.67	16.67	100	Costs would depend on outreach success of the program.
SoC-CCC-23.1.1.4	Action Step	Roads/Railroads	Evaluate and remove roadside berms that lead to increased runoff velocities and result in increased sediment discharge.	3	20	CalFire, IWRP, Private Landowners, Santa Cruz County, Santa Cruz RCD							

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	
SoC-CCC-23.1.1.5	Action Step	Roads/Railroads	Prioritize decommissioning of riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).	3	20	CalFire, CalTrans, NRCS, Private Landowners, Redwood Empire, RWQCB, Santa Cruz County, Santa Cruz County Land Trust, Santa Cruz RCD, Soquel Demonstration State Forest, State Parks	13.75	13.75	13.75	13.75		55	Cost will depend on landowner willingness to participate and site specific conditions. The most likely candidates for this recommendation include roads on State Parks, private timberlands, and Soquel Demonstration State Forest. Mainline public roads, although a major issue, are unlikely to be decommissioned due to common infrastructure and high property acquisition expense. Cost based on decommissioning 4 miles of riparian road network at a rate of $13,680/mile. If upgrading riparian roads, cost are estimated to total $96,000.
SoC-CCC-23.1.1.6	Action Step	Roads/Railroads	Establish adequate spoils storage sites throughout the watershed so that material from landslides and road maintenance can be stored safely away from coho streams. Coordinate these efforts with all landowners in the watershed, CalTrans, and county road maintenance staff as appropriate.	3	5	CalFire, City of Capitola, Santa Cruz County							
SoC-CCC-23.1.1.7	Action Step	Roads/Railroads	Install and maintain adequate energy dissipaters for culverts and other drainage pipe outlets where needed.	3	20	CalFire, City of Capitola, Santa Cruz County	490.00	490.00	490.00	490.00		1,960	Cost based on treating 20 stream crossings at a rate of $97,673/culvert (assume average size to be 10-20').
SoC-CCC-23.1.1.8	Action Step	Roads/Railroads	Evaluate stream crossings for their potential to impair natural geomorphic processes. Replace or retrofit crossings to achieve more natural conditions that meet sediment transport goals.	3	5	CalFire, City of Capitola, NRCS, Redwood Empire, RWQCB, Santa Cruz County, Soquel Demonstration State Forest, State Parks	255.00					255	Encourage Soquel Demonstration State Forest to install a bridge or decommission a wet ford crossing on East Branch Soquel. Cost for providing passage (assume bottomless arch) at a rate of $255,000.
SoC-CCC-23.1.1.9	Action Step	Roads/Railroads	Educate road associations and informal road maintenance collectives regarding the benefit of integrating into the Santa Cruz County Service Area process.	2	5	IWRP, Santa Cruz County						In-Kind	

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	
SoC-CCC-23.1.1.10	Action Step	Roads/Railroads	Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas in historical habitats or Core CCC coho salmon watersheds.	3	20	CalFire, IWRP, NRCS, Santa Cruz RCD	55.00	55.00	55.00	55.00		220	This action should carefully balance impacts of riparian roads, future risks, and juxtaposition to important spawning and rearing areas. Although ambitious, this recommendation, by focusing on infrequently used and infrequently maintained high risk areas; should be considered a realistic goal with long-term benefits. Areas targeted will most likely included unsurfaced and infrequently used roads in the upper portion of the Soquel watershed. Indiscriminate road density reduction should be avoided so as not to preclude inhibiting future road realignments that could also effectively reduce sediment delivery. Cost based on treating 16 miles of road network at a rate of 13,680/mile.
SoC-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to watershed hydrology										
SoC-CCC-23.1.2.1	Action Step	Roads/Railroads	Size culverts to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure.	2	100	CalFire, City of Capitola, Private Landowners, Redwood Empire, Santa Cruz County, Soquel Demonstration State Forest, State Parks							Cost accounted for in prevent impairment to instream substrate.
SoC-CCC-23.1.3	Recovery Action	Roads/Railroads	Prevent impairment to passage and migration										
SoC-CCC-23.1.3.1	Action Step	Roads/Railroads	Evaluate SCCRCD (2003) recommendations for passage improvements and prioritize accordingly.	2	10	IWRP, Santa Cruz County, Santa Cruz RCD, USACE	3,526	3,526				7,051	Cost based on treating 14 barriers at a rate of $503,675/barrier. Cost may vary depending on size of stream and land use. Box culverts on Bates Creek and Hester Creek (Soquel-San Jose Road) restrict movement of large instream wood. Locations that impede wood movement in addition to salmonid movement should be considered a high priority for remediation.
SoC-CCC-23.1.3.2	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	100	CalFire, CalTrans, City of Capitola, NRCS, Redwood Empire, RWQCB, Santa Cruz County, Soquel Demonstration State Forest, USACE						In-Kind	Adopt NMFS (2001) Guideline for Stream Crossings.

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	
SoC-CCC-23.1.4	Recovery Action	Roads/Railroads	Prevent adverse alterations to riparian species composition and structure										
SoC-CCC-23.1.4.1	Action Step	Roads/Railroads	Encourage ongoing implementation of the County of Santa Cruz's Integrated Vegetation Management Plan for Roads Near Perennial Waters (URS Corporation, 2008) regarding roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.	2	100	Santa Cruz County							
SoC-CCC-23.2	**Objective**	**Roads/Railroads**	**Address the inadequacy of existing regulatory mechanisms**										
SoC-CCC-23.2.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate										
SoC-CCC-23.2.1.1	Action Step	Roads/Railroads	Encourage Redwood Empire and State Parks to address wetted road crossings and sediment runoff from their riparian roads located on Hinckley Creek, tributary to East Branch Soquel.	2	5	IWRP, Redwood Empire, Santa Cruz County, State Parks							This road is used by residents in an inholding on Hinckley Creek and is a significant source of fine sediment input into a reach of stream close to where the southern most coho population was detected in 2009. The sediment should be stabilized within five years. Ultimately, this road should be closed and decommissioned.
SoC-CCC-23.2.1.2	Action Step	Roads/Railroads	Licensed engineering geologists should review and approve grading on inner gorge slopes.	3	100	CalFire, California Geological Survey, CalTrans, NRCS, Private Landowners, Santa Cruz County Department of Public Works, Soquel Demonstration State Forest, State Parks						TBD	This is a cost that is frequently absorbed into road projects.
SoC-CCC-23.2.1.3	Action Step	Roads/Railroads	Improve enforcement of Erosion Control Ordinance for private roads. The current Santa Cruz Erosion Control Ordinance has provisions requiring the responsible parties to repair and alleviate erosion problems that are deemed severe. Santa Cruz Planning should create new erosion control staff positions to help coordinate the County's cooperative efforts, but also to conduct inspections and enforcement actions as necessary.	2	10	Santa Cruz County	250.00	250.00				500	Cost likely amounts to a 1/2 time position in the Soquel Creek/Aptos Creek watersheds. Costs were estimated over a ten year interval and will likely need further refinement if this recommendation is carried out over a longer duration.

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	
SoC-CCC-23.2.1.4	Action Step	Roads/Railroads	Close unauthorized (pioneer) trails and conduct appropriate decommissioning practices. Hydrologically disconnect trails from associated waterways.	3	20	Private Landowners, Santa Cruz RCD, Soquel Demonstration State Forest, State Parks						In-Kind	Constant diligence will be necessary to minimize the impacts of unsanctioned trials and roads.
SoC-CCC-23.2.1.5	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads where appropriate.	2	100	IWRP, NRCS, Private Landowners, Santa Cruz County, Santa Cruz RCD						TBD	Inadequate road maintenance practices is most problematic on rural residential road networks, particularly those not subject to forest practice rules performance standards.
SoC-CCC-23.2.1.6	Action Step	Roads/Railroads	Encourage appropriate restrictions for winter use of unsurfaced roads along rural utility easements; and establish best management practices for clearance within riparian corridors.	2	100	CalFire, PG&E, Santa Cruz County							
SoC-CCC-23.2.2	Recovery Action	Roads/Railroads	Prevent impairment to floodplain connectivity (impaired quality & extent)										
SoC-CCC-23.2.2.1	Action Step	Roads/Railroads	Avoid 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.	1	20	CalFire, CalTrans, City of Capitola, NRCS, RWQCB, Santa Cruz County						TBD	Cost may vary significantly. However, a well designed road management plan should result in overall cost savings.
SoC-CCC-24.1	**Objective**	**Severe Weather Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
SoC-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to the estuary										
SoC-CCC-24.1.1.1	Action Step	Severe Weather Patterns	Design estuary restoration projects to include subtidal habitats and natural bioengineering techniques that buffer wave action and increase sediment deposition to minimize shoreline and wetland erosion.	3	100	CA Coastal Commission, City of Capitola, Santa Cruz County, Santa Cruz RCD						TBD	Cost accounted for in ESTUARY.
SoC-CCC-24.1.2	Recovery Action	Severe Weather Patterns	Prevent impairment to stream hydrology.										

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	
SoC-CCC-24.1.2.1	Action Step	Severe Weather Patterns	Implement water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.	2	100	IWRP, NRCS, Private Landowners, Santa Cruz County, Santa Cruz RCD							
SoC-CCC-24.1.2.2	Action Step	Severe Weather Patterns	If predicted flows are below a level considered critical to maintain viable rearing habitat for salmonids, measures to reduce water consumption should be initiated by municipal water suppliers and other users in the watershed through conservation programs.	1	10	City of Capitola, IWRP, NRCS, SWRCB	36.00	36.00				72	Cost for stream flow model estimated at $71,825/project
SoC-CCC-24.1.2.3	Action Step	Severe Weather Patterns	Patterns of water runoff, including surface and subsurface drainage, should match, to the greatest extent possible, the natural hydrologic pattern for the watershed in timing, quantity, and quality.	3	100	City of Capitola, IWRP, Santa Cruz County, Santa Cruz RCD						In-Kind	
SoC-CCC-24.2	**Objective**	**Severe Weather Patterns**	**Address the inadequacy of existing regulatory mechanisms**										
SoC-CCC-24.2.1	Recovery Action	Severe Weather Patterns	Prevent impairment to instream habitat complexity (reduced large wood and/or shelter)										
SoC-CCC-24.2.1.1	Action Step	Severe Weather Patterns	Work with local governments to incorporate protection of CCC coho salmon in any flood management activity (CDFG 2004).	2	100	City of Capitola, Santa Cruz County, USACE						In-Kind	
SoC-CCC-24.2.2	Recovery Action	Severe Weather Patterns	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)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
SoC-CCC-24.2.2.1	Action Step	Severe Weather Patterns	Protect high-risk shallow-seated landslide areas and surfaces prone to erosion from being mobilized by intense storm events.	3	100	CalFire, City of Capitola, IWRP, Santa Cruz County, Santa Cruz RCD, USACE						TBD	Concentrated rainfall and extreme flood events could increase sediment input into Soquel Creek and tributaries from upslope locations. Much of the watershed is comprised of steep topography in erodible geology, which has led to frequent landslides. Accumulated fine sediment within the stream channel from upslope landslides has likely adversely impacted salmonid spawning and rearing habitats. Improved land-use practices will likely lower sediment yield rates following future flooding events. However, much of the watershed is considered impaired and additional flooding events could slow the recovery rate of instream habitat conditions. Erosion assessment cost accounted for in other action steps. Assessment should identify protective measures for high-risk shallow-seeded landslides.
SoC-CCC-24.2.3	Recovery Action	Severe Weather Patterns	Prevent impairment to stream hydrology.										
SoC-CCC-24.2.3.1	Action Step	Severe Weather Patterns	Agencies and landowners should develop contingencies for, drought conditions in a manner compatible with CCC coho salmon recovery needs.	2	10	Private Landowners, Santa Cruz County, Soquel Creek Water District, SWRCB						TBD	Due to the heavy over-drafting of water from Soquel Creek, the impact of a severe drought in conjunction with ongoing overdraft of the aquifer could be devastating to all lifestages of coho salmon and steelhead in the watershed. Although the watershed is Fully Appropriated and adjudicated, a water master is not appointed and there is no oversight of flow requirements. Required minimum bypass flows are not enforced for permitted surface water diversions and it is likely flows drop below mandated requirements in many stream reaches during the summer period. Additionally, even less oversight exists for ground water pumping in the watershed, which may impact baseflows more significantly than surface water diversions. Current demand for water exceeds the safe yield of local aquifers and is in danger of seawater contamination. Severe drought, particularly if occurring over a period of two or more years, would likely reduce flows significantly throughout the watershed, which would reduce overall salmonid abundance and compromise coho recovery goals for the Santa Cruz Mountains Diversity Stratum.

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	
SoC-CCC-24.2.3.2	Action Step	Severe Weather Patterns	CDFG, SWRCB, RWQCB, CalFire, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon during droughts.	3	20	CalFire, CDFG, Private Consultants, Private Landowners, RWQCB, SWRCB						In-Kind	These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality.
SoC-CCC-24.2.3.3	Action Step	Severe Weather Patterns	Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.	1	100	CDFG, SWRCB							
SoC-CCC-24.2.3.4	Action Step	Severe Weather Patterns	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	3	100	IWRP, NRCS, Santa Cruz RCD							
SoC-CCC-24.2.3.5	Action Step	Severe Weather Patterns	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).	2	10	CDFG, City of Capitola, NMFS, RWQCB, Soquel Creek Water District, SWRCB							
SoC-CCC-24.3	**Objective**	**Severe Weather Patterns**	**Address the overutilization for commercial, recreational, scientific or educational purposes**										
SoC-CCC-24.3.1	Recovery Action	Severe Weather Patterns	Prevent reduced density, abundance, and diversity										
SoC-CCC-24.3.1.1	Action Step	Severe Weather Patterns	Increase enforcement patrols by CDFG and NMFS OLE in sensitive spawning and rearing areas.	1	10	CDFG Law Enforcement, NMFS OLE						In-Kind	Patrols should focus on the lower East Branch of Soquel where coho salmon were most recently spawned successfully.
SoC-CCC-25.1	**Objective**	**Water Diversion/Impoundment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
SoC-CCC-25.1.1	Recovery Action	Water Diversion/Impoundment	Prevent impairment to the estuary (impaired quality and extent)										
SoC-CCC-25.1.1.1	Action Step	Water Diversion/Impoundment	Ensure current and future water diversions (surface and groundwater) do not further impair water quality conditions for rearing juvenile salmonids.	2	10	Private Landowners, RWQCB, SWRCB	7.50	7.50				15	Cost for continuous water quality monitoring estimated at $5,000/station. Assume minimum of 3 for lagoon. Cost does not account for maintenance or data management.

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	
SoC-CCC-25.1.2	Recovery Action	Water Diversion/Impoundment	Prevent impairment to stream hydrology (impaired water flow)										
SoC-CCC-25.1.2.1	Action Step	Water Diversion/Impoundment	Ensure water supply demands can be met without impacting flow either directly or indirectly through groundwater withdrawals and aquifer depletion.	2	100	City of Capitola, Santa Cruz County, SWRCB						TBD	Stream flow model should identify flow levels for coho salmon.
SoC-CCC-25.1.2.2	Action Step	Water Diversion/Impoundment	Develop water education programs to reduce water use directed at both municipal water users and those with riparian and appropriative water rights.	2	5	City of Capitola, Santa Cruz County, Santa Cruz RCD, Soquel Creek Water District, SWRCB	20.00					20	
SoC-CCC-25.1.2.3	Action Step	Water Diversion/Impoundment	Work with water diverters in the lower West Branch of Soquel to evaluate and modify diversions that may impact rearing habitat quality.	2	15	IWRP, NRCS, Santa Cruz RCD, SWRCB						In-Kind	
SoC-CCC-25.1.2.4	Action Step	Water Diversion/Impoundment	Coordinate timing of water diversions to minimize the likelihood of fish stranding and stream dewatering.	2	100	Private Consultants, Private Landowners, Santa Cruz RCD, Soquel Creek Water District, SWRCB						In-Kind	
SoC-CCC-25.1.2.5	Action Step	Water Diversion/Impoundment	Install passive flow bypass devices designed to allow diversion of water only when minimum streamflow requirements are exceeded.	2	20	CDFG, IWRP, Private Landowners, Santa Cruz RCD, SWRCB						In-Kind	CDFG should review diversions during period 1600 agreement updates and request installation of passive diversion devices where appropriate and feasible.
SoC-CCC-25.1.2.6	Action Step	Water Diversion/Impoundment	Encourage programs and entrepreneurial efforts by private organizations to purchase easements on water rights for maintenance of adequate surface flows.	2	20	IWRP, NRCS, Santa Cruz County, Santa Cruz County Land Trust, Soquel Creek Water District, SWRCB						In-Kind	

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	
SoC-CCC-25.1.2.7	Action Step	Water Diversion/Impoundment	Encourage riparian water users that were assigned Class 2 water rights at the time of the adjudication to lease their water right portion to the City of Capitola.	3	20	CDFG, City of Capitola, Private Landowners, SWRCB						In-Kind	Based on claimed or estimated use at the time of the Soquel adjudication, the SWRCB assigned four classes of water right. The right assignment describes the user's maximum daily use in each of the four classes. The water desired in each class of user must be fully satisfied before water may be apportioned to the next higher numbered class. Within the riparian use classes, Classes 1,2, and 4, water is to be simultaneously shared among all the users of that class in proportion to the user's allotment in that class. This implies that if there is insufficient water to satisfy everyone's right a determination must be made of how much water is available. Riparian users with a Class 2 water right could release their water right to Capitola for protection of fish per section 1707. This would protect fish habitat by protecting streamflow leading to the lagoon and inflow into the lagoon.
SoC-CCC-25.1.2.8	Action Step	Water Diversion/Impoundment	Evaluate recycling waste water as a supplemental supply for irrigation and possibly groundwater recharge.	2	10	City of Capitola, IWRP, Public, RWQCB, Soquel Creek Water District, SWRCB						TBD	Use and recharging of recycled waste water would lead to reduced groundwater pumping which in turn could result in increased base flows in Soquel Creek.
SoC-CCC-25.1.3	Recovery Action	Water Diversion/Impoundment	Prevent impairment to passage and migration										
SoC-CCC-25.1.3.1	Action Step	Water Diversion/Impoundment	Adequately screen water diversions to prevent juvenile salmonid mortalities.	3	10	CDFG, Private Landowners, SWRCB						In-Kind	All authorized surface water diverters should be notified of fish screen obligations. Notification should be followed by site visits within one year by DFG and SWRCB staff to ensure diversion are in compliance.
SoC-CCC-25.1.4	Recovery Action	Water Diversion/Impoundment	Prevent impairment to water quality (impaired instream temperature)										
SoC-CCC-25.1.4.1	Action Step	Water Diversion/Impoundment	Ensure water diversions do not impair water temperatures in Soquel Creek.	1	100	CDFG, Private Landowners, SWRCB						In-Kind	As part of future 1600 agreements, CDFG should require installation of temperature thermographs upstream and downstream of diversion. These results should be reviewed by CDFG for every subsequent 1600 agreement.
SoC-CCC-25.2	**Objective**	**Water Diversion/Impoundment**	**Address the inadequacy of existing regulatory mechanisms.**										

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	
SoC-CCC-25.2.1	Recovery Action	Water Diversion/Impoundment	Prevent impairment to stream hydrology (impaired water flow)										
SoC-CCC-25.2.1.1	Action Step	Water Diversion/Impoundment	Appoint and adequately fund a Water Master to carry out the adjudication of water rights on Soquel Creek.	1	5	Santa Cruz County, Private Landowners, Soquel Creek Water District, SWRCB	200.00					200	The watershed has been designated as a Fully Appropriated Stream by the California State Water Resources Control Board and placed under a statutory adjudication by court order in 1978. However, a water master to enforce the conditions of the adjudication has not occurred. The lack of oversight places the fishery at even greater risk. Surface water diversions and ground water pumping adversely impact almost all coho lifestages and are particularly deleterious during drought conditions. Water diversions result in excessively high water temperatures for coho salmon in Soquel Creek and loss of surface flow. Loss of surface flow has been documented in 1992, 1994, and 2008.
SoC-CCC-25.2.1.2	Action Step	Water Diversion/Impoundment	Establish a comprehensive stream flow evaluation program to determine instream flow needs for salmonids throughout the watershed.	1	5	CDFG, City of Capitola, IWRP, Santa Cruz County, Santa Cruz RCD, Soquel Creek Water District, SWRCB, USFWS							Diversions, from direct diversions and near stream wells, adversely impact the summer rearing lifestage and was determined to be the most significant threat to salmonids in the watershed. Water diversions and pumping of the alluvial aquifer reduce the quantity of water in the wetted stream channel, which increases diurnal temperature fluctuations and reduces available rearing habitat. A streamflow evaluation program should be developed in consultation with CDFG and NMFS. The program should develop rule curves, based on water year, that specifies flows necessary for salmonids to survive and thrive at all lifestages. Cost accounted for above.

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	
SoC-CCC-25.2.1.3	Action Step	Water Diversion/Impoundment	Install gauging devices to acquire hydrologic data on stream flows.	1	10	CDFG, IWRP, Soquel Creek Water District, SWRCB	12.00	12.00				24	Groundwater depletion is a limiting factor as well in the watershed and pieziometers will likely also be need to assess groundwater/surface water interactions. Gauging locations can be calibrated with the USGS gauge on Soquel Creek. Gauging sites should be located near areas with significant diversions and high value habitats. Likely locations include 1) lower Reach 1 immediately upstream of the lagoon, 2) upper Reach 1 downstream of Soquel Avenue near Walnut Street Park, 3) Reach 3 immediately downstream of the Bates Creek confluence, 4) in lower Reach 4 below the surface water diversion at the lower nursery, 5) in Reach 6 adjacent to the Mountain School, 6) Reach 9 below the Mill Pond diversion, Reach 13 of the West Branch near its mouth and below residential diversions. Other locations are likely necessary and should also be evaluated. Cost for stream flow gauges estimated at $1000/gauge. Cost does not account for maintenance or data management.
SoC-CCC-25.2.1.4	Action Step	Water Diversion/Impoundment	Request the SWRCB to conduct interagency consultation with the California Department of Fish and Game, and seek technical assistance from NMFS on the issuance, perfection, or changes to water rights permits.	1	100	CDFG, NMFS, SWRCB						In-Kind	
SoC-CCC-25.2.1.5	Action Step	Water Diversion/Impoundment	Identify and work with the SWRCB to address depletion of summer base flows from authorized and unauthorized water uses. Coordinated efforts by Federal, State, and County law enforcement agencies to remove illegal diversions from all streams in the Soquel Creek watershed.	1	10	CDFG, IWRP, NMFS, Private Landowners, State Water Resources Control Board						In-Kind	Request the SWRCB review and/or modify water use of permitted diversion to instream flows supportive of the freshwater life history requisites of steelhead and coho salmon.

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	
SoC-CCC-25.2.1.6	Action Step	Water Diversion/Impoundment	Prohibit new or increased surface water diversions, or groundwater pumping that depletes surface flows, for existing permit holders in Soquel Creek.	1	100	CDFG, NMFS, Private Landowners, Santa Cruz County, SWRCB						In-Kind	No additional water diversions should occur in Soquel Creek. Water diversions and ground water pumping, which have depleted the aquifer, coupled with degraded instream habitat conditions, significantly degrade juvenile rearing opportunities during the summer period. Many stream reaches go dry during the summer juvenile rearing period, and this drying is unambiguously not due to natural conditions. A notable decline in base flow has occurred in the watershed since the 1950s as measured at the USGS Soquel Creek gage during dry periods. Balance Hydrologics, Inc. (2003) reported that the decrease was characterized by a drop in baseflows of two to four cfs resulting in dry period baseflows of zero to two cfs. The most likely cause of the decreases in baseflow are surface diversions and near-stream groundwater pumping.
SoC-CCC-25.2.1.7	Action Step	Water Diversion/Impoundment	Evaluate and monitor 1600 program compliance related to all water diversions (CDFG 2004) in Soquel Creek.	1	100	CDFG						In-Kind	Initial focus for compliance should be directed at the East Branch of Soquel Creek upstream of areas where coho were detected in 2009.
SoC-CCC-25.2.1.8	Action Step	Water Diversion/Impoundment	Encourage SWRCB to bring illegal water diverters (those unpermitted and permitted but out-of-compliance with permit terms) into compliance with State law.	1	5	CDFG, NMFS, Public, Santa Cruz County, Soquel Creek Water District, SWRCB						In-Kind	Initial area of concentration should be directed at diversions in the East Branch of Soquel Creek where coho salmon juveniles were detected in 2008.
SoC-CCC-25.2.1.9	Action Step	Water Diversion/Impoundment	Evaluate major groundwater diversions for impacts to surface flow.	2	10	CDFG, Private Landowners, Public, Santa Cruz County, Soquel Creek Water District, SWRCB						TBD	Available information indicates the Soquel Creek Water District operates a deep-aquifer well near Main Street in Soquel Village and it draws underflow from Soquel Creek. This location and others should be assessed and if determined to impact surface flows, 1600 agreements and water rights should be reviewed and modified to ensure impacts to rearing habitats are minimized, particularly during the summer low flow period.
SoC-CCC-26.1	**Objective**	**Watershed Process**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
SoC-CCC-26.1.1	Recovery Action	Watershed Process	Reduce adverse impacts to watershed processes associated with urbanization.										

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	
SoC-CCC-26.1.1.1	Action Step	Watershed Process	Conserve open space in contiguous landscapes, protect floodplain areas and riparian corridors, and develop conservation easements.	1	100	CalFire, FEMA, Santa Cruz County, Santa Cruz County Land Trust, The Nature Conservancy						In-Kind	