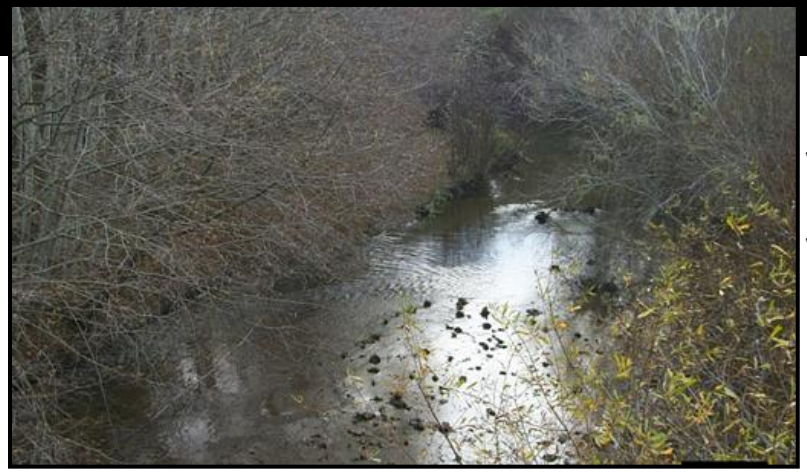
Walker Creek

Location	•Sonoma County
Watershed Area	•75.0 Square Miles
Potential Habitat	•67.6 Stream Miles
Vegetation	•24% Riparian or Montane Forest, 61% Grassland
Erodability	•Low to Moderate
Ownership Patterns	•96% Private, 4% Public
Dominant Land Uses	•Livestock
Housing Density	•Low
TMDL Pollutants	•Sediment, Nutrients, Pathogens, Metals



Walker Creek
Photo by Bob Coey, NMFS

Walker Creek Coho Salmon: Nearly Extirpated

Recovery Goals

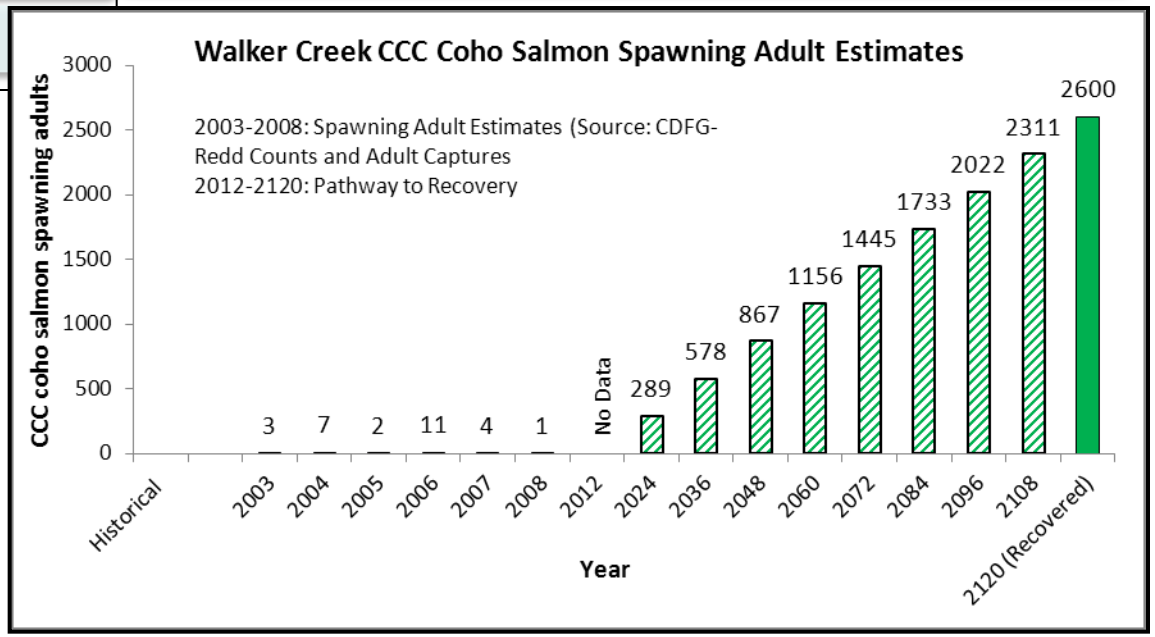
- ✓ Continue operation of the Captive Broodstock Program, including use of rescued fish
- ✓ Expand fish and habitat monitoring programs

Walker Creek
Adult Spawner Targets

Downlisting to Threatened
1,300

Recovery
2,600

STEELHEAD: YES
CHINOOK SALMON: NO



Walker Creek

Potential Habitat: 67.6 miles
Recovery Target: 2,600 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	FAIR	FAIR	POOR	POOR	POOR	POOR	POOR	POOR	GOOD

Preventing Extinction & Improving Conditions

Priority 1: Immediate Restoration Actions

- Re-establish a naturally reproducing run of coho salmon in appropriate subwatersheds
- Implement exclusion fencing and replant native riparian species and native conifers/hardwoods throughout riparian zones
- Annually capture or retain (during rescue efforts) - small numbers of surplus fish from drying streams/habitats in Marin and Sonoma Counties for purposes of broodstock for Russian River, Walker and Salmon Creeks.
- Minimize departure from the genetic profile that historically existed in the population

Priority 2 & 3: Long-Term Restoration Actions

- Support a salmonid limiting factors assessment in Keys Estero and Tomales Bay
- Restore estuarine wetlands and sloughs, replant native riparian vegetation
- Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats, and complex habitat features
- Conduct instream and upslope sediment source surveys to identify and remediate existing sources of high sediment yield
- Identify and provide solutions for point and non-point sources contributing to toxicity and turbidity

MARIN RESOURCE CONSERVATION DISTRICT

TOMALES BAY Watershed Council

Recovery Partners

THE UNIVERSITY OF CALIFORNIA 1868

MARIN MUNICIPAL WATER DISTRICT

RESOURCES AGENCY CALIFORNIA DEPARTMENT FISH&GAME

Photo courtesy from left to right: Josh Fuller, NMFS, Campbell Timberland, Gualala River Watershed Council, Eli Asarian and Morgan Bond, SWFSC

Walker Creek

Potential Habitat: 67.6 miles
Recovery Target: 2,600 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
VERY HIGH	MEDIUM	MEDIUM	LOW	LOW	LOW	VERY HIGH	LOW	MEDIUM	MEDIUM	HIGH	HIGH	HIGH	HIGH

Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- Promote off-channel storage to reduce impacts of water diversion
- Develop off-channel watering facilities for livestock
- Minimize impacts to riparian habitat and water quality from livestock
- Ensure livestock crossings avoid streams

Priority 2 & 3: Long-Term Threat Abatement Actions

- Ensure adequate "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) are available prior to diverting stream flows
- Upgrade existing crossings (bridges, culverts, fills, and other crossings) to accommodate 100-year flood flows
- Identify and remediate upstream pollution sources contributing to poor water quality conditions in the estuary
- Adequately screen water diversions to prevent juvenile salmonid mortalities

Streambank restoration on Walker Creek
Photo by Bob Coey, NMFS

Conservation Highlights

- Coho salmon from broodstock programs were released into the watershed
- Erosion control efforts are taking place to control sediment in the watershed
- Dairy and farming Best Management Practices have been developed and implemented in the Walker Creek Watershed

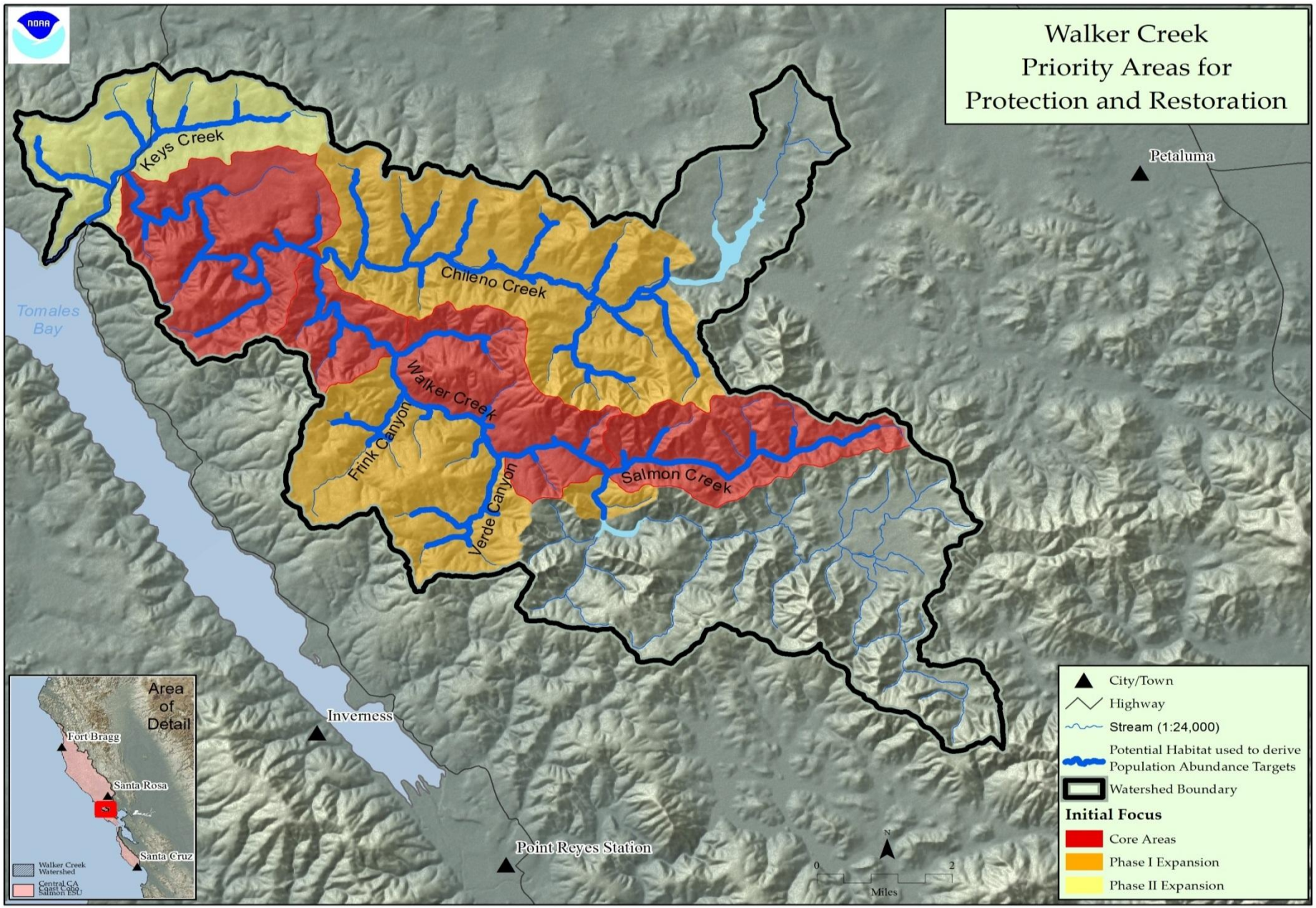


Figure 1: Map of Walker Creek

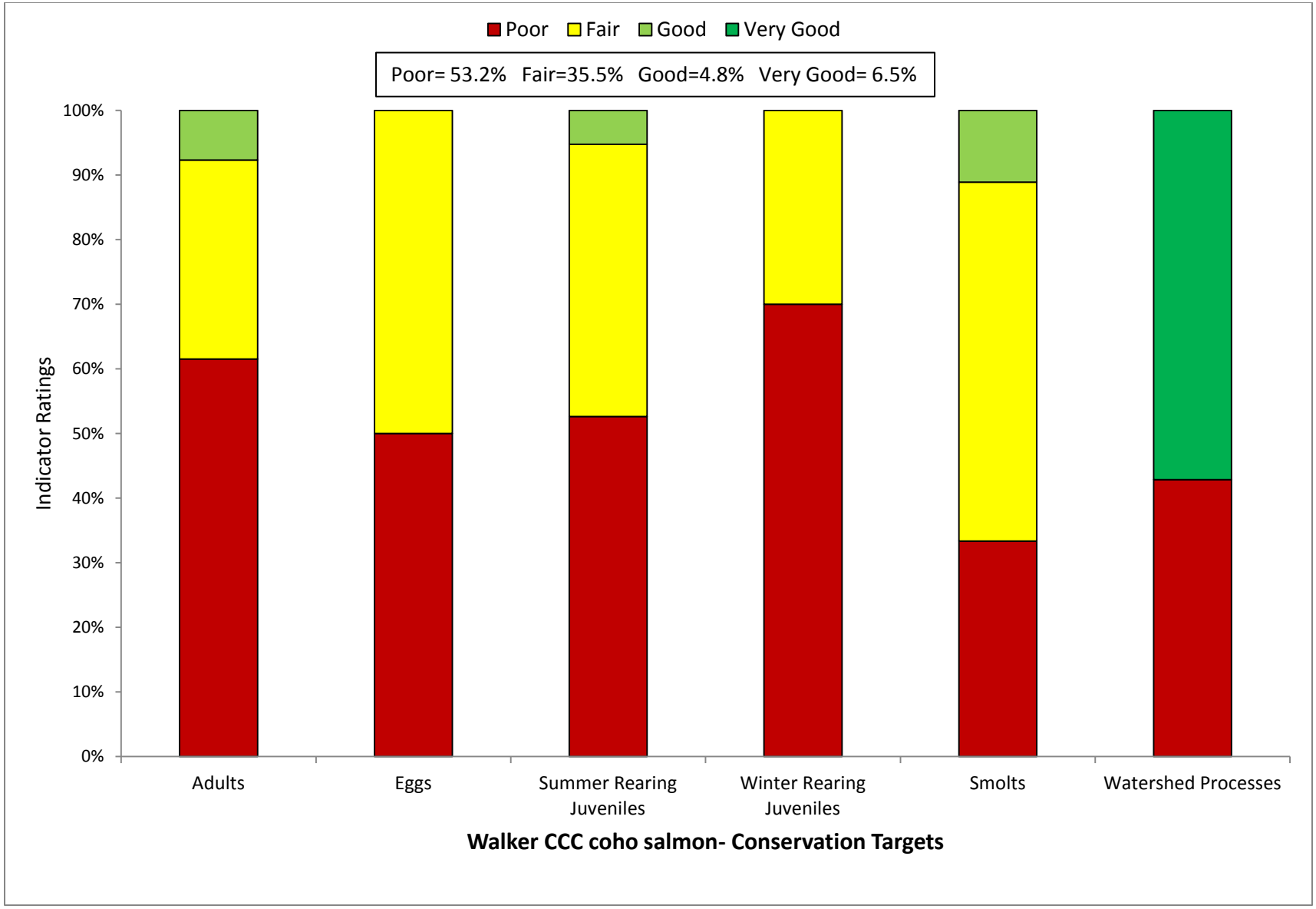


Figure 2: Viability Results by Lifestage

Table 1: CAP Viability Results ~ Walker Creek

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	**0.2 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)	**<1 Key Pieces/100m**	Poor	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**0% streams 0 % 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% streams 0 % 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 =42**	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Adults	Passage/Migration	Passage at Mouth or Confluence	**70% of IP-km accessible**	Fair	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Passage/Migration	Physical Barriers	**70% of IP-km accessible**	Fair	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	**0% Class 5 & 6 across IP-km**	Poor	SEC Analysis/CDFG Data	55 - 69% Class 5 & 6 across IP-km
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	**NA**	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Adults	Sediment	Quantity & Distribution of Spawning Gravels	**<50% of IP-km accessible**	Poor	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	**50% Response Reach Connectivity**	Poor	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Adults	Water Quality	Toxicity	**Sublethal or Chronic**	Fair	SEC Analysis/CDFG Data	No Acute or Chronic
Adults	Water Quality	Turbidity	**50% to 74% of streams/ IP-km maintains severity score of 3 or lower**	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Adults	Viability	Density	**<1 spawner per IP-km**	Poor	SEC Analysis/CDFG Data	low risk spawner density per Spence (2008)
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor Score =58**	Fair	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	**Risk Factor Score =58**	Fair	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)	**0% streams 0 % IP-km (>50% stream average scores of 1 & 2)**	Poor	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	**Impaired but functioning**	Fair	NMFS Instream Flow Analysis	Properly Functioning Condition
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	**0.2 Key Pieces/100m**	Poor	NMFS Instream Flow Analysis	6 to 11 key pcs/100m
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	**<1 Key Pieces/100m**	Poor	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	**<50% of streams/ 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	**0% streams 0 % 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% streams 0 % 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 =83**	Poor	NMFS Instream Flow Analysis	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor Score =58**	Fair	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	**0.58 Diversions/10 IP-km**	Good	NMFS Watershed Characterization	0.01 - 1 Diversions/10 IP km
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	**50% of IP-km to 74% of IP-km accessible**	Fair	NMFS Watershed Characterization	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	**70% of IP-km accessible**	Fair	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	**67% of IP-km (>85% average stream canopy)**	Fair	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>85% average stream canopy)
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	**0% Class 5 & 6 across IP-km**	Poor	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	**NA**	0	SEC or PAD/CDFG Data	≥80% Density rating "D" across IP-km
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	**0% streams 0 % 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)	**40% IP-km (<16 C MWMT)**	Poor	Population Profile/BPJ	75 to 89% IP km (<16 C MWMT)
Summer Rearing Juveniles	Water Quality	Toxicity	**Sublethal or Chronic**	Fair	NMFS Watershed Characterization/CWHR	No Acute or Chronic
Summer Rearing Juveniles	Water Quality	Turbidity	**50% to 74% of streams/ IP-km maintains severity score of 3 or lower**	Fair	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Summer Rearing Juveniles	Viability	Density	**<0.2 fish/meter^2**	Poor	SEC Analysis/CDFG Data	0.5 - 1.0 fish/meter^2
Summer Rearing Juveniles	Viability	Spatial Structure	**72% of Historical Range**	Fair	NMFS Watershed Characterization/CWHR	75-90% of Historical Range
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	**0.2 Key Pieces/100m**	Poor	NMFS Watershed Characterization/CWHR	6 to 11 key pcs/100m
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	**<1 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	**0% streams 0 % 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% streams 0 % 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	**70% of IP-km accessible**	Fair	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	**0% Class 5 & 6 across IP-km**	Poor	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	**NA**	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	**50% to 74% of streams/ IP-km (>50% stream average scores of 1 & 2)**	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	**50% Response Reach Connectivity**	Poor	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Winter Rearing Juveniles	Water Quality	Toxicity	**Sublethal or Chronic**	Fair	NMFS Watershed Characterization	No Acute or Chronic
Winter Rearing Juveniles	Water Quality	Turbidity	**<50% of streams/ IP-km maintains severity score of 3 or lower**	Poor	NMFS Watershed Characterization	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower

Smolts	Estuary/Lagoon	Quality & Extent	**Impaired but functioning**	Fair	SEC Analysis/CDFG Data	Properly Functioning Condition
Smolts	Habitat Complexity	Shelter Rating	**0% streams 0 % 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	**0.58 Diversions/10 IP-km**	Good	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	**Risk Factor Score =58**	Fair	TRT Spence (2008)	NMFS Flow Protocol: Risk Factor Score 35-50
Smolts	Passage/Migration	Passage at Mouth or Confluence	**50% of IP-km to 74% of IP-km accessible**	Fair	TRT Spence (2008)	75% of IP-Km to 90% of IP-km
Smolts	Smoltification	Temperature	**50-74% IP-km (>6 and <16 C)**	Fair	TRT Spence (2008)	75-90% IP-Km (>6 and <16 C)
Smolts	Water Quality	Toxicity	**Sublethal or Chronic**	Fair	TRT Spence (2008)	No Acute or Chronic
Smolts	Water Quality	Turbidity	**<50% of streams/ IP-km maintains severity score of 3 or lower**	Poor	EPA/RWQCB/NMFS Criteria	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
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	**0.16% of Watershed in Impervious Surfaces**	Very Good	SEC Analysis	3-6% of Watershed in Impervious Surfaces
Watershed Processes	Landscape Patterns	Agriculture	**>30% of Watershed in Agriculture**	Poor	EPA/RWQCB/NMFS Criteria	10-19% of Watershed in Agriculture
Watershed Processes	Landscape Patterns	Timber Harvest	**<15% of Watershed in Timber Harvest**	Very Good	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	**1% of watershed >1 unit/20 acres**	Very Good	EPA/RWQCB/NMFS Criteria	8-11% of watershed >1 unit/20 acres
Watershed Processes	Riparian Vegetation	Species Composition	**<25% Historical Species Composition**	Poor	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	**1.3 Miles/Square Mile**	Very Good	EPA/RWQCB/NMFS Criteria	1.6 to 2.4 Miles/Square Mile
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	**3 Miles/Square Mile**	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

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

Central CA Coast Coho Salmon ~ Walker Creek

ACTIONS FOR RESTORING HABITATS

1. Restoration- Estuary

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

1.1.1. **Recovery Action:** Implement estuary protection and enhancement measures to restore estuary to properly functioning conditions.

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

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

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

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

1.2.1.1. **Action Step:** Support a salmonid limiting factors assessment in Keys Estero and Tomales Bay (CDFG 2004).

1.2.1.2. **Action Step:** Per a completed limiting factors assessment, and utilizing adaptive management guidelines, develop restoration projects in areas which have high value physical and chemical properties for rearing salmonids

1.2.1.3. **Action Step:** Evaluate alterations to river mouth dynamics and implement changes to restore natural function

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

1.2.2.1. **Action Step:** Restore estuarine wetlands and sloughs, and improve prey abundance by increasing shoreline perimeter and planting native emergent and riparian species to improve foraging and cover.

1.2.3. **Recovery Action:** Improve the quality of each estuarine habitat zones (see WQ parameters)

1.2.3.1. **Action Step:** Improve estuarine water quality by identifying and remediating upstream pollution sources which contribute to poor water quality conditions in the estuary

1.2.3.2. **Action Step:** Modify alterations to freshwater inflow and water quality (temperature, dissolved oxygen)

2. Restoration- Floodplain Connectivity

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

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

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

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

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

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

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

2.2.2.1. **Action Step:** Identify the floodplain activation flow - the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation (Williams et al. 2009).

2.2.2.2. **Action Step:** Delineate reaches possessing both potential winter rearing habitat and floodplain areas.

2.2.2.3. **Action Step:** Identify areas where floodplain connectivity can be re-established in low gradient response reaches of Walker Creek. Develop and implement site specific plans to improve these conditions to re-create, and restore alcove, backwater, or perennial pond habitats.

2.2.2.4. **Action Step:** Support landowners and the Marin RCD in developing projects to improve channel conditions and restore natural channel geomorphology, including side channels and dense contiguous riparian vegetation (CDFG 2004).

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:** Improve habitat complexity

3.1.1.1. **Action Step:** Conduct habitat assessment in Keys Creek

3.1.1.2. **Action Step:** Utilize recommendations to prioritize reaches for habitat improvement

3.1.2. **Recovery Action:** Improve pool:riffle:flatwater ratio

3.1.2.1. **Action Step:** Increase the frequencies of riffles in 55% of the streams within the watershed

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

3.1.3. **Recovery Action:** Improve large wood frequency

3.1.3.1. **Action Step:** Increase large wood frequency in 75% of streams within the watershed to improve conditions for adults, and winter/summer rearing juveniles

3.1.3.2. **Action Step:** Increase LWD frequency to optimal conditions (>2 key LWD pieces/100 meters) in middle and upper reaches of Walker Creek

3.1.3.3. **Action Step:** Modify MMWD's multi-agency MOU for Large Woody Debris to include Walker Creek.

3.1.3.4. **Action Step:** Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in all reaches of Chileno, Salmon and Verde Canyon

3.1.3.5. **Action Step:** Modify MMWD's multi-agency MOU for Large Woody Debris to include Walker Creek.

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

3.1.4.1. **Action Step:** Increase primary pool frequency in 75% of streams within the watershed to improve conditions for adults, and summer/winter juveniles

3.1.4.2. **Action Step:** Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in all reaches of Chileno, Verde Canyon, and Walker Creek

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

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

3.1.5.2. **Action Step:** Increase shelter ratings to optimal conditions (>80 pool shelter value) in all reaches of Chileno, Salmon, Verde Canyon and Walker Creeks

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:** Monitor, identify problems, and prioritize needed changes to water diversion on current or potential coho streams that go dry in some years (CDFG 2004).

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

4.1.1.3. **Action Step:** To improve connectivity of surface flows with groundwater reduce aggradation and overall sediment load at the watershed scale by treating roads and sources of mass wasting.

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

4.1.1.5. **Action Step:** Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and §1707 (CDFG 2004).

4.1.2. **Recovery Action:** Improve passage flows

4.1.2.1. **Action Step:** Continue to assess the release of water from Soulejule Reservoir to develop the optimum flow release for coho salmon (CDFG 2004).

4.1.2.2. **Action Step:** Manage reservoirs and dam releases to maintain suitable rearing temperatures and migratory flows in downstream habitats (e.g., pulse flow programs for adult upstream migration and smolt outmigration).

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:** Improve sediment transport

5.1.1.1. **Action Step:** Implement DS level actions for treating watershed road networks

5.1.2. **Recovery Action:** Improve watershed hydrology

5.1.2.1. **Action Step:** Implement DS level recommendations to improve baseflows, and hydrologic connectivity

5.1.3. **Recovery Action:** Prevent landscape disturbance

5.1.3.1. **Action Step:** Implement Best Management Practices from DS level actions to prevent impairment due to Agriculture, Livestock and Residential Development.

5.1.3.2. **Action Step:** Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements

6. Restoration- Passage

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

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

6.1.1.1. **Action Step:** Evaluate the feasibility of bypassing large dams (CDFG 2004) in the watershed.

6.1.1.2. **Action Step:** Evaluate the potential for Laguna Lake to serve as rearing habitat, and the potential passage, and outmigration challenges and issues

7. Restoration- Pool Habitat

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

8. Restoration- Riparian

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

8.1.1. **Recovery Action:** Improve canopy cover

8.1.1.1. **Action Step:** Assess riparian canopy, extent of exotic vegetation (e.g., Arundo donax, etc.), and prioritize, develop and implement riparian habitat projects using native vegetation

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

8.1.1.3. **Action Step:** Increase the width of riparian corridors to 150' to allow multi-age stands of native trees and shrubs, and eventual recruitment of LWD

8.1.1.4. **Action Step:** Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers throughout the watershed (CDFG 2004).

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

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

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

8.1.2.3. **Action Step:** Plant native riparian species and native conifers/hardwoods throughout riparian zones within the northern (Chileno and Keys Creek) and eastern (Walker and Salmon Creek) portions of the watershed to increase overall tree diameter

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

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 and food productivity.

9.1.1.1. **Action Step:** Reduce embbeddness levels to the extent that 75% to 90% of streams within the watershed meet optimal criteria (>50% stream average scores of 1 & 2)

9.1.1.2. **Action Step:** Conduct instream and upslope sediment source surveys in upper Walker Creek and sub-watersheds (Salmon and Key Creeks) to identify existing sources of high sediment yield using accepted protocols and implement recommendations

9.1.1.3. **Action Step:** Implement recommendations of completed sediment source surveys in the watershed (See ROADS for specific actions)

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

9.1.1.5. **Action Step:** Solicit cooperation from NRCS, RCDs, Farm Bureau, and others to devise incentive programs and incentive-based approaches to encourage and support landowners who conduct operations in a manner compatible with CCC coho salmon recovery priorities.

9.1.2. **Recovery Action:** Improve and expand instream gravel quantity

9.1.2.1. **Action Step:** Increase the quantity and distribution of spawning gravels in 50% of streams within the watershed

9.1.2.2. **Action Step:** Implement high priority coho salmon enhancement projects for the reduction of sediment delivery and the restoration of riparian corridors as listed in the Walker Creek Enhancement Plan (Prunuske Chatham Inc. 2001, CDFG 2004).

9.1.2.3. **Action Step:** Develop habitat enhancement projects to establish additional riffle habitat and import spawning gravel from mining operations in the Russian River basin to select reaches of Chileno, Salmon, Verde Canyon, Frink Canyon and Walker Creeks

9.1.2.4. **Action Step:** Place instream structures to improve gravel retention and habitat complexity.

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 in appropriate subwatersheds.

10.1.1.2. **Action Step:** Adopt hatchery guidelines defined in Spence et al. 2008.

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

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

10.1.1.5. **Action Step:** Continue the operation of the Captive Broodstock Program in Walker Creek

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

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

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

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

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

10.1.3.1. **Action Step:** Fund monitoring actions in Walker Creek to evaluate success of adult reintroductions towards salmon recovery

10.2. **Objective:** Develop and implement a monitoring program to evaluate the performance of recovery efforts.

10.2.1. **Recovery Action:** Measure or estimate the condition of key habitat attributes across the watershed. Prioritize Core tributaries first, followed by Phase I and Phase II areas as appropriate.

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

10.2.1.2. **Action Step:** To better understand changes in sedimentation, monitoring in the basin should include: longitudinal profiles, cross-sections, V*, LWD volume and distribution, and embeddedness.

10.2.1.3. **Action Step:** Implement standardized assessment protocols (i.e., CDFG habitat assessment protocols) to ensure ESU-wide consistency.

10.2.2. **Recovery Action:** Conduct habitat surveys to monitor change in key habitat variables

10.2.2.1. **Action Step:** Specific locations to be monitored will be determined through implementation of the Coastal Salmonid Monitoring Plan

10.2.2.2. **Action Step:** To better understand changes in sedimentation, monitoring in the basin should include: longitudinal profiles, cross-sections, V*, LWD volume and distribution, and embeddedness.

10.2.3. **Recovery Action:** Monitor population status for response to recovery actions.

10.2.3.1. **Action Step:** Support MMWD in operation of outmigrant traps

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

11. Restoration- Water Quality

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

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

11.1.1.1. **Action Step:** Improve water temperature conditions for migrating smolts and summer rearing juvenile salmonids throughout 35% of watershed

11.1.1.2. **Action Step:** Reduce temperature levels within lower and upper Salmon and Walker Creeks.

11.1.1.3. **Action Step:** Reduce water temperatures in Chileno and Frink Canyon Creek.

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

11.1.1.5. **Action Step:** Rehabilitate or restore riparian corridor conditions within all current and potential high value habitat summer rearing areas.

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

11.1.1.7. **Action Step:** Explore releasing cooler flow out of Walker Dam (CDFG and NMFS 2002).

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

11.1.2.1. **Action Step:** Identify and provide solutions for point and non-point sources contributing to toxicity and turbidity.

11.1.2.2. **Action Step:** Install continuous water quality monitoring stations in lower Walker and within Salmon Creeks

11.1.2.3. **Action Step:** Implement recommendation to rest the Gambioni Mine

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

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

11.1.3.1. **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.

THREAT ABATEMENT ACTIONS

12. Threat- Agricultural Practices

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

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

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

12.1.1.2. **Action Step:** Coordinate with the agencies that authorize forest land conversions to discourage conversions to agriculture.

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

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

12.2.1.1. **Action Step:** Keep agricultural activities from within 100 feet of the edge of the stream

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

12.2.2.1. **Action Step:** Utilize BMP's for irrigation (cover crop, drip) and frost protection (wind machines, cold air drains, heaters, or micro-sprayers) which eliminate or minimize water use

12.2.2.2. **Action Step:** If water is being used as part of frost protection measures, flow metering should accompany water management to ensure flows are maintained for other beneficial uses

12.2.3. **Recovery Action:** Prevent impairment to habitat complexity

12.2.3.1. **Action Step:** Preserve snags, leave downed wood on the banks or in the stream, and encourage multi-age stands within existing corridors

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

12.2.4.1. **Action Step:** Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels (see Roads for specific actions/areas)

12.2.4.2. **Action Step:** Encourage the NRCS, RCDs, and other appropriate organizations to increase the number of landowners participating in sediment reduction planning and implementation.

12.2.4.3. **Action Step:** Continue the use of cover crops in agriculture fields.

12.2.5. **Recovery Action:** Prevent impairment to riparian

12.2.5.1. **Action Step:** Complete Farm Conservation Plans (through the SRCD, NRCS, Fish Friendly Farming program or other cooperative conservation programs) to address sediment source reduction, riparian habitat, forest health, and restoration.

12.2.5.2. **Action Step:** Implement Best Management Practices in DS level actions

12.2.5.3. **Action Step:** Re-establish native plant communities in riparian zones to increase stream canopy to 80%

12.2.5.4. **Action Step:** Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to provide future recruitment of large wood and other shelter components

12.2.5.5. **Action Step:** Monitor instream water temperatures to determine baseline conditions and judge the efficacy of restoration actions. High priority streams include tributary and mainstem reaches within Salmon and Walker Creeks (CDFG stream survey reports).

13. Threat- Channel Modification

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

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

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

13.1.1.2. **Action Step:** Prevent additional channel modification or utilize BMP's described in DS level actions to address flood control or bank stabilization issue

13.1.1.3. **Action Step:** Evaluate design alternatives to riprap bank repairs. Where riprap is necessary, evaluate integration of other habitat-forming features – including large woody debris to ensure improved habitat at the restoration site.

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

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

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

13.2.1.2. **Action Step:** Improve conditions to re-create, and restore alcove, backwater, or perennial pond habitats in lower Walker Creek or other areas where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, (See FLOODPLAIN for specific actions/criteria).

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

14. Threat- Disease/Predation/Competition

No species-specific actions were developed.

15. Threat- Fire/Fuel Management

No species-specific actions were developed.

16. Threat- Fishing/Collecting

No species-specific actions were developed.

17. Threat- Hatcheries

No species-specific actions were developed.

18. Threat- Livestock

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

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

18.1.1.1. **Action Step:** Where necessary, establish predetermined stream crossings when herding cattle between pastures.

18.1.1.2. **Action Step:** Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff. Short term, seasonal and long term rest from grazing in overgrazed areas would improve soil conditions for native revegetation and land values as well.

18.1.1.3. **Action Step:** To minimize gully initiation, grazing should be kept at relatively low intensities on steeper slopes

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

18.1.2.1. **Action Step:** Develop a watershed wide program with Marin RCD to identify riparian corridors subject to livestock grazing, and develop and implement livestock exclusion measures to protect and improve riparian resources

18.1.2.2. **Action Step:** Provide funding assistance to landowners willing to fence riparian and other sensitive areas (areas prone to erosion) to exclude cattle and sheep. Calf/cow operations should take first priority for riparian fencing programs over steer operations.

18.1.2.3. **Action Step:** Aid landowners willing to fence off riparian areas with development of offstream alternative water sources

18.1.2.4. **Action Step:** Develop and fund riparian restoration and bank stabilization projects to regain riparian corridors damaged from livestock and other causes.

18.1.2.5. **Action Step:** Manage rotational grazing to aid in the reduction of noxious weeds.

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

18.1.3.1. **Action Step:** Increase the use of water storage and catchment systems that collect rainwater in the winter for use during the dry summer and fall seasons.

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

18.2.1. **Recovery Action:** Improve canopy cover

18.2.1.1. **Action Step:** Assess riparian canopy, extent of exotic vegetation (e.g., Arundo donax, etc.), and prioritize, develop and implement riparian habitat projects using native vegetation

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

18.2.1.3. **Action Step:** Increase the width of riparian corridors to 150' to allow multi-age stands of native trees and shrubs, and eventual recruitment of LWD

18.2.1.4. **Action Step:** Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers throughout the watershed (CDFG 2004).

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

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

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

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

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 instream habitat complexity (reduced large wood and/or shelter)

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

19.1.2. **Recovery Action:** Prevent impairment to riparian

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

20. Threat- Mining

No species-specific actions were developed.

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 riparian species and composition

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

22.1.1.2. **Action Step:** Reduce impacts of existing development in floodplains/riparian zones by encouraging willing landowners to restore these areas

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

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

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

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

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

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

23. Threat- Roads/Railroads

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

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

23.1.1.1. **Action Step:** Assess existing road networks and implement actions that hydrologically disconnect roads and reduce sediment sources

23.1.1.2. **Action Step:** Assess roads in Salmon Creek, Walker Creek and Keys Creek to identify high priority and high sediment yield sources.

23.1.1.3. **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.

23.1.1.4. **Action Step:** Reduce the hydrologic connectivity of roads and trails to adjacent crossings across watercourses.

23.1.1.5. **Action Step:** Restoration projects that upgrade or decommission high risk roads in Core areas should be considered an extremely high priority for funding (e.g., PCSRF). Where no Core areas are designated, apply this action to Phase I areas.

23.1.1.6. **Action Step:** Decommission riparian roads and skid trails on forestlands that deliver sediment into adjacent watercourses. High priority streams identified by CDFG habitat reports include Verde Canyon, Frink Canyon, and Salmon Creek (http://coastalwatersheds.ca.gov/)

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

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

23.1.1.9. **Action Step:** Utilize BMP's to reduce the lengths of ditches, increase the size of ditch relief culverts, or replace with rolling dips

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

23.1.2.1. **Action Step:** Assess private and public road stream crossings for barrier potential and implement recommendations

23.1.2.2. **Action Step:** Utilize BMP's to upgrade existing crossings (bridges, culverts, fills, and other crossings) to accommodate 100-year flood flows and associated bedload and debris.

23.1.2.3. **Action Step:** All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) should accommodate 100-year flood flows and associated bedload and debris.

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

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 water quality (impaired instream temperature)

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

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

25. Threat- Water Diversion/Impoundment

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

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

25.1.1.1. **Action Step:** Allow all "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) to bypass diversion facilities.

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

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

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

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

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

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

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

26. Threat- Watershed Process

No species-specific actions were developed.

Table 3: Implementation Schedule ~ Walker 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	
WalC-CCC-1.1	**Objective**	**Estuary**	**Address the inadequacy of existing regulatory mechanisms**										
WalC-CCC-1.1.1	Recovery Action	Estuary	Implement estuary protection and enhancement measures to restore estuary to properly functioning conditions.										
WalC-CCC-1.1.1.1	Action Step	Estuary	Prevent future encroachment of landuse (agricultural, residential and commercial) into floodplain areas of the estuary	3	50	CDFG, RWQCB, Sonoma County, USACE						In-Kind	
WalC-CCC-1.1.1.2	Action Step	Estuary	Evaluate the effect of nearby landuse practices and development structures which may impair or reduce the historical tidal prism and other estuarine functions and implement improvements	3	10	CA Coastal Commission, California Coastal Conservancy, CDFG						TBD	Costs associated with removal of structures will depend on the number and type of structures identified and cannot be accurately determined at this time.
WalC-CCC-1.2	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-1.2.1	Recovery Action	Estuary	Increase the extent of estuarine habitat										
WalC-CCC-1.2.1.1	Action Step	Estuary	Support a salmonid limiting factors assessment in Keys Estero and Tomales Bay (CDFG 2004).	2	5	MMWD, Tomales Bay Watershed Council	273.00					273	Cost for estuary use/residence timing estimated at $273,217/project.
WalC-CCC-1.2.1.2	Action Step	Estuary	Per a completed limiting factors assessment, and utilizing adaptive management guidelines, develop restoration projects in areas which have high value physical and chemical properties for rearing salmonids	2	15	NMFS, Sonoma County Water Agency						TBD	Cost accounted for in below action steps.
WalC-CCC-1.2.1.3	Action Step	Estuary	Evaluate alterations to river mouth dynamics and implement changes to restore natural function	2	10	California Coastal Conservancy, CDFG, NMFS, Sonoma County, Sonoma County Water Agency, State Parks, USACE						In-Kind	
WalC-CCC-1.2.2	Recovery Action	Estuary	Improve the quality of each estuarine habitat zone										

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	
WalC-CCC-1.2.2.1	Action Step	Estuary	Restore estuarine wetlands and sloughs, and improve prey abundance by increasing shoreline perimeter and planting native emergent and riparian species to improve foraging and cover.	2	10	CA Coastal Commission, California Coastal Conservancy, CDFG, Private Landowners	878	878				1,755	Cost based on treating 6.5 acres (assume 5% of total estuarine habitat) at a rate of $272,120/acre.
WalC-CCC-1.2.3	Recovery Action	Estuary	Improve the quality of each estuarine habitat zones (see WQ parameters)										
WalC-CCC-1.2.3.1	Action Step	Estuary	Improve estuarine water quality by identifying and remediating upstream pollution sources which contribute to poor water quality conditions in the estuary	2	10	Sonoma County, Sonoma County Water Agency, SWRCB	7.50	7.50				15	Cost for continuous water quality monitoring stations estimated at $5,000/station. Assume minimum of 3 for lagoon. Cost does not account for maintenance or data management.
WalC-CCC-1.2.3.2	Action Step	Estuary	Modify alterations to freshwater inflow and water quality (temperature, dissolved oxygen)	2	12	CDFG, NMFS, Sonoma County Water Agency, USACE						TBD	
WalC-CCC-2.1	**Objective**	**Floodplain Connectivity**	**Address the inadequacy of existing regulatory mechanisms**										
WalC-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Prevent impairment to floodplain connectivity.										
WalC-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Set-back existing levees in strategic areas to increase flood-flow detention and promote flood-tolerant land uses.	3	10	MMWD	193.50	193.50				387	Cost for treating 10 miles (assume 1 project/mile in 25% High IP) at a rate of $36,046/mile.
WalC-CCC-2.2	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-2.2.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
WalC-CCC-2.2.1.1	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	10	Marin County, MMWD, Tomales Bay Watershed Council	116.50	116.50				233	Cost to treat 6.5 miles (assume 1 project/mile in 15% High IP) at a rate of $36,046/mile.
WalC-CCC-2.2.2	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	
WalC-CCC-2.2.2.1	Action Step	Floodplain Connectivity	Identify the floodplain activation flow - the smallest flood pulse event that initiates substantial beneficial ecological processes when associated with floodplain inundation (Williams et al. 2009).	2	10	Private Consultants, Private Landowners, Sonoma County	31.50	31.50				63	Cost for stream flow model estimated at $63,005/project.
WalC-CCC-2.2.2.2	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	10	Marin RCD, MMWD	103.50	103.50				207	Cost for wetland restoration monitoring estimated at $206,493/project.
WalC-CCC-2.2.2.3	Action Step	Floodplain Connectivity	Identify areas where floodplain connectivity can be re-established in low gradient response reaches of Walker Creek. Develop and implement site specific plans to improve these conditions to re-create, and restore alcove, backwater, or perennial pond habitats.	2	20	Farm Bureau, NMFS HCD, Public Works, RCD						TBD	Cost accounted for in above action steps.
WalC-CCC-2.2.2.4	Action Step	Floodplain Connectivity	Support landowners and the Marin RCD in developing projects to improve channel conditions and restore natural channel geomorphology, including side channels and dense contiguous riparian vegetation (CDFG 2004).	2	40	Marin County, MMWD, Tomales Bay Watershed Council						TBD	Cost cannot be determined due to unknown number of projects at various scales.
WalC-CCC-3.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
WalC-CCC-3.1.1	Recovery Action	Habitat Complexity	Improve habitat complexity										
WalC-CCC-3.1.1.1	Action Step	Habitat Complexity	Conduct habitat assessment in Keys Creek	2	5		23.00					23	Cost for habitat survey estimated at $333/IP km.
WalC-CCC-3.1.1.2	Action Step	Habitat Complexity	Utilize recommendations to prioritize reaches for habitat improvement	2	5	CDFG, Marin RCD, Private Landowners							
WalC-CCC-3.1.2	Recovery Action	Habitat Complexity	Improve pool:riffle:flatwater ratio										
WalC-CCC-3.1.2.1	Action Step	Habitat Complexity	Increase the frequencies of riffles in 55% of the streams within the watershed	2	10		275.00	275.00				550	Cost based on treating 22 miles (assume 1 project/mile in 50% High IP) at a rate of $25,000/mile.
WalC-CCC-3.1.2.2	Action Step	Habitat Complexity	Increase riffle frequency to 20% by converting flatwater habitats (glides, runs, etc.) utilizing boulders and log structures in select reaches of Chilen, Salmon and Walker Creek	2	5	CDFG, Marin RCD, NOAA RC, Private Consultants, Private Landowners, RCD						TBD	Cost likely accounted for in above action step.

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	
WalC-CCC-3.1.3	Recovery Action	Habitat Complexity	Improve large wood frequency										
WalC-CCC-3.1.3.1	Action Step	Habitat Complexity	Increase large wood frequency in 75% of streams within the watershed to improve conditions for adults, and winter/summer rearing juveniles	2	10		275.00	275.00				550	Cost based on treating 22 miles (assume 1 project/mile in 50% High IP) at a rate of $25,000/mile. Cost may be reduced if done in concert with increase frequencies of riffles.
WalC-CCC-3.1.3.2	Action Step	Habitat Complexity	Increase LWD frequency to optimal conditions (>2 key LWD pieces/100 meters) in middle and upper reaches of Walker Creek	2	10	CDFG, Marin RCD, MMWD, NOAA RC, Private Landowners						TBD	Cost accounted for in above action steps.
WalC-CCC-3.1.3.3	Action Step	Habitat Complexity	Modify MMWD's multi-agency MOU for Large Woody Debris to include Walker Creek.	2	1	CDFG, Marin RCD, MMWD, NMFS						TBD	
WalC-CCC-3.1.3.4	Action Step	Habitat Complexity	Increase LWD frequency to optimal conditions (>6 key LWD pieces/100 meters) in all reaches of Chileno, Salmon and Verde Canyon	2	10	CDFG, Marin RCD, MMWD, NOAA RC, Private Consultants, Private Landowners, RCD						TBD	Cost accounted for in above action steps.
WalC-CCC-3.1.3.5	Action Step	Habitat Complexity	Modify MMWD's multi-agency MOU for Large Woody Debris to include Walker Creek.	3									
WalC-CCC-3.1.4	Recovery Action	Habitat Complexity	Improve frequency of primary pools										
WalC-CCC-3.1.4.1	Action Step	Habitat Complexity	Increase primary pool frequency in 75% of streams within the watershed to improve conditions for adults, and summer/winter juveniles	2	10							TBD	Cost for this action step may be accounted for in other action steps above. Increasing primary pools likely part of LWD placement and increase riffles.
WalC-CCC-3.1.4.2	Action Step	Habitat Complexity	Increase primary pool frequency to achieve optimal conditions (>40% of pools meet primary pool criteria (>2.5 feet deep in 1st and 2nd order streams; >3 feet in third order or larger streams)) in all reaches of Chileno, Verde Canyon, and Walker Creek	2	10	CDFG, Marin RCD, NOAA RC, Private Consultants, Private Landowners						TBD	
WalC-CCC-3.1.5	Recovery Action	Habitat Complexity	Improve shelter rating										
WalC-CCC-3.1.5.1	Action Step	Habitat Complexity	Increase shelter ratings in 75% of streams across the watershed to improve conditions for adults, and winter/summer rearing juveniles	2	20							TBD	Cost likely accounted for in increase pools, riffles, and LWD frequency.

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	
WalC-CCC-3.1.5.2	Action Step	Habitat Complexity	Increase shelter ratings to optimal conditions (>80 pool shelter value) in all reaches of Chileno, Salmon, Verde Canyon and Walker Creeks	2	10	CDFG, Marin RCD, NOAA RC, Private Consultants, Private Landowners						TBD	
WalC-CCC-4.1	**Objective**	**Hydrology**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
WalC-CCC-4.1.1	Recovery Action	Hydrology	Improve flow conditions (baseflow conditions)										
WalC-CCC-4.1.1.1	Action Step	Hydrology	Monitor, identify problems, and prioritize needed changes to water diversion on current or potential coho streams that go dry in some years (CDFG 2004).	2	60	MMWD, SPAWN						TBD	Cost accounted for in stream flow model.
WalC-CCC-4.1.1.2	Action Step	Hydrology	Promote, via technical assistance and/or regulatory action, the reduction of water use affecting the natural hydrograph, development of alternative water sources, and implementation of diversion regimes protective of the natural hydrograph.	2	30	Marin County, Marin RCD, MMWD						In-Kind	
WalC-CCC-4.1.1.3	Action Step	Hydrology	To improve connectivity of surface flows with groundwater reduce aggradation and overall sediment load at the watershed scale by treating roads and sources of mass wasting.	3	10	Marin RCD						TBD	
WalC-CCC-4.1.1.4	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	2	30	Marin County, Marin RCD, MMWD						TBD	Cost difficult to determine because of landowner participation.
WalC-CCC-4.1.1.5	Action Step	Hydrology	Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and §1707 (CDFG 2004).	3	10	DWR, NMFS, SWRCB						TBD	
WalC-CCC-4.1.2	Recovery Action	Hydrology	Improve passage flows										
WalC-CCC-4.1.2.1	Action Step	Hydrology	Continue to assess the release of water from Soulejule Reservoir to develop the optimum flow release for coho salmon (CDFG 2004).	3	60	CDFG, MMWD, NMFS						In-Kind	
WalC-CCC-4.1.2.2	Action Step	Hydrology	Manage reservoirs and dam releases to maintain suitable rearing temperatures and migratory flows in downstream habitats (e.g., pulse flow programs for adult upstream migration and smolt outmigration).	2	60	CDFG, MMWD, NMFS						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	
WalC-CCC-5.1	**Objective**	**Landscape Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-5.1.1	Recovery Action	Landscape Patterns	Improve sediment transport										
WalC-CCC-5.1.1.1	Action Step	Landscape Patterns	Implement DS level actions for treating watershed road networks	2	50	Private Landowners, RCD						TBD	
WalC-CCC-5.1.2	Recovery Action	Landscape Patterns	Improve watershed hydrology										
WalC-CCC-5.1.2.1	Action Step	Landscape Patterns	Implement DS level recommendations to improve baseflows, and hydrologic connectivity	2		CDFG, Farm Bureau, NRCS, Private Consultants, Private Landowners, SWRCB							
WalC-CCC-5.1.3	Recovery Action	Landscape Patterns	Prevent landscape disturbance										
WalC-CCC-5.1.3.1	Action Step	Landscape Patterns	Implement Best Management Practices from DS level actions to prevent impairment due to Agriculture, Livestock and Residential Development.	2	100	Farm Bureau, Private Landowners, RCD							
WalC-CCC-5.1.3.2	Action Step	Landscape Patterns	Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements	3									
WalC-CCC-6.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
WalC-CCC-6.1.1	Recovery Action	Passage	Improve access of spawning adults and juveniles										
WalC-CCC-6.1.1.1	Action Step	Passage	Evaluate the feasibility of bypassing large dams (CDFG 2004) in the watershed.	3	20	MMWD, NMFS						TBD	Evaluate truck and trap operations
WalC-CCC-6.1.1.2	Action Step	Passage	Evaluate the potential for Laguna Lake to serve as rearing habitat, and the potential passage, and outmigration challenges and issues	3	10	CDFG, Marin County, MMWD, NMFS, NMFS PRD, NOAA SWFSC	56.00	56.00				112	Cost for fish/habitat effectiveness monitoring estimated at $111,192/project.

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	
WalC-CCC-8.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-8.1.1	Recovery Action	Riparian	Improve canopy cover										
WalC-CCC-8.1.1.1	Action Step	Riparian	Assess riparian canopy, extent of exotic vegetation (e.g., Arundo donax, etc.), and prioritize, develop and implement riparian habitat projects using native vegetation	1	20	Marin RCD	2,405	2,405	2,405	2,405		9,620	Cost for riparian restoration monitoring estimated at $71,436/project. Cost for riparian planting based on treating 160 acres (assume 80 acres/mile in 5% High IP) at a rate of $20,057/acre. Cost for exotic vegetation removal base on treating 160 acres (assume 80 acres/mile in 5% High IP) at a rate of $39,574/acre.
WalC-CCC-8.1.1.2	Action Step	Riparian	Support grazing practices that minimize impacts to riparian and instream habitat: livestock exclusion, rotational grazing, etc.	1	60	Marin RCD, RWQCB						In-Kind	
WalC-CCC-8.1.1.3	Action Step	Riparian	Increase the width of riparian corridors to 150' to allow multi-age stands of native trees and shrubs, and eventual recruitment of LWD	3	50							In-Kind	
WalC-CCC-8.1.1.4	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers throughout the watershed (CDFG 2004).	2	30	City Planning, Land Trusts, Sonoma County						In-Kind	
WalC-CCC-8.1.2	Recovery Action	Riparian	Improve tree diameter										
WalC-CCC-8.1.2.1	Action Step	Riparian	Increase tree diameter within 55% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 tree)	2	30							TBD	Cost likely accounted for in above action steps.
WalC-CCC-8.1.2.2	Action Step	Riparian	Improve the structure and composition of riparian areas to provide shade, large woody debris input, nutrient input, bank stabilization, and other CCC coho salmon needs.	2	20							TBD	Cost likely accounted for in above action steps.
WalC-CCC-8.1.2.3	Action Step	Riparian	Plant native riparian species and native conifers/hardwoods throughout riparian zones within the northern (Chileno and Keys Creek) and eastern (Walker and Salmon Creek) portions of the watershed to increase overall tree diameter	1	20	CDFG, NOAA RC, Private Consultants, Private Landowners, RCD						TBD	Cost accounted for in above action steps.
WalC-CCC-8.1.2.4	Action Step	Riparian	Encourage programs to purchase land/conservation easements to re-establish and enhance natural riparian communities.	2	10	Marin RCD, MMWD						In-Kind	

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	
WalC-CCC-9.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
WalC-CCC-9.1.1	Recovery Action	Sediment	Improve instream gravel quality and food productivity.										
WalC-CCC-9.1.1.1	Action Step	Sediment	Reduce embbeddness levels to the extent that 75% to 90% of streams within the watershed meet optimal criteria (>50% stream average scores of 1 & 2)	2	20							TBD	Habitat typing analysis should identify areas with high embeddness.
WalC-CCC-9.1.1.2	Action Step	Sediment	Conduct instream and upslope sediment source surveys in upper Walker Creek and sub-watersheds (Salmon and Key Creeks) to identify existing sources of high sediment yield using accepted protocols and implement recommendations	2	10	Marin County, Marin RCD, Private Consultants, Private Landowners, RCD	73.00	73.00				146	Cost for erosion assessment estimated at $12.22/acre (assume 25% of total watershed acres).
WalC-CCC-9.1.1.3	Action Step	Sediment	Implement recommendations of completed sediment source surveys in the watershed (See ROADS for specific actions)	2	5	CDFG, Marin County, Marin RCD, Private Landowners, RCD						TBD	
WalC-CCC-9.1.1.4	Action Step	Sediment	Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream).	3	20	CDFG, Marin RCD, NOAA RC, NRCS							
WalC-CCC-9.1.1.5	Action Step	Sediment	Solicit cooperation from NRCS, RCDs, Farm Bureau, and others to devise incentive programs and incentive-based approaches to encourage and support landowners who conduct operations in a manner compatible with CCC coho salmon recovery priorities.	3	60	Marin RCD, NRCS						In-Kind	
WalC-CCC-9.1.2	Recovery Action	Sediment	Improve and expand instream gravel quantity										
WalC-CCC-9.1.2.1	Action Step	Sediment	Increase the quantity and distribution of spawning gravels in 50% of streams within the watershed	2	20							TBD	Cost difficult to determine at this time. Information from habitat typing will identify areas deficient in suitable spawning substrate.
WalC-CCC-9.1.2.2	Action Step	Sediment	Implement high priority coho salmon enhancement projects for the reduction of sediment delivery and the restoration of riparian corridors as listed in the Walker Creek Enhancement Plan (Prunuske Chatham Inc. 2001, CDFG 2004).	2	20	Marin RCD, MMWD, RWQCB						TBD	Cost accounted for in above action steps.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WalC-CCC-9.1.2.3	Action Step	Sediment	Develop habitat enhancement projects to establish additional riffle habitat and import spawning gravel from mining operations in the Russian River basin to select reaches of Chileno, Salmon, Verde Canyon, Frink Canyon and Walker Creeks	2	5	CDFG, NMFS, NOAA RC, Private Consultants, Private Landowners, RCD, Trout Unlimited						TBD	Cost accounted for in above action steps.
WalC-CCC-9.1.2.4	Action Step	Sediment	Place instream structures to improve gravel retention and habitat complexity.	2	10	Marin RCD, MMWD, RWQCB							
WalC-CCC-10.1	**Objective**	**Viability**	**Address the present or threatened destruction of the species habitat or range**										
WalC-CCC-10.1.1	Recovery Action	Viability	Increase abundance										
WalC-CCC-10.1.1.1	Action Step	Viability	Re-establish a naturally reproducing run of coho salmon in appropriate subwatersheds.	1	10							TBD	Cost difficult to determine because first need to identify appropriate subwatersheds.
WalC-CCC-10.1.1.2	Action Step	Viability	Adopt hatchery guidelines defined in Spence et al. 2008.	2	10	NMFS						TBD	
WalC-CCC-10.1.1.3	Action Step	Viability	Annually capture or retain (during rescue efforts) - small numbers of surplus fish from drying streams/habitats in Marin and Sonoma Counties for purposes of broodstock in Russian River, Walker and Salmon Creeks	1	10	CDFG						TBD	
WalC-CCC-10.1.1.4	Action Step	Viability	Minimize departure from the genetic profile that historically existed in the population.	1	100							In-Kind	
WalC-CCC-10.1.1.5	Action Step	Viability	Continue the operation of the Captive Broodstock Program in Walker Creek	1	50								
WalC-CCC-10.1.2	Recovery Action	Viability	Increase spatial structure and diversity										
WalC-CCC-10.1.2.1	Action Step	Viability	Continue to rescue juvenile coho salmon with existing permittees that are under an imminent risk of stranding and mortality and relocate to suitable habitat when deemed appropriate by NMFS and CDFG	2	10	CDFG, MMWD, NMFS, Tomales Bay Watershed Council, Trout Unlimited						In-Kind	Existing operations
WalC-CCC-10.1.2.2	Action Step	Viability	Utilize broodstock from Marin County to repopulate remaining extirpated streams within the watershed.	1	10	CDFG, USACE						TBD	

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WalC-CCC-10.1.2.3	Action Step	Viability	Conduct outreach with landowners to expand broodstock releases within core areas, and remaining extirpated streams within the watershed	2	5	CDFG, Marin RCD, NMFS						In-Kind	
WalC-CCC-10.1.3	Recovery Action	Viability	Increase spawner density										
WalC-CCC-10.1.3.1	Action Step	Viability	Fund monitoring actions in Walker Creek to evaluate success of adult reintroductions towards salmon recovery	3	10	MMWD, NMFS						TBD	Cost accounted for in above action steps.
WalC-CCC-10.2	**Objective**	**Viability**	**Develop and implement a monitoring program to evaluate the performance of recovery efforts.**										
WalC-CCC-10.2.1	Recovery Action	Viability	Measure or estimate the condition of key habitat attributes across the watershed. Prioritize Core tributaries first, followed by Phase I and Phase II areas as appropriate.										
WalC-CCC-10.2.1.1	Action Step	Viability	Develop standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas. Encourage all major landowners to develop similar assessment methods.	3	5	CDFG, Marin County, Marin RCD, MMWD, NMFS						In-Kind	
WalC-CCC-10.2.1.2	Action Step	Viability	To better understand changes in sedimentation, monitoring in the basin should include: longitudinal profiles, cross-sections, V*, LWD volume and distribution, and embeddedness.	3	60	Marin RCD, MMWD						TBD	
WalC-CCC-10.2.1.3	Action Step	Viability	Implement standardized assessment protocols (i.e., CDFG habitat assessment protocols) to ensure ESU-wide consistency.	3	60	Marin RCD, MMWD						TBD	
WalC-CCC-10.2.2	Recovery Action	Viability	Conduct habitat surveys to monitor change in key habitat variables		10								
WalC-CCC-10.2.2.1	Action Step	Viability	Specific locations to be monitored will be determined through implementation of the Coastal Salmonid Monitoring Plan	3	20	CDFG, NMFS						TBD	
WalC-CCC-10.2.2.2	Action Step	Viability	To better understand changes in sedimentation, monitoring in the basin should include: longitudinal profiles, cross-sections, V*, LWD volume and distribution, and embeddedness.	3	60	Marin RCD, MMWD						TBD	
WalC-CCC-10.2.3	Recovery Action	Viability	Monitor population status for response to recovery actions.										
WalC-CCC-10.2.3.1	Action Step	Viability	Support MMWD in operation of outmigrant traps	3	10		292.00	292.00				584	Cost for annual smolt outmigrant trapping estimated at $58,404/year.

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	
WalC-CCC-10.2.3.2	Action Step	Viability	Adjust population targets and indicator ratings to reflect new habitat improvements and accessible habitat expansions	3	10	NMFS						TBD	
WalC-CCC-11.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-11.1.1	Recovery Action	Water Quality	Improve stream temperature conditions										
WalC-CCC-11.1.1.1	Action Step	Water Quality	Improve water temperature conditions for migrating smolts and summer rearing juvenile salmonids throughout 35% of watershed	2	10		2.50	2.50				5	Cost for stream temperature gauges estimated at $500/gauge. Assume minimum of 10. Cost does not account for maintenance or data management.
WalC-CCC-11.1.1.2	Action Step	Water Quality	Reduce temperature levels within lower and upper Salmon and Walker Creeks.	2									
WalC-CCC-11.1.1.3	Action Step	Water Quality	Reduce water temperatures in Chileno and Frink Canyon Creek.	2									
WalC-CCC-11.1.1.4	Action Step	Water Quality	Plant native vegetation to promote streamside shade.	2		Marin RCD							
WalC-CCC-11.1.1.5	Action Step	Water Quality	Rehabilitate or restore riparian corridor conditions within all current and potential high value habitat summer rearing areas.	2									
WalC-CCC-11.1.1.6	Action Step	Water Quality	Develop site-specific recommendations, including incentives, to remedy high temperatures and implement (CDFG 2004) initially in core areas, following with phase 1 and 2 areas.	2	3	Marin RCD						TBD	Cost difficult to determine without temperature monitoring data.
WalC-CCC-11.1.1.7	Action Step	Water Quality	Explore releasing cooler flow out of Walker Dam (CDFG and NMFS 2002).	2	20							TBD	Cost vary widely based on suitable alternatives.
WalC-CCC-11.1.2	Recovery Action	Water Quality	Improve stream water quality conditions										
WalC-CCC-11.1.2.1	Action Step	Water Quality	Identify and provide solutions for point and non-point sources contributing to toxicity and turbidity.	2									

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	
WalC-CCC-11.1.2.2	Action Step	Water Quality	Install continuous water quality monitoring stations in lower Walker and within Salmon Creeks	3	5	NMFS, Private Landowners, RWQCB	25.00					25	Cost for continuous water quality monitoring stations estimated at $5,000/station. Assume a minimum of 5 strategically placed in watershed. Cost does not account for maintenance or data management. This action step should be in concert with estuary continuous water quality monitoring.
WalC-CCC-11.1.2.3	Action Step	Water Quality	Implement recommendation to rest the Gambioni Mine	2	5	CDFG, CDFG Law Enforcement, NMFS HCD, NMFS OLE, RWQCB, USEPA							
WalC-CCC-11.1.2.4	Action Step	Water Quality	Work with livestock and ranch owners to implement BMP's to control sediment and nitrates	2		NRCS, Private Landowners, RCD						In-Kind	
WalC-CCC-11.1.3	Recovery Action	Water Quality	Reduce turbidity and suspended sediment										
WalC-CCC-11.1.3.1	Action Step	Water Quality	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	CDFG, Marin County, Marin RCD, MMWD, NMFS	33.00	33.00				66	Elevated instream sediment levels are a problem in the watershed. Restoration actions should focus on identifying and prioritizing current sources of sediment within the basin. High priority sites should receive initial restoration funding. Areas identified as shallow or deep seated landslides should be protected from future activities that could contribute to further instability. In particular, new roads should be carefully evaluated for their potential to contribute to further erosion as a result of major rainfall or flooding events. Cost accounted for in other recovery actions. Cost for sediment assessment estimated at $12.22/acre.
WalC-CCC-12.1	**Objective**	**Agricultural Practices**	**Address the inadequacy of existing regulatory mechanisms**										
WalC-CCC-12.1.1	Recovery Action	Agricultural Practices	Prevent impairment to riparian species and composition										
WalC-CCC-12.1.1.1	Action Step	Agricultural Practices	Develop riparian setbacks/buffers where they do not currently occur, and enforce requirements of local regulations where they do	2		City Planning, Marin County, RWQCB						TBD	
WalC-CCC-12.1.1.2	Action Step	Agricultural Practices	Coordinate with the agencies that authorize forest land conversions to discourage conversions to agriculture.	3	50	Board of Forestry, CDFG, Marin 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	
WalC-CCC-12.2	**Objective**	**Agricultural Practices**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**										
WalC-CCC-12.2.1	Recovery Action	Agricultural Practices	Prevent impairment to floodplain connectivity										
WalC-CCC-12.2.1.1	Action Step	Agricultural Practices	Keep agricultural activities from within 100 feet of the edge of the stream	2	50	Farm Bureau, NRCS, Private Landowners, RCD						In-Kind	
WalC-CCC-12.2.2	Recovery Action	Agricultural Practices	Prevent impairment to hydrology										
WalC-CCC-12.2.2.1	Action Step	Agricultural Practices	Utilize BMP's for irrigation (cover crop, drip) and frost protection (wind machines, cold air drains, heaters, or micro-sprayers) which eliminate or minimize water use	3	60	NRCS, Private Consultants, Private Landowners, RCD						In-Kind	
WalC-CCC-12.2.2.2	Action Step	Agricultural Practices	If water is being used as part of frost protection measures, flow metering should accompany water management to ensure flows are maintained for other beneficial uses	3	50	NRCS, Private Consultants, Private Landowners, RCD, UC Extension							Cost for flow metering should be incorporated into requirements for water diverters utilizing frost protection measures.
WalC-CCC-12.2.3	Recovery Action	Agricultural Practices	Prevent impairment to habitat complexity										
WalC-CCC-12.2.3.1	Action Step	Agricultural Practices	Preserve snags, leave downed wood on the banks or in the stream, and encourage multi-age stands within existing corridors	3		Private Landowners						In-Kind	
WalC-CCC-12.2.4	Recovery Action	Agricultural Practices	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
WalC-CCC-12.2.4.1	Action Step	Agricultural Practices	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels (see Roads for specific actions/areas)	2	60	CDFG, Private Consultants, Private Landowners, RCD							Cost accounted for in ROADS/RAILROADS
WalC-CCC-12.2.4.2	Action Step	Agricultural Practices	Encourage the NRCS, RCDs, and other appropriate organizations to increase the number of landowners participating in sediment reduction planning and implementation.	3	10	CDFG, NMFS, NRCS, Private Landowners, RCD						In-Kind	Encouragement is free.
WalC-CCC-12.2.4.3	Action Step	Agricultural Practices	Continue the use of cover crops in agriculture fields.	3	100							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	
WalC-CCC-12.2.5	Recovery Action	Agricultural Practices	Prevent impairment to riparian										
WalC-CCC-12.2.5.1	Action Step	Agricultural Practices	Complete Farm Conservation Plans (through the SRCD, NRCS, Fish Friendly Farming program or other cooperative conservation programs) to address sediment source reduction, riparian habitat, forest health, and restoration.	3	10	CDFG, Farm Bureau, NMFS, NRCS, Private Landowners, RCD						In-Kind	
WalC-CCC-12.2.5.2	Action Step	Agricultural Practices	Implement Best Management Practices in DS level actions	3		NRCS, Private Consultants, Private Landowners, RCD							Cost effective
WalC-CCC-12.2.5.3	Action Step	Agricultural Practices	Re-establish native plant communities in riparian zones to increase stream canopy to 80%	2	60	CDFG, Private Landowners, RCD, UC Extension						TBD	Cost accounted for in above action steps.
WalC-CCC-12.2.5.4	Action Step	Agricultural Practices	Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to provide future recruitment of large wood and other shelter components	2	50	NRCS, Private Landowners, RCD						TBD	
WalC-CCC-12.2.5.5	Action Step	Agricultural Practices	Monitor instream water temperatures to determine baseline conditions and judge the efficacy of restoration actions. High priority streams include tributary and mainstem reaches within Salmon and Walker Creeks (CDFG stream survey reports).	3	5	CDFG, NMFS, NRCS, Private Landowners, RCD	5.00					5	Cost for stream temperature gauges estimated at $500/each. Assume a minimum of 10. Cost does not account for maintenance or data management.
WalC-CCC-13.1	**Objective**	**Channel Modification**	**Address the inadequacy of existing regulatory mechanisms**										
WalC-CCC-13.1.1	Recovery Action	Channel Modification	Prevent impairment to floodplain connectivity (impaired quality & extent)										
WalC-CCC-13.1.1.1	Action Step	Channel Modification	All proposed flood control projects should include habitat protection, and/or alternatives that minimize impacts to salmon habitat.	3	60	Marin County, NMFS PRD, USACE						In-Kind	
WalC-CCC-13.1.1.2	Action Step	Channel Modification	Prevent additional channel modification or utilize BMP's described in DS level actions to address flood control or bank stabilization issue	3	60							In-Kind	
WalC-CCC-13.1.1.3	Action Step	Channel Modification	Evaluate design alternatives to riprap bank repairs. Where riprap is necessary, evaluate integration of other habitat-forming features – including large woody debris to ensure improved habitat at the restoration site.	3	30	CDFG, NMFS PRD, USACE						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	
WalC-CCC-13.2	**Objective**	**Channel Modification**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-13.2.1	Recovery Action	Channel Modification	Prevent impairment to floodplain connectivity (impaired quality & extent)										
WalC-CCC-13.2.1.1	Action Step	Channel Modification	Evaluate undeveloped and developed floodplain property for potential function and conservation easement and/or acquisition potential.	2	10	Marin County, RCD	103.50	103.50				207	Cost for wetland monitoring estimated at $206,493/project.
WalC-CCC-13.2.1.2	Action Step	Channel Modification	Improve conditions to re-create, and restore alcove, backwater, or perennial pond habitats in lower Walker Creek or other areas where channel modification has resulted in decreased shelter, LWD frequency, and habitat complexity, (See FLOODPLAIN for specific actions/criteria).	2	20	CDFG, NOAA RC, Private Landowners, USACE						TBD	Cost accounted for in above actions steps.
WalC-CCC-13.2.1.3	Action Step	Channel Modification	Promote bio-engineering solutions as appropriate (e.g. carefully evaluate feasibility where critical infrastructure is located) for bank hardening projects.	3	50	CDFG, NMFS PRD, USACE						In-Kind	
WalC-CCC-18.1	**Objective**	**Livestock**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-18.1.1	Recovery Action	Livestock	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
WalC-CCC-18.1.1.1	Action Step	Livestock	Where necessary, establish predetermined stream crossings when herding cattle between pastures.	2	60	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.1.2	Action Step	Livestock	Substitute continuous season-long use of pastures in favor of rotational grazing strategies to reduce runoff. Short term, seasonal and long term rest from grazing in overgrazed areas would improve soil conditions for native revegetation and land values as well.	3	60	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.1.3	Action Step	Livestock	To minimize gully initiation, grazing should be kept at relatively low intensities on steeper slopes	3	60	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.2	Recovery Action	Livestock	Prevent adverse alterations to riparian species composition and structure										

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	
WalC-CCC-18.1.2.1	Action Step	Livestock	Develop a watershed wide program with Marin RCD to identify riparian corridors subject to livestock grazing, and develop and implement livestock exclusion measures to protect and improve riparian resources	2	30	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.2.2	Action Step	Livestock	Provide funding assistance to landowners willing to fence riparian and other sensitive areas (areas prone to erosion) to exclude cattle and sheep. Calf/cow operations should take first priority for riparian fencing programs over steer operations.	2	60	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.2.3	Action Step	Livestock	Aid landowners willing to fence off riparian areas with development of offstream alternative water sources	2	30	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.2.4	Action Step	Livestock	Develop and fund riparian restoration and bank stabilization projects to regain riparian corridors damaged from livestock and other causes.	2	30	Marin RCD, NRCS						TBD	
WalC-CCC-18.1.2.5	Action Step	Livestock	Manage rotational grazing to aid in the reduction of noxious weeds.	3		Marin RCD, NRCS						TBD	
WalC-CCC-18.1.3	Recovery Action	Livestock	Prevent impairment to stream hydrology (impaired water flow)										
WalC-CCC-18.1.3.1	Action Step	Livestock	Increase the use of water storage and catchment systems that collect rainwater in the winter for use during the dry summer and fall seasons.	2	60	Marin RCD, NRCS						TBD	Cost difficult to determine because of landowner participation.
WalC-CCC-18.2	**Objective**	**Livestock**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-18.2.1	Recovery Action	Livestock	Improve canopy cover										
WalC-CCC-18.2.1.1	Action Step	Livestock	Assess riparian canopy, extent of exotic vegetation (e.g., Arundo donax, etc.), and prioritize, develop and implement riparian habitat projects using native vegetation	2	5	Marin RCD						TBD	
WalC-CCC-18.2.1.2	Action Step	Livestock	Support grazing practices that minimize impacts to riparian and instream habitat: livestock exclusion, rotational grazing, etc.	2	60	Marin RCD, RWQCB						TBD	
WalC-CCC-18.2.1.3	Action Step	Livestock	Increase the width of riparian corridors to 150' to allow multi-age stands of native trees and shrubs, and eventual recruitment of LWD	2	50							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	
WalC-CCC-18.2.1.4	Action Step	Livestock	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers throughout the watershed (CDFG 2004).	3	60	City Planning, Land Trusts, Sonoma County						In-Kind	
WalC-CCC-18.2.2	Recovery Action	Livestock	Improve tree diameter										
WalC-CCC-18.2.2.1	Action Step	Livestock	Increase tree diameter within 55% of watershed to achieve optimal riparian forest conditions (55 - 69% Class 5 & 6 tree)	3	30								Cost accounted for in above action steps.
WalC-CCC-18.2.2.2	Action Step	Livestock	Improve the structure and composition of riparian areas to provide shade, large woody debris input, nutrient input, bank stabilization, and other CCC coho salmon needs.	3	30							TBD	
WalC-CCC-18.2.2.3	Action Step	Livestock	Encourage programs to purchase land/conservation easements to re-establish and enhance natural riparian communities.	3	10	Marin RCD, MMWD						In-Kind	
WalC-CCC-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
WalC-CCC-19.1.1	Recovery Action	Logging	Prevent impairment to instream habitat complexity (reduced large wood and/or shelter)										
WalC-CCC-19.1.1.1	Action Step	Logging	Encourage forest management which allows for optimal levels of natural LWD recruitment of larger older trees into stream channels	3	60	Board of Forestry, Marin County, NMFS, Private Landowners, US EPA						In-Kind	Recruitment of LWD to the stream is critical. This action is mainly a policy issue, with little or no direct costs.
WalC-CCC-19.1.2	Recovery Action	Logging	Prevent impairment to riparian										
WalC-CCC-19.1.2.1	Action Step	Logging	Conserve and manage forestlands for older forest stages.	3	60	Board of Forestry, CDFG, Marin County, NMFS, USEPA						TBD	Costs cannot be determined at this time, due to an unknown number of variables and research priorities.
WalC-CCC-22.1	**Objective**	**Residential/Commercial Development**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
WalC-CCC-22.1.1	Recovery Action	Residential/Commercial Development	Prevent impairment to riparian species and composition										

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	
WalC-CCC-22.1.1.1	Action Step	Residential/Commercial Development	Develop riparian setbacks/buffers where they do not currently occur, and enforce requirements of local regulations where they do	2	30	City Planning, County Planning						In-Kind	
WalC-CCC-22.1.1.2	Action Step	Residential/Commercial Development	Reduce impacts of existing development in floodplains/riparian zones by encouraging willing landowners to restore these areas	3	15	CDFG, RWQCB						In-Kind	This action is basically a policy issue, however additional authorities may be developed to implement the action fully.
WalC-CCC-22.1.1.3	Action Step	Residential/Commercial Development	Explore the use of conservation easements to provide incentives for private landowners to preserve riparian corridors	3	10	Land Trusts, Private Consultants, Private Landowners, RCD						In-Kind	
WalC-CCC-22.1.1.4	Action Step	Residential/Commercial Development	Utilize native plants when landscaping and discourage the use of exotic invasives	3		Private Landowners, UC Extension							
WalC-CCC-22.1.2	Recovery Action	Residential/Commercial Development	Prevent impairment to watershed hydrology										
WalC-CCC-22.1.2.1	Action Step	Residential/Commercial Development	Assess efficacy and necessity of ongoing stream maintenance practices and evaluate, avoid, minimize and/or mitigate their impacts to rearing and migrating coho.	3	50	County Planning, MMWD						In-Kind	
WalC-CCC-22.1.2.2	Action Step	Residential/Commercial Development	Implement performance standards in Stormwater Management Plans.	3		County Planning, RWQCB							
WalC-CCC-22.1.2.3	Action Step	Residential/Commercial Development	Implement DS level actions	2									
WalC-CCC-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
WalC-CCC-23.1.1.1	Action Step	Roads/Railroads	Assess existing road networks and implement actions that hydrologically disconnect roads and reduce sediment sources	2	10		12.00	12.00				24	Cost for road inventory estimated at $927/mile (assume 25% of road network).

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	
WalC-CCC-23.1.1.2	Action Step	Roads/Railroads	Assess roads in Salmon Creek, Walker Creek and Keys Creek to identify high priority and high sediment yield sources.	2		Private Consultants, Private Landowners, Public Works, RCD							
WalC-CCC-23.1.1.3	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	5	CDFG, Marin County, NMFS, NRCS	250.00					250	
WalC-CCC-23.1.1.4	Action Step	Roads/Railroads	Reduce the hydrologic connectivity of roads and trails to adjacent crossings across watercourses.	3	60	Marin County, Marin RCD, MMWD, Private Landowners						TBD	
WalC-CCC-23.1.1.5	Action Step	Roads/Railroads	Restoration projects that upgrade or decommission high risk roads in Core areas should be considered an extremely high priority for funding (e.g., PCSRF). Where no Core areas are designated, apply this action to Phase I areas.	2	60	CDFG, NMFS, RWQCB, WCB						TBD	
WalC-CCC-23.1.1.6	Action Step	Roads/Railroads	Decommission riparian roads and skid trails on forestlands that deliver sediment into adjacent watercourses. High priority streams identified by CDFG habitat reports include Verde Canyon, Frink Canyon, and Salmon Creek (http://coastalwatersheds.ca.gov/)	3	10	NRCS, Private Landowners, Public Works	18.00	18.00				36	Cost based on treating 3 miles of riparian road at a rate of $12,000/mile.
WalC-CCC-23.1.1.7	Action Step	Roads/Railroads	Establish adequate spoils storage sites throughout the watershed so material from landslides and road maintenance can be stored safely away from watercourses. Coordinate these efforts with all landowners in the watershed.	3		Private Landowners, Public Works							
WalC-CCC-23.1.1.8	Action Step	Roads/Railroads	Utilize best management practices for road maintenance, management (e.g. Fishnet 4C, 2004; Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3		Private Landowners, Public Works							
WalC-CCC-23.1.1.9	Action Step	Roads/Railroads	Utilize BMP's to reduce the lengths of ditches, increase the size of ditch relief culverts, or replace with rolling dips	3		Private Consultants, Private Landowners, Public Works, RCD, State Parks							
WalC-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to passage and migration										

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	
WalC-CCC-23.1.2.1	Action Step	Roads/Railroads	Assess private and public road stream crossings for barrier potential and implement recommendations	2	5	CDFG, Private Consultants, Private Landowners, RCD, Trout Unlimited						TBD	
WalC-CCC-23.1.2.2	Action Step	Roads/Railroads	Utilize BMP's to upgrade existing crossings (bridges, culverts, fills, and other crossings) to accommodate 100-year flood flows and associated bedload and debris.	2	10	Private Consultants, Private Landowners, Public Works, State Parks	446.00	446.00				892	Cost based on treating 4 crossings (assume upgrade to bottomless arch) at a rate of $223,051/unit.
WalC-CCC-23.1.2.3	Action Step	Roads/Railroads	All new crossings and upgrades to existing crossings (bridges, culverts, fills, and other crossings) should accommodate 100-year flood flows and associated bedload and debris.	3		Public Works							
WalC-CCC-23.1.2.4	Action Step	Roads/Railroads	Utilize best management practices for road construction, maintenance, management and decommissioning (e.g. Fishnet 4C, 2004; Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3		FishNet 4C, Private Landowners, Public Works							
WalC-CCC-24.1	**Objective**	**Severe Weather Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WalC-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to water quality (impaired instream temperature)										
WalC-CCC-24.1.1.1	Action Step	Severe Weather Patterns	Maintain canopy levels at desirable levels in all streams and restore canopy levels to desirable levels in high value habitat areas (See WATER QUALITY for specific actions/areas	2		CDFG, NOAA RC, Private Landowners, Trout Unlimited							
WalC-CCC-24.1.1.2	Action Step	Severe Weather Patterns	Implement DS level actions	2									
WalC-CCC-25.1	**Objective**	**Water Diversion/Impoundment**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
WalC-CCC-25.1.1	Recovery Action	Water Diversion/Impoundment	Prevent impairment to stream hydrology (impaired water flow)										
WalC-CCC-25.1.1.1	Action Step	Water Diversion/Impoundment	Allow all "fisheries flows" (baseflows, and passage, attractant, and channel maintenance flows) to bypass diversion facilities.	2		SWRCB							

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	
WalC-CCC-25.1.1.2	Action Step	Water Diversion/Impoundment	Promote off-channel storage to reduce impacts of water diversion (e.g., storage tanks for rural residential users).	2	20	CDFG, Private Landowners, RCD, RWQCB, Sonoma County, Sonoma County Water Agency						TBD	Costs are minimal to promote. Costs for implementation will depend on the number of participants.
WalC-CCC-25.1.1.3	Action Step	Water Diversion/Impoundment	Promote water conservation best practices such as drip irrigation for vineyards.	3	20	CDFG, Farm Bureau, NRCS, Water Agencies						0	Promoting water conservation best practices is not expected to result in additional costs.
WalC-CCC-25.1.1.4	Action Step	Water Diversion/Impoundment	Implement DS level actions	3									
WalC-CCC-25.1.2	Recovery Action	Water Diversion/Impoundment	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
WalC-CCC-25.1.2.1	Action Step	Water Diversion/Impoundment	Identify upstream pollution sources which contribute to poor water quality conditions in the estuary	2		County Planning, SWRCB, Water Agencies						TBD	
WalC-CCC-25.1.3	Recovery Action	Water Diversion/Impoundment	Prevent reduced density, abundance, and diversity										
WalC-CCC-25.1.3.1	Action Step	Water Diversion/Impoundment	Adequately screen water diversions to prevent juvenile salmonid mortalities.	2		CDFG, NMFS HCD							