Wages Creek

Location	•Mendocino County
Watershed Area	• 13.0 Square Miles
Potential Habitat	•9.8 Stream Miles
Vegetation	•79% Coniferous •13% Riparian or Montane Forest
Erodability	•Moderately High
Ownership Patterns	•99% Private
Dominant Land Uses	•Timber
Housing Density	•Moderately Low
TMDL Pollutants	•None

Wages Creek estuary and campground. *Copyright (C) 2002-2009 Kenneth & Gabrielle Adelman, California Coastal Records Project, www.Californiacoastline.org.*

Wages Creek Coho Salmon: Nearly Extirpated

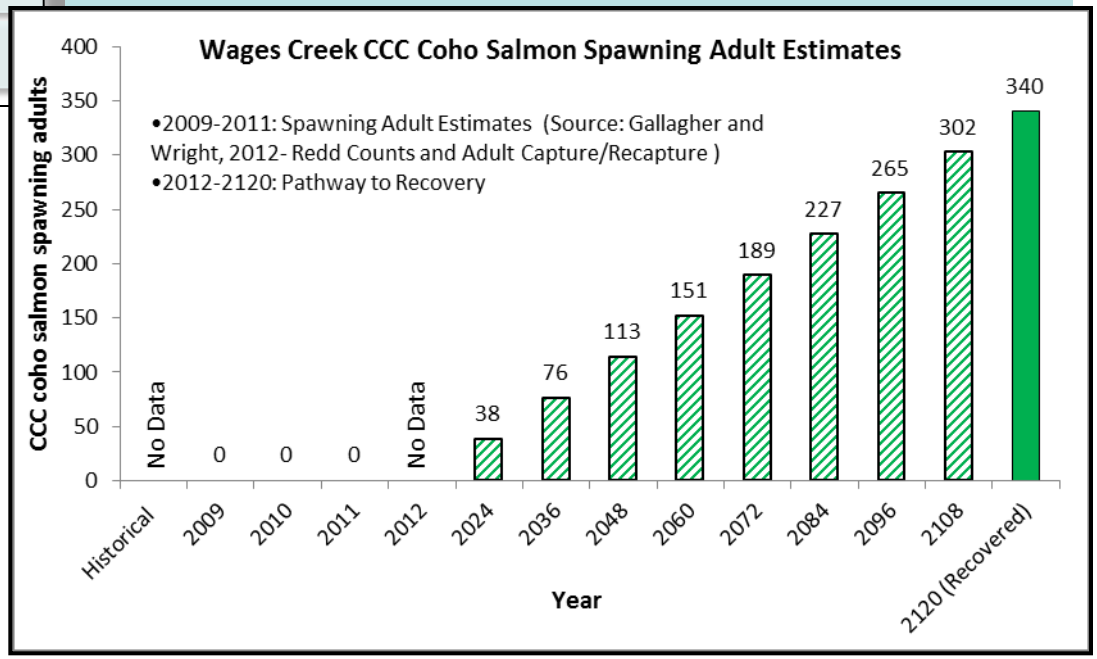
Recovery Goals

✓ Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed

Wages Creek
Adult Spawner Targets

Downlisting to Threatened
170

Recovery
340



STEELHEAD: YES
CHINOOK SALMON: NO

Wages Creek

Potential Habitat: 9.8 miles
Recovery Target: 340 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	GOOD	VERY GOOD	FAIR	POOR	VERY GOOD	GOOD	GOOD	POOR	GOOD

Preventing Extinction & Improving Conditions

Priority 1: Immediate Restoration Actions

- Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth

Priority 2 & 3: Long-Term Restoration Actions

- Promote restoration projects designed to create or restore off channel habitat
- Restore and expand riparian buffers to increase riparian canopy cover
- Allow trees in riparian areas to age, die, and recruit into the stream naturally

Recovery Partners

Westport Water District.
Board of Forestry Monitoring Study Group,
Ballard Forestry

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

Wages Creek

Potential Habitat: 9.8 miles
Recovery Target: 340 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
LOW	MEDIUM	LOW	HIGH	MEDIUM	NA	LOW	MEDIUM	LOW	LOW	MEDIUM	HIGH	MEDIUM	MEDIUM

Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- Discourage home building or other incompatible land use in areas identified as timber production zones
- Discourage forest-to-vineyard land or rural residential conversions
- Design new development to allow streams to meander in historical patterns
- Use available best management practices for road construction, maintenance, management and decommissioning

Priority 2 & 3: Long-Term Threat Abatement Actions

- Reduce erosion from fire prevention or suppression activities by maintaining existing natural topography
- Decommission or upgrade roads
- Size culverts to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure
- Fully maintain all roads with inside ditches unless these roads have been properly decommissioned
- Adopt a policy of "managed retreat" for areas highly susceptible to or previously damaged from flooding

South Fork Wages Creek Cooperative Instream Monitoring Project

Photo Courtsey: Cal Fire

Conservation Highlights

- Campbell Timberland Management has undertaken sediment remediation projects.
- The Wages Creek Monitoring Study Group, a collaborative effort, is conducting effectiveness monitoring to assess current conditions and long term trends in channel conditions.

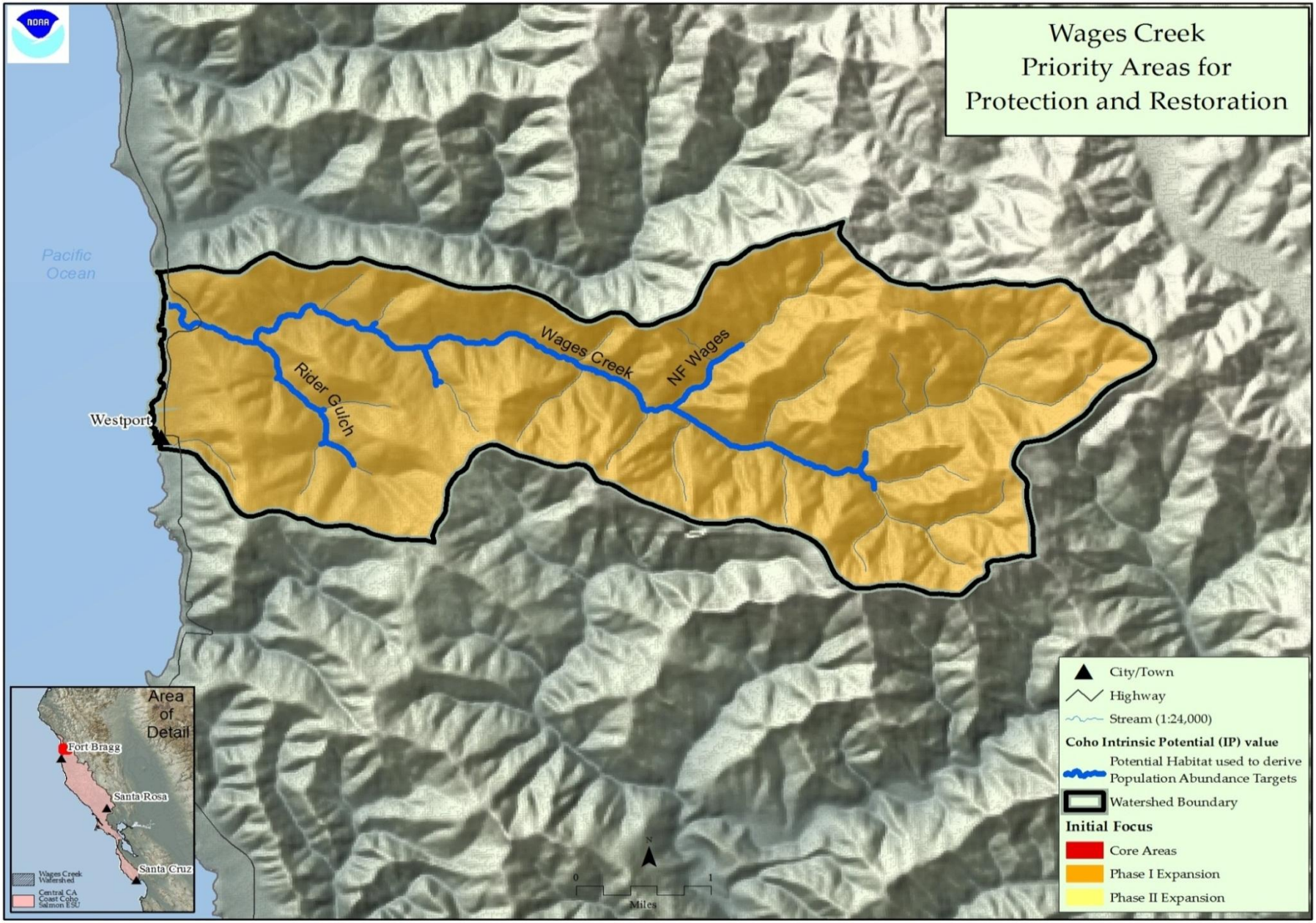


Figure 1: Map of Wages Creek

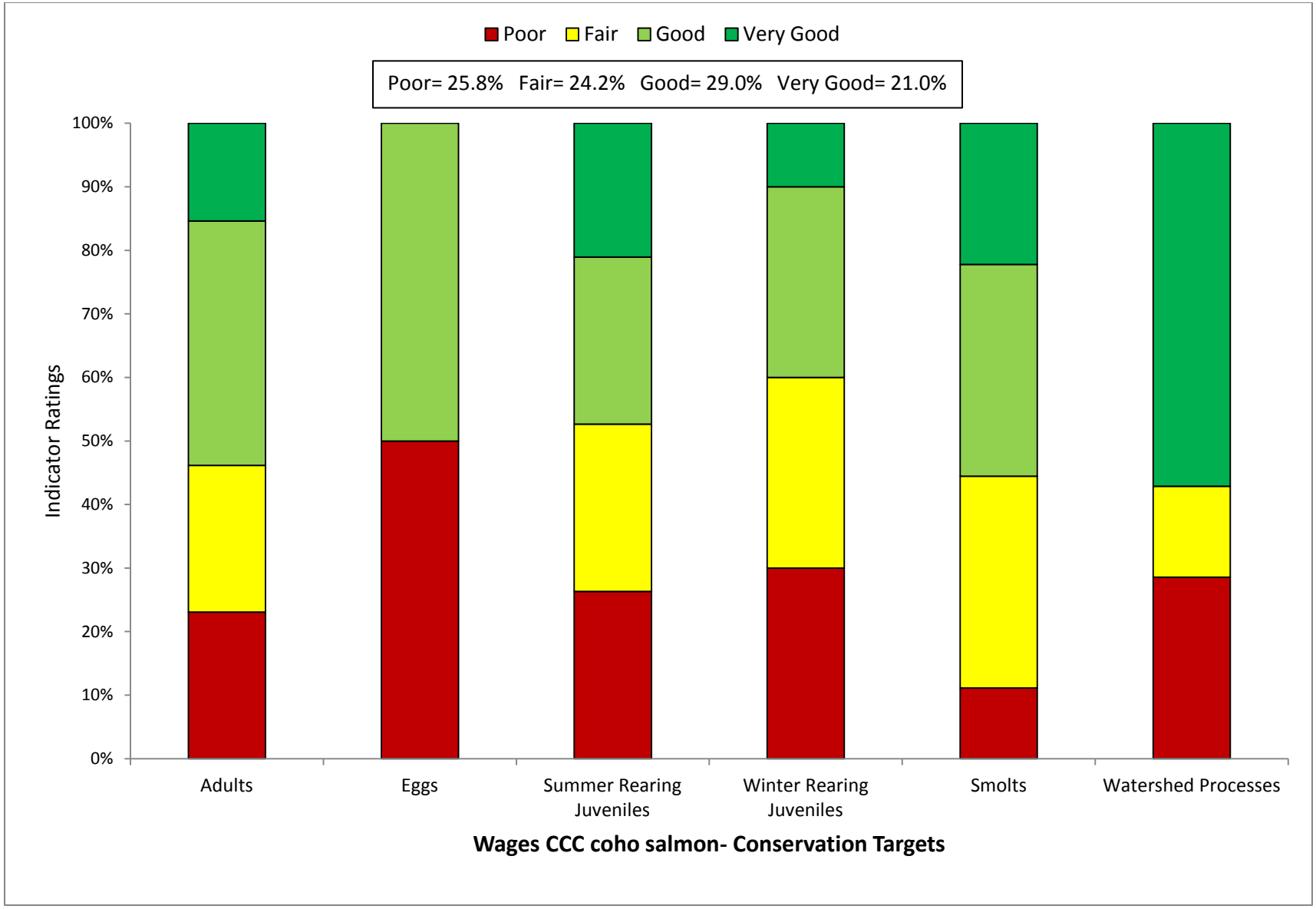


Figure 2: Viability Results by Lifestage

Table 1: CAP Viability Results ~ Wages Creek

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	**<4 key pcs/100m**	Poor	NMFS Expert Estuary/Lagoon Panel	6 to 11 key pcs/100m
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	**<1 to 1.3 Key Pieces/100m**	Fair	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**50% by streams; 79% by IP-km (>30% Pools; >20% Riffles)**	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	**50% streams; 79% IP-km (>80 stream average)**	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>80 stream average)
Adults	Hydrology	Passage Flows	**Risk Factor Score = 35-50**	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Adults	Passage/Migration	Passage at Mouth or Confluence	**>90% of IP-km accessible**	Very Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Passage/Migration	Physical Barriers	**100% of IP-km accessible**	Very Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Riparian Vegetation	Tree Diameter (North of SF Bay)	**36% Class 5 & 6 across IP-km**	Poor	SEC Analysis/CDFG Data	55 - 69% Class 5 & 6 across IP-km
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	**NA**	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Adults	Sediment	Quantity & Distribution of Spawning Gravels	**75% of IP-km to 90% of IP-km accessible**	Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	**>80% Response Reach Connectivity**	Good	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Adults	Water Quality	Toxicity	**No Acute or Chronic**	Good	SEC Analysis/CDFG Data	No Acute or Chronic
Adults	Water Quality	Turbidity	**75% to 90% of streams/ IP-km maintains severity score of 3 or lower**	Good	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 35-50**	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	**Risk Factor Score 35-50**	Good	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% of streams/ IP-km (>50% stream average scores of 1 & 2)**	Poor	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	**Impaired but functioning**	Fair	NMFS Instream Flow Analysis	Properly Functioning Condition
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	**<4 key pcs/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 to 1.3 Key Pieces/100m**	Fair	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	**0% 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	**50% streams; 79% IP-km (>30% Pools; >20% Riffles)**	Fair	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	**50% streams; 79% IP-km (>80 stream average)**	Fair	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>80 stream average)
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	**Risk Factor Score 35-50**	Good	NMFS Instream Flow Analysis	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor Score 35-50**	Good	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	**3.02 Diversions/10 IP-km**	Fair	NMFS Watershed Characterization	0.01 - 1 Diversions/10 IP km
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	**>90% of IP-km accessible**	Very Good	NMFS Watershed Characterization	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	**100% of IP-km accessible**	Very Good	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Riparian Vegetation	Canopy Cover	**>90% of streams/ IP-km (>85% average stream canopy)**	Very Good	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>85% average stream canopy)
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	**36% 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)	**>90% IP km (<16 C MWMT)**	Very Good	Population Profile/BPJ	75 to 89% IP km (<16 C MWMT)
Summer Rearing Juveniles	Water Quality	Toxicity	**No Acute or Chronic**	Good	NMFS Watershed Characterization/CWHR	No Acute or Chronic
Summer Rearing Juveniles	Water Quality	Turbidity	**75% to 90% of streams/ IP-km maintains severity score of 3 or lower**	Good	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Summer Rearing Juveniles	Viability	Density	**<0.2 fish/meter^2**	Poor	SEC Analysis/CDFG Data	0.5 - 1.0 fish/meter^2
Summer Rearing Juveniles	Viability	Spatial Structure	**75-90% of Historical Range**	Good	NMFS Watershed Characterization/CWHR	75-90% of Historical Range
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	**<4 key pcs/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 to 1.3 Key Pieces/100m**	Fair	NMFS Watershed Characterization/CWHR	1.3 to 4 Key Pieces/100 meters
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**50% streams; 79% IP-km (>30% Pools; >20% Riffles)**	Fair	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	**50% streams; 79% IP-km (>80 stream average)**	Fair	CDF Vegetation Maps/BPJ	75% to 90% of streams/ IP-Km (>80 stream average)
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	**100% of IP-km accessible**	Very Good	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	**36% 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)	**0% streams/IP-km (>50% stream average scores of 1 & 2)**	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	**>80% Response Reach Connectivity**	Good	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Winter Rearing Juveniles	Water Quality	Toxicity	**No Acute or Chronic**	Good	NMFS Watershed Characterization	No Acute or Chronic
Winter Rearing Juveniles	Water Quality	Turbidity	**75% to 90% of streams/ IP-km maintains severity score of 3 or lower**	Good	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	**50% streams; 79% IP-km (>80 stream average)**	Fair	Population Profile	75% to 90% of streams/ IP-Km (>80 stream average)
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	**3.02 Diversions/10 IP-km**	Fair	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	**NMFS Flow Protocol: Risk Factor Score 35-50**	Good	TRT Spence (2008)	NMFS Flow Protocol: Risk Factor Score 35-50
Smolts	Passage/Migration	Passage at Mouth or Confluence	**>90% of IP-km accessible**	Very Good	TRT Spence (2008)	75% of IP-Km to 90% of IP-km
Smolts	Smoltification	Temperature	**NMFS Flow Protocol: Risk Factor Score 35-50**	Very Good	TRT Spence (2008)	75-90% IP-Km (>6 and <16 C)
Smolts	Water Quality	Toxicity	**No Acute or Chronic**	Good	TRT Spence (2008)	No Acute or Chronic
Smolts	Water Quality	Turbidity	**75% to 90% of streams/ IP-km maintains severity score of 3 or lower**	Good	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	**0.197% of Watershed in Impervious Surfaces**	Very Good	SEC Analysis	3-6% of Watershed in Impervious Surfaces
Watershed Processes	Landscape Patterns	Agriculture	**0% of Watershed in Agriculture**	Very Good	EPA/RWQCB/NMFS Criteria	10-19% of Watershed in Agriculture
Watershed Processes	Landscape Patterns	Timber Harvest	**29% of Watershed in Timber Harvest**	Fair	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	**<8% 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	**>75% Historical Species Composition**	Very Good	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	**5.9 Miles/Square Mile**	Poor	EPA/RWQCB/NMFS Criteria	1.6 to 2.4 Miles/Square Mile
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	**5.7 Miles/Square Mile**	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

Table 2: CAP Threats Results ~ Wages Creek

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

Central CA Coast Coho Salmon ~ Wages Creek

ACTIONS FOR RESTORING HABITATS

1. Restoration- Estuary

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

1.1.1. **Recovery Action:** Enhance and restore estuary function by improving complex habitat features.

1.1.1.1. **Action Step:** Evaluate feasibility of enhancing the estuary with physical habitat improvement. Implement project if feasible and if determined to result in benefits to salmonid survival.

2. Restoration- Floodplain Connectivity

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

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

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

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

3. Restoration- Habitat Complexity

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

3.1.1. **Recovery Action:** Increase LWD, primary pools and shelter ratings.

3.1.1.1. **Action Step:** Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth.

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

3.1.1.3. **Action Step:** Allow trees in riparian areas to age, die, and recruit into the stream naturally.

4. Restoration- Hydrology

No species-specific actions were developed.

5. Restoration- Landscape Patterns

No species-specific actions were developed.

6. Restoration- Passage

No species-specific actions were developed.

7. Restoration- Pool Habitat

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

8. Restoration- Riparian

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

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

8.1.1.1. **Action Step:** Restore and expand riparian buffers to increase riparian canopy cover.

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

8.1.2.1. **Action Step:** Plant native vegetation in lower Wages and Rider Gulch to promote streamside shade.

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

9. Restoration- Sediment

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

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

9.1.1.1. **Action Step:** Where restricting winter access to unpaved roads is not feasible, encourage measures such as rocking to prevent sediment from reaching coho salmon streams (CDFG 2004).

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

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

10. Restoration- Viability

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

10.1.1. **Recovery Action:** Increase abundance

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

10.1.2. **Recovery Action:** Measure or estimate the condition of key attributes across the watershed.

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

10.1.3. **Recovery Action:** Measure or estimate response of key habitat attributes to recovery efforts across the watershed.

10.1.3.1. **Action Step:** Implement a monitoring program to evaluate the performance of recovery efforts. Core areas should have the highest priority for a site-based assessment; adapt the strategies for restoration and threat abatement to address site-based issues identified by the watershed assessments.

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

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

10.2.1.1. **Action Step:** Establish release imprinting stations, and other smolt release streams, so that smolts can be held for a minimum two week period prior to release. The holding period should allow for imprinting to occur on the parent release stream, increasing the potential for returns as adults which spawn naturally.

11. Restoration- Water Quality

No species-specific actions were developed.

THREAT ABATEMENT ACTIONS

12. Threat- Agricultural Practices

No species-specific actions were developed.

13. Threat- Channel Modification

No species-specific actions were developed.

14. Threat- Disease/Predation/Competition

No species-specific actions were developed.

15. Threat- Fire/Fuel Management

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

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

15.1.1.1. **Action Step:** Implement sediment reduction techniques in concert with prescribed fire techniques to minimize sediment impacts to various coho salmon life stages.

15.1.1.2. **Action Step:** Reduce erosion from fire prevention or suppression activities by maintaining existing natural topography to the extent possible.

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

15.1.2.1. **Action Step:** In the event of a wildfire, CalFire Resource Advisors should contact the resource agencies for ESA consultation (or technical assistance) about the incident.

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

15.1.3.1. **Action Step:** Draft water from lakes, ponds, and reservoirs not occupied by listed salmonids when possible. In fish-bearing streams, excavate active channel areas outside of wetted width to create off-stream pools for water source.

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

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

15.2.1.1. **Action Step:** Disseminate NMFS' October 9, 2007, jeopardy biological opinion on the use of fire retardants and its impacts to salmonids, to local firefighting agencies and CalFire.

16. Threat- Fishing/Collecting

No species-specific actions were developed.

17. Threat- Hatcheries

No species-specific actions were developed.

18. Threat- Livestock

No species-specific actions were developed.

19. Threat- Logging

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

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

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

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

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

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

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

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

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

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

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

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

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

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

19.1.6.1. **Action Step:** Allow trees in riparian areas to age, die, and recruit into the stream naturally.

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

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

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

19.2.1.2. **Action Step:** Discourage rezoning forestlands to rural residential or other land uses (e.g., vineyards).

19.2.1.3. **Action Step:** Reduce the amount and rate of even aged management.

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

19.2.2.1. **Action Step:** Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities that can promote erosion.

19.2.2.2. **Action Step:** Extend the monitoring period and upgrade THP road maintenance after harvest.

19.2.2.3. **Action Step:** Discourage all activities (e.g., roads, harvest, yarding, etc.) in unstable areas (e.g., steep slopes, headwall swales, inner gorges, streambanks, etc.) unless a detailed geological assessment is performed by a certified engineering geologist that shows there is no potential for increased sediment delivery to a watercourse.

20. Threat- Mining

No species-specific actions were developed.

21. Threat- Recreation

No species-specific actions were developed.

22. Threat- Residential/Commercial Development

No species-specific actions were developed.

23. Threat- Roads/Railroads

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

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

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

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

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

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

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

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

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

23.1.3.1. **Action Step:** Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas.

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

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

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

23.2.1.2. **Action Step:** Fully maintain all roads with inside ditches unless these roads have been properly decommissioned. All roads with inside ditches should be evaluated, and problems addressed, prior to the winter season.

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

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

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

24. Threat- Severe Weather Patterns

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

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

24.1.1.1. **Action Step:** Identify and work with water users to minimize depletion of summer base flows from unauthorized water uses.

24.1.1.2. **Action Step:** CDFG, SWRCB, RWQCB, CalFire, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon.

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

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

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

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

24.1.3.1. **Action Step:** Adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.

24.1.3.2. **Action Step:** Design new development to allow streams to meander in historical patterns. Protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.

25. Threat- Water Diversion/Impoundment

No species-specific actions were developed.

26. Threat- Watershed Process

No species-specific actions were developed.

Table 3: Implementation Schedule ~ Wages 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	
WagC-CCC-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
WagC-CCC-1.1.1	Recovery Action	Estuary	Enhance and restore estuary function by improving complex habitat features.										
WagC-CCC-1.1.1.1	Action Step	Estuary	Evaluate feasibility of enhancing the estuary with physical habitat improvement. Implement project if feasible and if determined to result in benefits to salmonid survival.	3	10	CA Coastal Commission, CDFG, Private Consultants, Private Landowners	136.50	136.50				273	The historical potential of the Wages Creek estuary to provide high quality rearing habitat is unknown. Due to the importance of estuaries for juvenile rearing (Bond et al. 2008), a thorough evaluation of the intrinsic potential of the estuary to provide necessary attributes for salmonid survival should occur to evaluate whether conditions could be improved. Due to various constraints, the overall habitat potential is likely relatively small. Cost based on evaluating estuarine habitat at a cost of $273,217/project..
WagC-CCC-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**										
WagC-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
WagC-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	5	CDFG, Private Landowners, Trout Unlimited	112.00					112	Cost based on fish/habitat restoration monitoring at a cost of $111,192.
WagC-CCC-2.1.1.2	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	10	CDFG, Private Landowners, Trout Unlimited							Cost accounted for in delineate reaches possessing both winter rearing habitat and floodplain areas.
WagC-CCC-3.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WagC-CCC-3.1.1	Recovery Action	Habitat Complexity	Increase LWD, primary pools and shelter ratings.										
WagC-CCC-3.1.1.1	Action Step	Habitat Complexity	Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth.	1	100	CalFire, CalTrans, Campbell Timberland Management, CDFG, Mendocino County, Private Landowners, RWQCB, USACE						In-Kind	Some landowners in the lower portions of Wages Creek may be concerned about potential property impacts associated with large wood materials adjacent to their infrastructure. This recommendation should be considered standard practice.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WagC-CCC-3.1.1.2	Action Step	Habitat Complexity	Install properly sized large woody debris to appropriate viability table targets.	2	10	CalFire, Campbell Timberland Management, CDFG, Private Landowners	50.00	50.00				100	Costs may be higher in Wages Creek than in some of the other watersheds in the Lost Coast Diversity Stratum due to the presence of rural residences in the lower portion of the watershed. Due to the presence of these structures, additional engineering may be required. Low gradient floodplain areas should be initially target for restoration. Cost based on treating 4 miles (assume 1 project/mile in 50% High IP) at a rate of $25,000/mile. If ELJ used in replacement of placing LWD, cost would be $404,480.
WagC-CCC-3.1.1.3	Action Step	Habitat Complexity	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	2	100	CalFire, PG&E, Private Landowners, RPFs						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-8.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WagC-CCC-8.1.1	Recovery Action	Riparian	Improve canopy cover										
WagC-CCC-8.1.1.1	Action Step	Riparian	Restore and expand riparian buffers to increase riparian canopy cover.	2	10	CalFire, Campbell Timberland Management, Private Landowners							Most of the Wages Creek watershed would benefit from improved riparian composition and structure, which would increase future LWD recruitment. General practices to improve riparian condition include initiating a conifer release program to promote existing conifer growth, and working with small landowners in the floodplain to increase riparian buffer widths and initiating planting of native vegetation. An immediate LWD supplementation program to enhance habitat complexity will likely be necessary due to the long period of time it may take for LWD to naturally recruit from existing riparian zones. Cost accounted for in other recovery actions.
WagC-CCC-8.1.2	Recovery Action	Riparian	Improve tree diameter										
WagC-CCC-8.1.2.1	Action Step	Riparian	Plant native vegetation in lower Wages and Rider Gulch to promote streamside shade.	3	20	CDFG, NRCS, RWQCB	402.50	402.50	402.50	402.50		1,610	Cost based on planting 1 mile (assume 80 acres/mile in 5% High IP with 1 mile minimum) at a rate of $20,057/acre.
WagC-CCC-8.1.2.2	Action Step	Riparian	Conduct conifer release to promote growth of larger diameter trees where appropriate.	3	10	CalFire, Campbell Timberland Management, Private Landowners	57.00	57.00				114	Cost to treat 1 mile (assume 80 acres/mile in 15% High IP with a 1 mile minimum) at a rate of $1,422/acre.

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	
WagC-CCC-9.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
WagC-CCC-9.1.1	Recovery Action	Sediment	Reduce turbidity and suspended sediment										
WagC-CCC-9.1.1.1	Action Step	Sediment	Where restricting winter access to unpaved roads is not feasible, encourage measures such as rocking to prevent sediment from reaching coho salmon streams (CDFG 2004).	3	10	CalFire, Campbell Timberland Management, Private Landowners, RWQCB							Minimal- difficult to estimate cost because assessments for the magnitude of the problem were not available. Additionally, many roads have been rocked - often through the timber harvest process - and these costs should be considered an ongoing operation expense.
WagC-CCC-9.1.2	Recovery Action	Sediment	Improve instream gravel quality										
WagC-CCC-9.1.2.1	Action Step	Sediment	Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.	3	10	CalFire, Campbell Timberland Management, Private Landowners	50.00	50.00				100	This estimate was taken from the Ten Mile Creek watershed. Ongoing maintenance will likely occur as part of a yearly evaluation prior to the winter period. Maintenance costs were estimated at $10,000/yr.
WagC-CCC-10.1	**Objective**	**Viability**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
WagC-CCC-10.1.1	Recovery Action	Viability	Increase abundance										
WagC-CCC-10.1.1.1	Action Step	Viability	Re-establish a naturally reproducing run of coho salmon.	3	15	CDFG, Private Landowners						TBD	An effort to re-establish coho salmon in Wages Creek was attempted in the mid-1990's with juvenile planting in the early fall. Most of these fish were released in one or two locations in the lower watershed. No attempt was made to restore habitat conditions as part of this re-establishment effort. Limiting habitat conditions must be addressed prior to initiating future attempts at re-establishment. Fish should be released throughout the watershed and not just one or two locations.
WagC-CCC-10.1.2	Recovery Action	Viability	Measure or estimate the condition of key attributes across the watershed.										
WagC-CCC-10.1.2.1	Action Step	Viability	Implement standardized assessment protocols (i.e., CDFG habitat assessment protocols) to ensure ESU-wide consistency.	3	15	CalFire, Campbell Timberland Management, CDFG, Private Landowners						In-Kind	A large proportion of the watershed has likely been habitat typed by Campbell Timberland Mgt. New habitat assessment methods may have future (unknown) costs.

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	
WagC-CCC-10.1.3	Recovery Action	Viability	Measure or estimate response of key habitat attributes to recovery efforts across the watershed.										
WagC-CCC-10.1.3.1	Action Step	Viability	Implement a monitoring program to evaluate the performance of recovery efforts. Core areas should have the highest priority for a site-based assessment; adapt the strategies for restoration and threat abatement to address site-based issues identified by the watershed assessments.	3	10	CalFire, Campbell Timberland Management, CDFG, Private Landowners	56.00	56.00				112	Cost based on fish/habitat restoration effectiveness monitoring estimated at $111,195/project..
WagC-CCC-10.2	**Objective**	**Viability**	**Address other natural or manmade factors affecting the species' continued existence**										
WagC-CCC-10.2.1	Recovery Action	Viability	Increase spawner density										
WagC-CCC-10.2.1.1	Action Step	Viability	Establish release imprinting stations, and other smolt release streams, so that smolts can be held for a minimum two week period prior to release. The holding period should allow for imprinting to occur on the parent release stream, increasing the potential for returns as adults which spawn naturally.	3	15	CDFG, Private Landowners						TBD	Identify suitable imprinting stations and annual availability of smolts.
WagC-CCC-15.1	**Objective**	**Fire/Fuel Management**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
WagC-CCC-15.1.1	Recovery Action	Fire/Fuel Management	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
WagC-CCC-15.1.1.1	Action Step	Fire/Fuel Management	Implement sediment reduction techniques in concert with prescribed fire techniques to minimize sediment impacts to various coho salmon life stages.	2	100	CalFire, Campbell Timberland Management						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-15.1.1.2	Action Step	Fire/Fuel Management	Reduce erosion from fire prevention or suppression activities by maintaining existing natural topography to the extent possible.	2	100	CalFire, Campbell Timberland Management						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-15.1.2	Recovery Action	Fire/Fuel Management	Prevent increased landscape disturbance										
WagC-CCC-15.1.2.1	Action Step	Fire/Fuel Management	In the event of a wildfire, CalFire Resource Advisors should contact the resource agencies for ESA consultation (or technical assistance) about the incident.	3	100	CalFire, CDFG, NMFS, USFWS						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	
WagC-CCC-15.1.3	Recovery Action	Fire/Fuel Management	Prevent impairment to stream hydrology (impaired water flow)										
WagC-CCC-15.1.3.1	Action Step	Fire/Fuel Management	Draft water from lakes, ponds, and reservoirs not occupied by listed salmonids when possible. In fish-bearing streams, excavate active channel areas outside of wetted width to create off-stream pools for water source.	3	100	CalFire, Campbell Timberland Management						In-Kind	Require all water truck/tenders be fitted with DFG and NMFS approved fish screens when water is acquired at fish bearing streams. Put up a silt fence or other erosion controls around the water extraction locations. Attempt to avoid significantly lowering stream flows during water drafting.
WagC-CCC-15.2	**Objective**	**Fire/Fuel Management**	**Address the inadequacy of existing regulatory mechanisms**										
WagC-CCC-15.2.1	Recovery Action	Fire/Fuel Management	Prevent impairment to water quality (increased turbidity, suspended sediment, and/or toxicity)										
WagC-CCC-15.2.1.1	Action Step	Fire/Fuel Management	Disseminate NMFS' October 9, 2007, jeopardy biological opinion on the use of fire retardants and its impacts to salmonids, to local firefighting agencies and CalFire.	2	1	CalFire, NMFS							
WagC-CCC-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
WagC-CCC-19.1.1	Recovery Action	Logging	Prevent impairment to floodplain connectivity (impaired quality & extent)										
WagC-CCC-19.1.1.1	Action Step	Logging	Timber harvest planning should evaluate and avoid or minimize adverse impacts to offchannel habitats, floodplains, ponds, and oxbows.	1	100	CalFire, Campbell Timberland Management, Private Landowners						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-19.1.2	Recovery Action	Logging	Prevent impairment to stream hydrology (impaired water flow)										
WagC-CCC-19.1.2.1	Action Step	Logging	Evaluate road surface treatment options to halt or minimize impacts from water drafting and diversion during droughts and summer low flow periods.	3	10	CalFire, Campbell Timberland Management, CDFG, RWQCB							Cost cannot be determined until the feasibility of road surface treatments account for number of miles to be treated.
WagC-CCC-19.1.3	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (gravel quality and quantity)										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WagC-CCC-19.1.3.1	Action Step	Logging	Protect headwater channels with larger buffers to minimize sediment delivery downstream.	2	100	CalFire, California Geological Survey, Campbell Timberland Management, Private Landowners						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-19.1.3.2	Action Step	Logging	Wet weather and/or winter operations should be discouraged in areas with high erosion potential.	2	100	CalFire, CDFG, RPFs, RWQCB						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-19.1.3.3	Action Step	Logging	Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.	3	100	CalFire, Campbell Timberland Management, CDFG, Private Landowners, RPFs, RWQCB						In-Kind	
WagC-CCC-19.1.4	Recovery Action	Logging	Prevent impairment to riparian										
WagC-CCC-19.1.4.1	Action Step	Logging	Conserve and manage forestlands for older forest stages.	2	100	CalFire, Campbell Timberland Management, Private Landowners						In-Kind	
WagC-CCC-19.1.5	Recovery Action	Logging	Prevent increased landscape disturbance										
WagC-CCC-19.1.5.1	Action Step	Logging	Encourage low impact timber harvest techniques such as full-suspension cable yarding (to improve canopy cover; reduce sediment input, etc.).	2	25	CalFire, Campbell Timberland Management, CDFG, Private Landowners, RPFs, RWQCB						In-Kind	This recommendation should be considered standard practice.
WagC-CCC-19.1.6	Recovery Action	Logging	Prevent future impairment to instream habitat complexity (reduced large wood and/or shelter)										
WagC-CCC-19.1.6.1	Action Step	Logging	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	2	100	CalFire, Campbell Timberland Management, Private Landowners						In-Kind	
WagC-CCC-19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms.**										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WagC-CCC-19.2.1	Recovery Action	Logging	Prevent increased landscape disturbance										
WagC-CCC-19.2.1.1	Action Step	Logging	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	1	100	CalFire, Campbell Timberland Management, Mendocino County, Private Landowners						In-Kind	Illegal marijuana cultivation may occur in some areas and have the potential to severely degrade juvenile rearing conditions by diverting water and introducing toxic quantities of fertilizers and pesticides into the stream environment. Increased anthropogenic interface with forested lands will likely lead to increases in these activities.
WagC-CCC-19.2.1.2	Action Step	Logging	Discourage rezoning forestlands to rural residential or other land uses (e.g., vineyards).	1	100	CalFire, Mendocino County, Private Landowners						In-Kind	
WagC-CCC-19.2.1.3	Action Step	Logging	Reduce the amount and rate of even aged management.	2	40	CalFire, Campbell Timberland Management, CDFG, Private Landowners, RPFs, RWQCB							
WagC-CCC-19.2.2	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
WagC-CCC-19.2.2.1	Action Step	Logging	Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities that can promote erosion.	2	10	CalFire, California Geological Survey, Campbell Timberland Management, RPFs	35.00	35.00				70	Cost based on sediment assessment for 6,438 acres (assume 75% of total watershed acres) at a cost of $10.70/acre. Cost may be lower if incorporated into other recover action recommendations.
WagC-CCC-19.2.2.2	Action Step	Logging	Extend the monitoring period and upgrade THP road maintenance after harvest.	3	20	CalFire, Campbell Timberland Management, CDFG, Private Landowners, RPFs, RWQCB							
WagC-CCC-19.2.2.3	Action Step	Logging	Discourage all activities (e.g., roads, harvest, yarding, etc.) in unstable areas (e.g., steep slopes, headwall swales, inner gorges, streambanks, etc.) unless a detailed geological assessment is performed by a certified engineering geologist that shows there is no potential for increased sediment delivery to a watercourse.	2	100	CalFire, California Geological Survey, Campbell Timberland Management, CDFG, Private Landowners, RPFs, RWQCB						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	
WagC-CCC-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WagC-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate										
WagC-CCC-23.1.1.1	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	2	100	Campbell Timberland Management, Mendocino County, Private Landowners						TBD	Legacy roads from past logging activity continue to impact the Wages watershed. Road densities are high throughout the watershed and are estimated at 4.1 miles of road per square mile overall and at 5.3 miles per square mile in riparian areas. Many of these roads were poorly situated and constructed , not properly maintained, and many have been abandoned.
WagC-CCC-23.1.1.2	Action Step	Roads/Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized individuals and impacting uses to decrease fine sediment loads.	3	100	CalFire, Campbell Timberland Management, Private Landowners							
WagC-CCC-23.1.1.3	Action Step	Roads/Railroads	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (CDFG 2004).	3	20	CalFire, Campbell Timberland Management, RWQCB							Abandoned riparian roads in the upper portion of mainstem Wages should be closely evaluated for decommissioning. The original old growth forest of Wages Creek has been completely removed, aside from some scattered residual trees. The final removal occurred relatively recently, compared to many of the other watersheds in coastal Mendocino County (largely between the late 1950s and early 1980s). The mechanized removal practices left an extensive and inadequately maintained road network that continues to contribute sediment to the watercourses. The alteration of sediment transport will likely continue to affect multiple life stages of CCC coho salmon in the watershed. Cost accounted for in other recovery actions.
WagC-CCC-23.1.1.4	Action Step	Roads/Railroads	Establish adequate spoils storage sites throughout the watershed so materials from landslides and road maintenance can be stored safely away from watercourses. Coordinate these efforts with all landowners in the watershed.	3	10	CalFire, Campbell Timberland Management, Private Landowners, RWQCB							
WagC-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to watershed hydrology										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WagC-CCC-23.1.2.1	Action Step	Roads/Railroads	Size culverts to accommodate flashy, debris-laden flows and maintain trash racks to prevent culvert plugging and subsequent road failure.	2	25	CalFire, Campbell Timberland Management, Private Landowners							
WagC-CCC-23.1.3	Recovery Action	Roads/Railroads	Prevent increased landscape disturbance										
WagC-CCC-23.1.3.1	Action Step	Roads/Railroads	Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas.	3	40	CalFire, Campbell Timberland Management, CDFG, Private Landowners						TBD	Initial focus should be directed in steeper portions of the upper watershed. Active and abandoned logging roads and skid trials exist throughout the basin and likely contribute large volumes of sediment. Many logging roads have been upgraded to modern standards, but substantial work remains before this significant sediment source is thoroughly addressed. Chronic sediment input from roads is likely a major limiting factor to overall habitat quality. This is a feasible recommendation for the Wages Creek watershed due to the fact most of the watershed is in timber management and owned by only a few landowners. The program should include a component that closes and remediates unnecessary roads and skid trails, lowering the overall road density in the watershed. Including road remediation within future timber harvest plans should be considered a top mitigation priority. Indiscriminate road density reduction should be avoided so as not to preclude inhibiting future road realignments that could also effectively reduce sediment delivery.
WagC-CCC-23.2	**Objective**	**Roads/Railroads**	**Address the inadequacy of existing regulatory mechanism**										
WagC-CCC-23.2.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate										
WagC-CCC-23.2.1.1	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.	2	100	CalFire, Campbell Timberland Management, Private Landowners							This is part of ongoing maintenance requirements. Correct conditions that are likely to deliver sediment to streams, otherwise roads will be hydrologically closed/disconnected (fills and culverts removed, natural hydrology of hillslope largely restored).
WagC-CCC-23.2.1.2	Action Step	Roads/Railroads	Fully maintain all roads with inside ditches unless these roads have been properly decommissioned. All roads with inside ditches should be evaluated, and problems addressed, prior to the winter season.	2	100	CalFire, Campbell Timberland Management, Private Landowners							

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	
WagC-CCC-23.2.1.3	Action Step	Roads/Railroads	Licensed engineering geologists should review and approve grading on inner gorge slopes.	2	100	CalFire, California Geological Survey, Campbell Timberland Management, Private Landowners							
WagC-CCC-23.2.2	Recovery Action	Roads/Railroads	Prevent impairment to floodplain connectivity (impaired quality & extent)										
WagC-CCC-23.2.2.1	Action Step	Roads/Railroads	Avoid new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.	2	20	CalFire, California Geological Survey, Campbell Timberland Management, CDFG, Mendocino County, RWQCB							
WagC-CCC-24.1	**Objective**	**Severe Weather Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
WagC-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to hydrology										
WagC-CCC-24.1.1.1	Action Step	Severe Weather Patterns	Identify and work with water users to minimize depletion of summer base flows from unauthorized water uses.	1	20	CDFG, Private Landowners, SWRCB							
WagC-CCC-24.1.1.2	Action Step	Severe Weather Patterns	CDFG, SWRCB, RWQCB, CalFire, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon.	3	10	CalFire, Campbell Timberland Management, CDFG, Private Landowners, RWQCB, SWRCB						In-Kind	These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality. This recommendation should be considered standard practice.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
WagC-CCC-24.1.1.3	Action Step	Severe Weather Patterns	Pursue opportunities to acquire or lease water, or acquire water rights from willing sellers, for coho salmon recovery purposes. Develop incentives for water right holders to dedicate instream flows for the protection of coho salmon (CDFG 2004)(Water Code § 1707).	3	20	CDFG, NOAA RC, Private Landowners						TBD	The price at which water is sold on environmental markets is determined by negotiations between landowners and purchasing entity. Cost will vary depending on water availability and landowner participation. It is unknown if this program will gain widespread acceptance in the watershed and therefore costs cannot be estimated. It is recommended that the equations used in the State Coho Plan for socioeconomic cost be utilized when more information regarding landowner participation is gathered.
WagC-CCC-24.1.2	Recovery Action	Severe Weather Patterns	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
WagC-CCC-24.1.2.1	Action Step	Severe Weather Patterns	Protect high-risk shallow-seeded landslide areas and surfaces prone to erosion from being mobilized by intense storm events.	2	100	CalFire, California Geological Survey, Campbell Timberland Management, RWQCB							These areas should be identified and efforts should be made to minimize disturbance leading to increased risk of mobilization. An inventory of high-risk shallow-seeded landslide areas needs to be conducted to prioritize and develop costs for treatment.
WagC-CCC-24.1.3	Recovery Action	Severe Weather Patterns	Prevent impairment to floodplain connectivity (impaired quality & extent)										
WagC-CCC-24.1.3.1	Action Step	Severe Weather Patterns	Adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.	2	30	CalFire, Campbell Timberland Management, FEMA, Mendocino County						In-Kind	
WagC-CCC-24.1.3.2	Action Step	Severe Weather Patterns	Design new development to allow streams to meander in historical patterns. Protecting riparian zones and their floodplains or channel migration zones averts the need for bank erosion control in most situations.	1	100	CalFire, Campbell Timberland Management, Mendocino County, Private Landowners						In-Kind	This recommendation should be considered standard practice.