Caspar Creek

Location	•Mendocino County
Watershed Area	• 8.0 Square Miles
Potential Habitat	• 12.5 Stream Miles
Vegetation	• 83% Coniferous, 17% Riparian or Montane Forest
Erodability	•Moderate to High
Ownership Patterns	•10% Private; 90% Public
Dominant Land Uses	•Timber
Housing Density	•Moderate
TMDL Pollutants	•None

Caspar Creek, Large Wood
Photo provided by Bob Coey, NMFS, and is used with permission. All rights reserved.

Caspar Creek Coho Salmon: Present – moderate abundance

Recovery Goals

✓ Continue funding of life cycle station

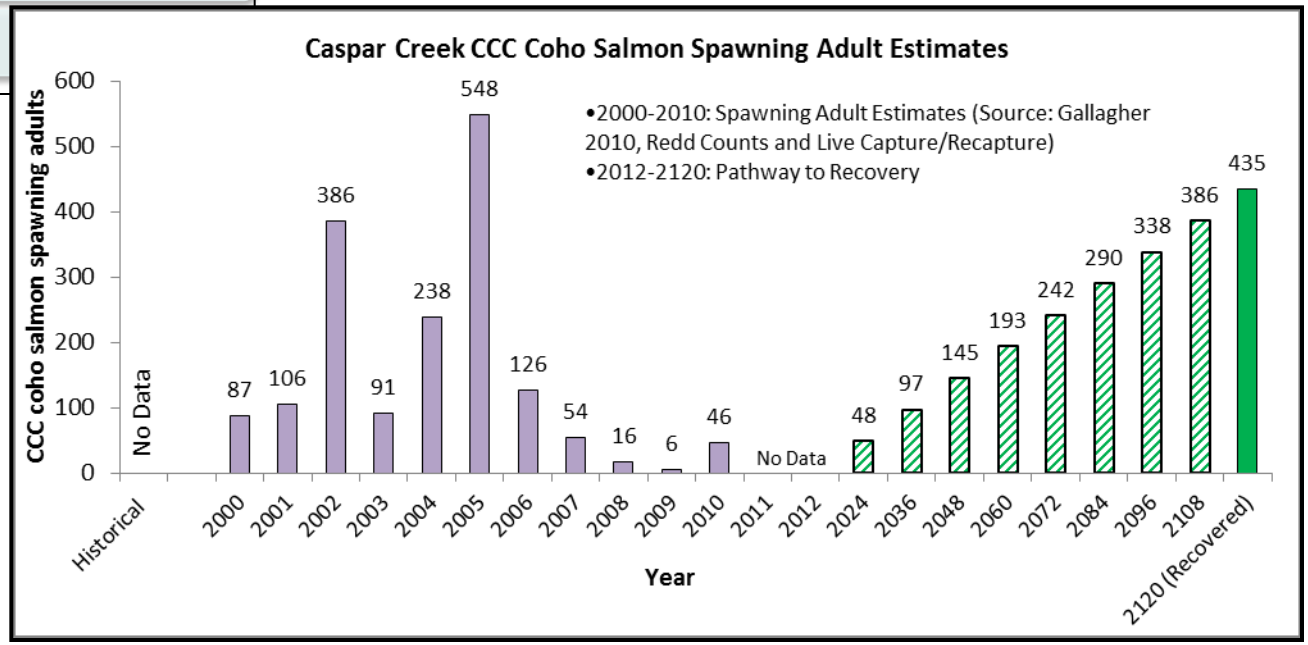
✓ Continue ongoing juvenile monitoring efforts

Caspar Creek Adult Spawner Targets

Downlisting to Threatened 218

Recovery 435

STEELHEAD: YES
CHINOOK SALMON: YES



Caspar Creek

Potential Habitat: 12.5 miles
Recovery Target: 435 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	FAIR	VERY GOOD	VERY GOOD	GOOD	FAIR	FAIR	POOR	FAIR	FAIR	VERY GOOD

Preventing Extinction & Improving Conditions

- Target habitat restoration and enhancement that will function between winter base flow and flood stage
- Existing areas with floodplains or off channel habitats should be protected from future development of any kind
- Maintain current LWD, boulders, and other structure providing features to maintain current stream complexity, pool frequency, and depth
- Continue funding of lifecycle station operated by CDFG, and continue ongoing juvenile sampling efforts in the watershed
- Promote restoration projects designed to create or restore alcove and backchannel habitats
- Decommission elevated road alignments through riparian zones or adjacent to stream channels which functionally limit seasonal floodplain access
- Close unauthorized trails and conduct appropriate decommissioning practices

Recovery Partners

Jackson Demonstration State Forest,
USFS Pacific Southwest Research Station

Photo courtesy from left to right: Josh Fuller, NMFS, Campbell Timberland, KRIS Information System , Eli Asarian and Morgan Bond, SWFSC

Caspar Creek

Potential Habitat: 12.5 miles
Recovery Target: 435 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	MEDIUM	MEDIUM	MEDIUM	NA	LOW	MEDIUM	NA	LOW	MEDIUM	HIGH	HIGH	MEDIUM

Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- Identify and hydrologically disconnect problematic legacy roads or landings within WLPZ's
- Discourage rural residential housing on forest lands
- Limit winter use of unsurfaced roads and recreational trails
- Avoid new road construction within floodplains, riparian areas, unstable soils or other sensitive areas
- Protect sources of cool water input from future diversions

Priority 2 & 3: Long-Term Threat Abatement Actions

- Conduct conifer release to promote growth of larger diameter trees where appropriate
- Encourage Jackson Demonstration State Forest and USFS to implement restoration projects
- Encourage low impact timber harvest techniques
- Conserve and manage forestlands for older forest stages
- Reduce the amount and rate of even aged management
- Implement the Jackson Demonstration State Forest Road Management Plan
- Replace or remove stream crossings if they cannot pass 100 year flow
- Minimize water withdrawals for dust control

North Fork Caspar Creek, Fish Ladder Construction
Courtesy Rick Macedo, CDFG, 2009

Conservation Highlights

- Watershed research actions since 1962 by Jackson Demonstration State Forest and US Forest Service Pacific Southwest Research Station.
- Coho salmon life cycle station operated by DFG.

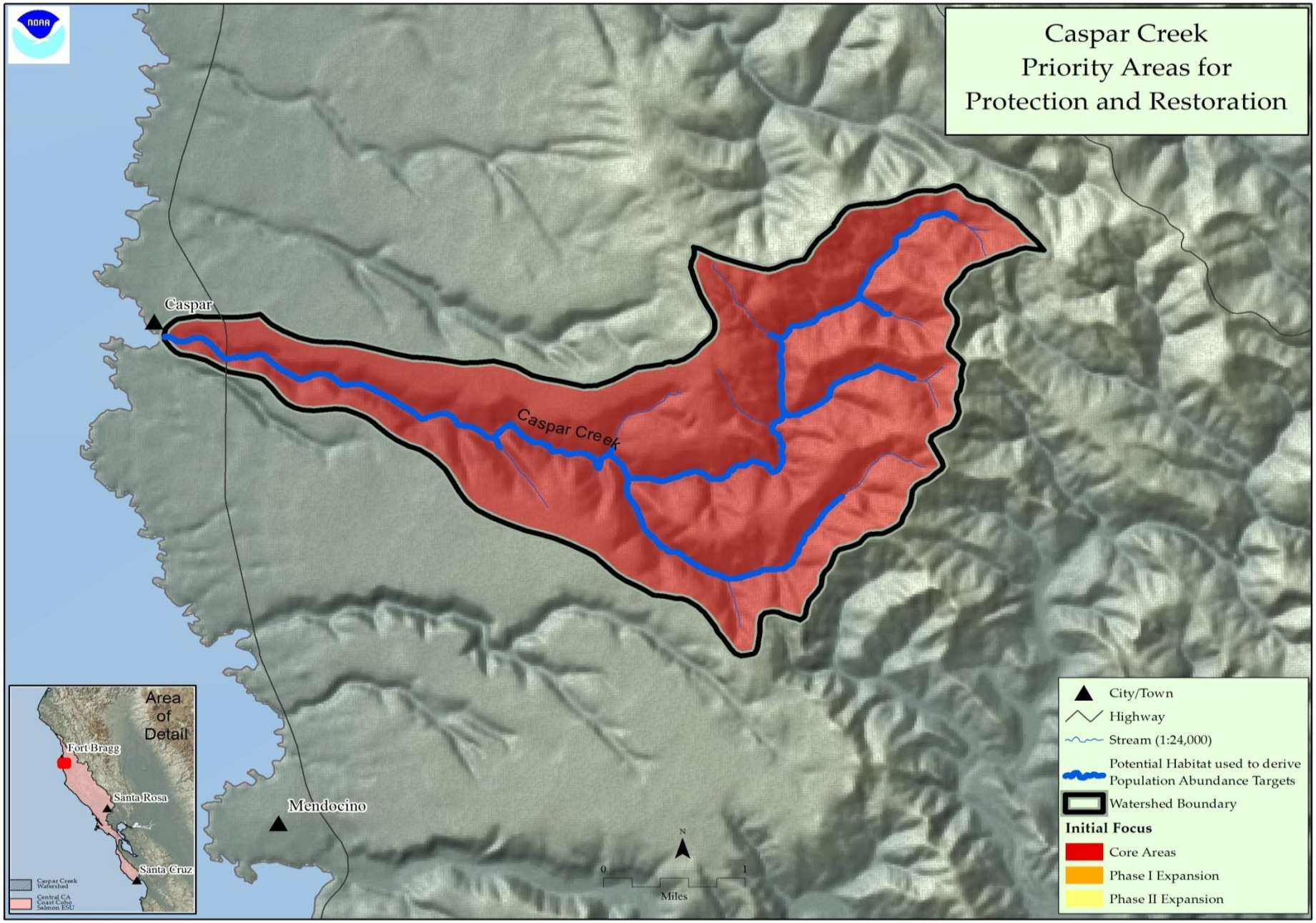


Figure 1: Map of Caspar Creek

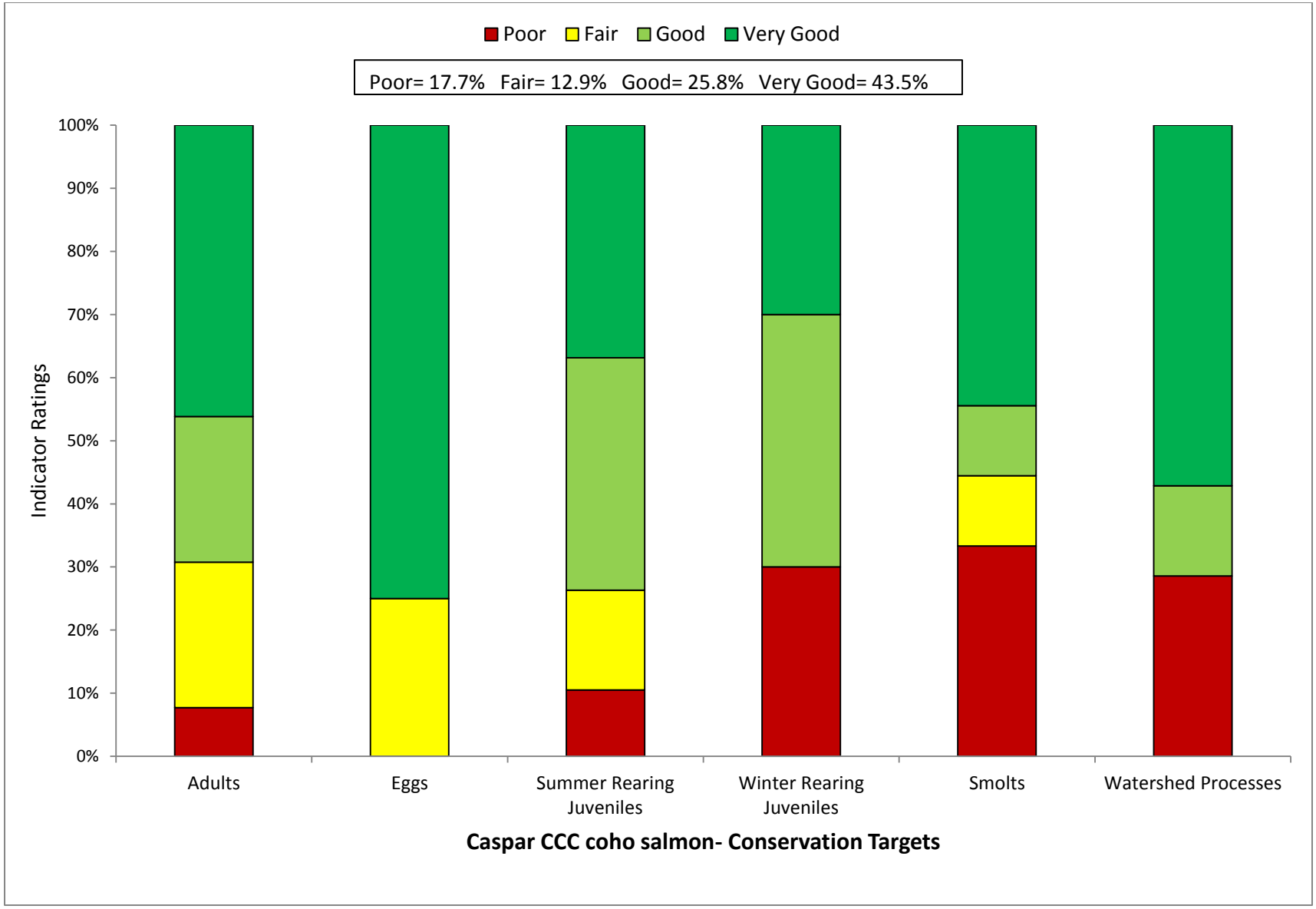


Figure 2: Viability Results by Lifestage

Table 1: CAP Viability Results ~ Caspar Creek

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	**13.3 Key Pieces/100m**	Very Good	NMFS Expert Estuary/Lagoon Panel	6 to 11 key pcs/100m
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	**1.3 to 4 Key Pieces/100m**	Good	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**67% streams 95% IP-km (>30% Pools; >20% Riffles)**	Very Good	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	**33% streams 3% 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 =33**	Very 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)	**56% Class 5 & 6 across IP-km**	Good	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	**>90% of IP-km accessible**	Very Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	**50-80% Response Reach Connectivity**	Fair	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Adults	Water Quality	Toxicity	**No Acute or Chronic**	Good	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	**1-20 per IP-km to < low risk spawner density**	Fair	SEC Analysis/CDFG Data	low risk spawner density per Spence (2008)
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor Score = <35**	Very Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	**Risk Factor Score = <35**	Very Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50

Eggs	Sediment	Gravel Quality (Bulk)	**15-17% (0.85mm) and <30% (6.4mm)**	Fair	NMFS Instream Flow Analysis	12-14% (0.85mm) and <30% (6.4mm)
Eggs	Sediment	Gravel Quality (Embeddedness)	**100% of streams/ IP-km (>50% stream average scores of 1 & 2)**	Very Good	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)	**13.3 Key Pieces/100m**	Very Good	NMFS Instream Flow Analysis	6 to 11 key pcs/100m
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	**1.3 to 4 Key Pieces/100m**	Good	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	**33% streams 23% 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	**67% streams 97% IP-km (>30% Pools; >20% Riffles)**	Good	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	**33% streams 3% 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 =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**	Very Good	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	**0 Diversions**	Very Good	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	**100% streams 100% IP-km (>85% average stream canopy)**	Very Good	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>85% average stream canopy)
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	**56% Class 5 & 6 across IP-km**	Good	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)	**100% of streams/ IP-km (>50% stream average scores of 1 & 2)**	Very Good	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)

Summer Rearing Juveniles	Water Quality	Temperature (MWMT)	**50 to 74% IP-km (<20 C MWMT; <16 C MWMT where coho IP overlaps)**	Fair	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	**0.2-0.5 fish/meter^2**	Fair	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)	**13.3 Key Pieces/100m**	Very Good	NMFS Watershed Characterization/CWHR	6 to 11 key pcs/100m
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	**1.3 to 4 Key Pieces/100m**	Good	NMFS Watershed Characterization/CWHR	1.3 to 4 Key Pieces/100 meters
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**67% streams 95% IP-km (>30% Pools; >20% Riffles)**	Good	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	**33% streams 3% IP-km (>80 stream average)**	Poor	CDF Vegetation Maps/BPJ	75% to 90% of streams/ IP-Km (>80 stream average)
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	**100% of IP-km accessible**	Very Good	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	**56% Class 5 & 6 across IP-km**	Good	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)	**100% of streams/ IP-km (>50% stream average scores of 1 & 2)**	Very Good	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	**No Acute or Chronic**	Good	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	**33% streams 3% 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 Diversions**	Very Good	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	**Risk Factor Score = <35**	Very 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	**>90% IP-km (>6 and <14 C)**	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	**<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	**0.233% 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	**2% of Watershed in Timber Harvest**	Very Good	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	**7% 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	**51-74% Historical Species Composition**	Good	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	**5.1 Miles/Square Mile**	Poor	EPA/RWQCB/NMFS Criteria	1.6 to 2.4 Miles/Square Mile
Watershed Processes	Sediment Transport	Streamside Road Density (100 m)	**5.8 Miles/Square Mile**	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

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

Central CA Coast Coho Salmon ~ Caspar 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 enhancement opportunities for the Caspar estuary.

1.1.1.2. **Action Step:** Evaluate water quality conditions.

1.1.1.3. **Action Step:** Evaluate juvenile salmonid usage of the Caspar estuary during the summer and late fall period.

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

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

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

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

3. Restoration- Habitat Complexity

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

3.1.1. **Recovery Action:** Improve frequency of primary pools, LWD, 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 (CDFG 2004).

3.1.1.2. **Action Step:** Install properly sized large woody debris placed and constructed to improve instream shelter ratings.

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

No species-specific actions were developed.

9. Restoration- Sediment

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

9.1.1. **Recovery Action:** Improve instream gravel quality and food productivity.

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

9.1.1.2. **Action Step:** Close unauthorized trails and conduct appropriate decommissioning practices. Hydrologically disconnect trails from associated waterways.

10. Restoration- Viability

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

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

10.1.1.1. **Action Step:** Continue funding of lifecycle station operated by CDFG.

10.1.1.2. **Action Step:** Continue ongoing juvenile sampling efforts in the watershed. Establish consistent reporting methods to ensure ESU-wide consistency.

10.1.2. **Recovery Action:** Increase abundance

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

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:** Reduce turbidity and suspended sediment

11.1.1.1. **Action Step:** Conduct sediment source surveys to identify existing sources of high sediment yield using accepted protocols and develop and implement recommendations to address sources of detrimental sediment input.

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

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

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 habitat complexity

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

19.1.1.2. **Action Step:** Encourage Jackson Demonstration State Forest and USFS to implement restoration projects as part of their ongoing practices in priority stream reaches and where LWD is found lacking.

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

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

19.1.2.2. **Action Step:** New THPs should identify problematic legacy roads within WLPZ's, decommission them, and revegetate the area with appropriate native species.

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

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

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

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

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

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

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

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

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

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

19.2.3.1. **Action Step:** Assign NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004).

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:** Implement the Jackson Demonstration State Forest Road Management Plan.

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

23.1.1.3. **Action Step:** Establish adequate spoils storage sites throughout the watershed so that material from landslides and road maintenance can be stored safely away from coho streams.

23.1.1.4. **Action Step:** Install sediment traps for pretreatment, and a modified culvert system that can act as an efficient detention system.

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

23.1.1.6. **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).

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

23.1.2.1. **Action Step:** Stream crossings should be identified and mapped with the intention of replacement or removal if they cannot pass 100 year flow. Design should include fail safe measures to accommodate culvert overflow without causing massive road fill failures.

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

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

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

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

23.2.1.3. **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 stream hydrology (impaired water flow)

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

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

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

24.1.2.2. **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 water quality (impaired instream temperature)

24.1.3.1. **Action Step:** Protect sources of cool water input from future diversions.

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 ~ Caspar 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	
CaC-CCC-1.1	**Objective**	**Estuary**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
CaC-CCC-1.1.1	Recovery Action	Estuary	Enhance and restore estuary function by improving complex habitat features.										
CaC-CCC-1.1.1.1	Action Step	Estuary	Evaluate enhancement opportunities for the Caspar estuary.	3	10	CalFire, CDFG, Mendocino County, USFS	137.50	137.50				275	Evaluation should include analysis of the historical tidal prism compared to the current prism of the estuary. If breaching occurs it should also be evaluated and a series of recommendations (if necessary) should be proposed. Careful consideration should be given to preservation of historical foundations of the Caspar Saw Mill which is located in the estuary. The estuary is small and potential benefits should be carefully considered. Cost for estuary use is estimated at $273,217/project.
CaC-CCC-1.1.1.2	Action Step	Estuary	Evaluate water quality conditions.	3	10	CDFG, Jackson Demonstration State Forest, Mendocino County, RWQCB, USFS	7.50	7.50				15	Cost estimates may be on the high range and should not exceed this estimate. Sampling in the lagoon should be relatively straight forward due to the relatively small tidal prism of the Caspar estuary. Cost for continuous water quality monitoring is estimated at $5,000/station. Assume a minimum of 3 for the lagoon. Cost estimate does not account for maintenance or data management.
CaC-CCC-1.1.1.3	Action Step	Estuary	Evaluate juvenile salmonid usage of the Caspar estuary during the summer and late fall period.	3	10	CDFG, Jackson Demonstration State Forest, USFS							Coho salmon use of the Caspar estuary during the summer/late fall is unknown. Lagoons are documented to be important rearing habitats for juvenile steelhead and it is possible the Caspar lagoon may serve a similar role as documented by researchers in other central California lagoons. If coho salmon utilization is limited, measures to improve the overall productivity of this habitat feature should be evaluated and enhancement measures proposed. Cost for evaluating juvenile salmonid use of the estuary is accounted for in above action steps.
CaC-CCC-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**										
CaC-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CaC-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	5	CalFire, Jackson Demonstration State Forest, USFS	36.00					36	Cost based on treating 1 mile (assume 1 project/mile in 25% High IP) at a rate of $36,046/mile.
CaC-CCC-2.1.1.2	Action Step	Floodplain Connectivity	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	2	5	CalFire, California Coastal Conservancy, CDFG, Jackson Demonstration State Forest, USFS	62.50					63	Floodplains have incised and it is likely, based on this incision, that undercut banks and other cover/shelter analogs are significantly less functional than under historical conditions. Based on these criteria high velocity refugia are considered marginal. Increased LWD frequencies may provide the winter habitat targeted by this action. Cost based on treating 2.5 miles (assume 1 project/mile in 50% High IP) at a rate of $25,000/mile.
CaC-CCC-2.1.1.3	Action Step	Floodplain Connectivity	Existing areas with floodplains or off channel habitats should be protected from future urban development of any kind.	1	100	CalFire, Jackson Demonstration State Forest, USFS						In-Kind	
CaC-CCC-2.1.1.4	Action Step	Floodplain Connectivity	De-commission elevated road alignments through riparian zones or adjacent to stream channels which functionally limit seasonal floodplain access.	2	10	CalFire, Jackson Demonstration State Forest, USFS	12.00	12.00				24	Cost based on decommissioning 2 miles of riparian road network at a rate of $12,000/mile.
CaC-CCC-3.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
CaC-CCC-3.1.1	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD, and shelter ratings.										
CaC-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 (CDFG 2004).	1	100	CalFire, CDFG, Jackson Demonstration State Forest, USFS						In-Kind	Cost are minimal if passive management of key habitat features are left intact.

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	
CaC-CCC-3.1.1.2	Action Step	Habitat Complexity	Install properly sized large woody debris placed and constructed to improve instream shelter ratings.	1	5	CalFire, CDFG, Jackson Demonstration State Forest, USFS	50.00					50	It is anticipated that significant cost savings (and ecological benefits) would be realized if unsecured woody material (sized at 1.5 to 2 times bankfull) is used over engineered structures. Large woody material should be targeted to reach density and volume outlined in the Viability table in this document. Additional and very significant cost savings would be realized it natural recruitment into the watershed was allowed to stay in place. These actions will improve summer rearing, winter rearing, and smolt survival by increasing instream channel complexity and shelter rating values in potential rearing and migration reaches. Some large woody debris supplementation has already occurred in the watershed. Supplementation programs that are a part of future timber harvest plans may result in significantly reduced costs. Due to the lack of downstream infrastructure in Caspar Creek, unsecured techniques should be used. Cost for treating 2 miles (assume 1 project/mile in 50% High IP) at a rate of $25,000/mile. This action step may be in concert with targeting restoration of winter base flow.
CaC-CCC-9.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
CaC-CCC-9.1.1	Recovery Action	Sediment	Improve instream gravel quality and food productivity.										
CaC-CCC-9.1.1.1	Action Step	Sediment	Permitting agencies (State, Federal, and local) should evaluate all authorized erosion control measures during the winter period.	3	100	CalFire, Campbell Timberland Management, CDFG, Jackson Demonstration State Forest, NMFS, Private Landowners, RPFs, RWQCB, USFS						In-Kind	
CaC-CCC-9.1.1.2	Action Step	Sediment	Close unauthorized trails and conduct appropriate decommissioning practices. Hydrologically disconnect trails from associated waterways.	2	100	CalFire, CDFG, Mendocino County, NMFS, RWQCB						In-Kind	Cost will likely be low since work will likely be absorbed by agency personnel.
CaC-CCC-10.1	**Objective**	**Viability**	**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	
CaC-CCC-10.1.1	Recovery Action	Viability	Increase spatial structure and diversity										
CaC-CCC-10.1.1.1	Action Step	Viability	Continue funding of lifecycle station operated by CDFG.	1	10	CDFG, Jackson Demonstration State Forest	117.50	117.50				235	In 2004/2005, CDFG initiated sampling in the Caspar Creek watershed, according to criteria in an action plan for monitoring California's coastal salmonid populations (Boydstun and McDonald 2005). Under this monitoring scheme, Caspar Creek and two other local streams serve as life cycle monitoring streams to calibrate regional sampling consisting of extensive spawning surveys to estimate escapement. The sampling is based on redd counts selected under a random stratified survey of ten percent of available habitat each year. In the streams that serve as the life cycle stations abundance of adults and smolts are estimated and a complete census of red density is conducted (Gallagher and Wright 2009). Cost based on life cycle monitoring at a cost of $234,600.
CaC-CCC-10.1.1.2	Action Step	Viability	Continue ongoing juvenile sampling efforts in the watershed. Establish consistent reporting methods to ensure ESU-wide consistency.	1	15	CDFG, Jackson Demonstration State Forest, USFS	86.67	86.67	86.67			260	Caspar Creek watershed has been the site of an ongoing, long-term watershed study since 1962, conducted jointly by USFS-PSW and CalFire. Fisheries research has been conducted since the inception of the Caspar Creek study with numerous reports, including information on coho salmon. Burns (1972) evaluated the impacts of logging and road building on juvenile salmonid abundance in four northern California streams from 1966 through 1969, including Caspar Creek. Long term monitoring should continue to ensure a long-term data is collected. Cost based on abundance/distribution at a cost of $129, 391.
CaC-CCC-10.1.2	Recovery Action	Viability	Increase abundance										
CaC-CCC-10.1.2.1	Action Step	Viability	Work with existing permittees to rescue juvenile coho salmon that are under an imminent risk of stranding and mortality and relocate to suitable habitat when deemed appropriate by NMFS and CDFG.	3	100	CDFG, Jackson Demonstration State Forest, NMFS						In-Kind	Inter-agency coordination will continue as part of doing business to rescue juvenile coho salmon until habitat conditions are restored to prevent imminent risk of stranding and mortality.
CaC-CCC-11.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
CaC-CCC-11.1.1	Recovery Action	Water Quality	Reduce turbidity and suspended sediment										

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	
CaC-CCC-11.1.1.1	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	CalFire, Jackson Demonstration State Forest, USFS	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.
CaC-CCC-19.1	**Objective**	**Logging**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
CaC-CCC-19.1.1	Recovery Action	Logging	Prevent impairment to habitat complexity										
CaC-CCC-19.1.1.1	Action Step	Logging	Conduct conifer release to promote growth of larger diameter trees where appropriate.	3	10	CalFire, Jackson Demonstration State Forest, Private Landowners, USFS	57.00	57.00				114	Cost based on treating 1 mile (assume 80 acres/mile in 15% High IP with a minimum of 1 mile) at a rate of $1,422/mile.
CaC-CCC-19.1.1.2	Action Step	Logging	Encourage Jackson Demonstration State Forest and USFS to implement restoration projects as part of their ongoing practices in priority stream reaches and where LWD is found lacking.	2	30	CalFire, CDFG, Jackson Demonstration State Forest, USFS						In-Kind	Recovery actions should focus on retaining instream LWD to improve floodplain connectivity through placement of standard log/boulder habitat structures which can effectively increase holding and rearing habitat and retain instream gravels. Since virtually no infrastructure is present in downstream areas, properly sized trees could be felled into stream channels to create these structures. Retention of instream gravels could ultimately increase bed elevation and enhance stream channel interactions with floodplain areas
CaC-CCC-19.1.2	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CaC-CCC-19.1.2.1	Action Step	Logging	Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.	3	100	CalFire, Campbell Timberland Management, CDFG, Jackson Demonstration State Forest, NMFS, Private Landowners						In-Kind	This recommendation should be considered standard practice.
CaC-CCC-19.1.2.2	Action Step	Logging	New THPs should identify problematic legacy roads within WLPZ's, decommission them, and revegetate the area with appropriate native species.	2	20	CalFire, CDFG, Jackson Demonstration State Forest, NMFS, USFS						In-Kind	This should be considered an appropriate mitigation measure for future timber harvest plans in the watershed.
CaC-CCC-19.1.2.3	Action Step	Logging	Encourage low impact timber harvest techniques such as full-suspension cable yarding (to improve canopy cover; reduce sediment input, etc.).	2	100	CalFire, Jackson Demonstration State Forest, USFS						In-Kind	Timber harvest remains a threat to salmonid habitat in the Caspar Creek, but at diminished levels compared to historical practices. For coho salmon timber harvest was listed as a threat to watershed processes due primarily to road use, road location and density, and the resulting increases in sediment input. Nonetheless, the Caspar Creek watershed is unique in that it is a very well-studied watershed and timber harvest plans receive a high degree of scrutiny and oversight, which may ameliorate impacts compared to timber operations in other watersheds.
CaC-CCC-19.1.3	Recovery Action	Logging	Prevent increased landscape disturbance										
CaC-CCC-19.1.3.1	Action Step	Logging	Conserve and manage forestlands for older forest stages.	2	100	CalFire, Jackson Demonstration State Forest, Private Landowners						In-Kind	
CaC-CCC-19.2	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms.**										
CaC-CCC-19.2.1	Recovery Action	Logging	Prevent increased landscape disturbance										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CaC-CCC-19.2.1.1	Action Step	Logging	Reduce the amount and rate of even aged management.	2	100	CalFire, Jackson Demonstration State Forest, USFS						In-Kind	In 1962, the Caspar Creek Watershed Study was initiated to obtain more information on the effects of logging and road construction on sedimentation and aquatic habitat. The study is a cooperative effort between CalFire and the Pacific Southwest Reach Station Redwood Sciences Laboratory. The study has been conducted in two phases. The South Fork phase was designed as a traditional paired-watershed study and involved monitoring the impacts of road construction and selection harvesting by tractor on stream flow, suspended sediment, and bedload. The North Fork phase was started in the early 1980s and harvest units were logged using primarily skyline cable yarding techniques. Road and landing construction and tractor logging were limited to ridgetop and upper slope locations. Based on this study design, other areas in the watershed are likely targeted for even aged management.
CaC-CCC-19.2.1.2	Action Step	Logging	Discourage Mendocino County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	1	100	Campbell Timberland Management, Jackson Demonstration State Forest, Mendocino County						In-Kind	
CaC-CCC-19.2.2	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
CaC-CCC-19.2.2.1	Action Step	Logging	Extend the monitoring period and upgrade THP road maintenance after harvest.	3	30	CalFire, CDFG, Jackson Demonstration State Forest, Private Landowners, USFS						In-Kind	
CaC-CCC-19.2.2.2	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, Jackson Demonstration State Forest, NMFS, Private Landowners						TBD	Cost of future sampling efforts is dependent on the number, location and frequency of sampling efforts.
CaC-CCC-19.2.2.3	Action Step	Logging	Protect headwater channels with larger buffers to minimize sediment delivery downstream.	2	40	CalFire, Jackson Demonstration State Forest, USFS						In-Kind	This recommendation should be considered standard practice.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
CaC-CCC-19.2.3	Recovery Action	Logging	Prevent impairment to habitat complexity										
CaC-CCC-19.2.3.1	Action Step	Logging	Assign NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004).	2	100	NMFS						In-Kind	
CaC-CCC-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CaC-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate										
CaC-CCC-23.1.1.1	Action Step	Roads/Railroads	Implement the Jackson Demonstration State Forest Road Management Plan.	2	20	CalFire, Jackson Demonstration State Forest						In-Kind	The cost of implementing the plan will likely be low, since the plan already exists and costs will be absorbed into existing management activities.
CaC-CCC-23.1.1.2	Action Step	Roads/Railroads	Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas in historical habitats.	2	10		41.00	41.00				82	Road densities are high throughout the watershed, estimated at 4.9 miles of road per square mile of watershed area and at 5.7 miles per square mile of riparian area. Roads parallel many of the waterways within Caspar Creek and impinge on channel migration. Chronic sediment input from roads is likely a major limiting factor to overall habitat quality. This is a feasible recommendation for the Caspar watershed due to the fact most of the watershed is in timber management and owned by only a few landowners. Riparian roads should be targeted for decommissioning. Cost based on decommissioning 7 miles of road network at a rate of $12,000/mile.
CaC-CCC-23.1.1.3	Action Step	Roads/Railroads	Establish adequate spoils storage sites throughout the watershed so that material from landslides and road maintenance can be stored safely away from coho streams.	3	100	CalFire, Campbell Timberland Management, CDFG, Jackson Demonstration State Forest, Mendocino County Department of Public Works, Private Landowners, USFS						TBD	These areas are likely already established on the JDSF portion of the Caspar watershed.

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	
CaC-CCC-23.1.1.4	Action Step	Roads/Railroads	Install sediment traps for pretreatment, and a modified culvert system that can act as an efficient detention system.	3	10	CalFire, Campbell Timberland Management, Jackson Demonstration State Forest, Private Landowners, USFS						In-Kind	Since the majority of the watershed is in timber management it is anticipated that the majority of these actions will occur as part of future road upgrades and therefore no costs are assigned to this action.
CaC-CCC-23.1.1.5	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.	3	100	CalFire, Campbell Timberland Management, CDFG, Jackson Demonstration State Forest, NMFS, Private Landowners						TBD	Many high priority sites are identified in the JDSF EIR.
CaC-CCC-23.1.1.6	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	2	100	CalFire, Campbell Timberland Management, Jackson Demonstration State Forest, Private Landowners, USFS						In-Kind	NMFS assumes some of the roads in the watershed have been upgraded as part of past timber operations. Costs cannot be estimated until a watershed-wide road inventory is conducted. Unsurfaced roads adjacent to watercourses should be rocked. However, rocked roads adjacent to watercourses should be closed during the winter period if feasible.
CaC-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to watershed hydrology										
CaC-CCC-23.1.2.1	Action Step	Roads/Railroads	Stream crossings should be identified and mapped with the intention of replacement or removal if they cannot pass 100 year flow. Design should include fail safe measures to accommodate culvert overflow without causing massive road fill failures.	2	10	CalFire, Jackson Demonstration State Forest, USFS	24.00	24.00				48	Adopt NMFS (2001) Guidelines for Salmonid Passage at Stream Crossings. Cost for road inventory estimated at $47,277 (assume 75% of total road network)
CaC-CCC-23.2	**Objective**	**Roads/Railroads**	**Address the inadequacy of existing regulatory mechanisms**										
CaC-CCC-23.2.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate										
CaC-CCC-23.2.1.1	Action Step	Roads/Railroads	Licensed engineering geologists should review and approve grading on inner gorge slopes.	3	100	CalFire, Jackson Demonstration State Forest, USFS						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	
CaC-CCC-23.2.1.2	Action Step	Roads/Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized individuals and impacting uses to decrease fine sediment loads.	2	100	CalFire, Campbell Timberland Management, Jackson Demonstration State Forest, Private Landowners, Public, USFS						In-Kind	
CaC-CCC-23.2.1.3	Action Step	Roads/Railroads	Avoid new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.	1	100	CalFire, California Geological Survey, Jackson Demonstration State Forest, Private Landowners						In-Kind	Costs likely to be incurred as part of timber harvest operations. However, in some circumstances this may be a stand alone cost.
CaC-CCC-24.1	**Objective**	**Severe Weather Patterns**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
CaC-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to stream hydrology (impaired water flow)										
CaC-CCC-24.1.1.1	Action Step	Severe Weather Patterns	CDFG, SWRCB, RWQCB, CalFire, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon during droughts.	2	100	CalFire, Jackson Demonstration State Forest, RWQCB, SWRCB, USFS						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.
CaC-CCC-24.1.2	Recovery Action	Severe Weather Patterns	Reduce turbidity and suspended sediment										
CaC-CCC-24.1.2.1	Action Step	Severe Weather Patterns	Patterns of water runoff, including surface and subsurface drainage, should match, to the greatest extent possible, the natural hydrologic pattern for the watershed in timing, quantity, and quality.	2	100	CalTrans, Campbell Timberland Management, Jackson Demonstration State Forest, Mendocino County, USFS						In-Kind	
CaC-CCC-24.1.2.2	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	20	CalFire, Jackson Demonstration State Forest, USFS						TBD	Sediment assessment should identify high-risk shallow-seeded landslide areas. Cost for protective measures cannot be determined until prioritization of landslide areas is identified.

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	
CaC-CCC-24.1.3	Recovery Action	Severe Weather Patterns	Prevent impairment to water quality (impaired instream temperature)										
CaC-CCC-24.1.3.1	Action Step	Severe Weather Patterns	Protect sources of cool water input from future diversions.	1	100	CalFire, CDFG, Jackson Demonstration State Forest, SWRCB, USFS						In-Kind	