Big River

Location	•Mendocino County
Watershed Area	•181 Square Miles
Potential Habitat	•214.8 Stream Miles
Vegetation	•64% Coniferous •14% Montane Hardwood
Erodability	•Moderately-High to High
Ownership Patterns	•77% Private, 23% Public
Dominant Land Uses	•Timber
Housing Density	•Moderate
TMDL Pollutants	•Sediment, Temperature

Historical stream conditions in Big River watershed
Photo courtesy of Alan Grass

Big River Coho Salmon: Persistent – low abundance

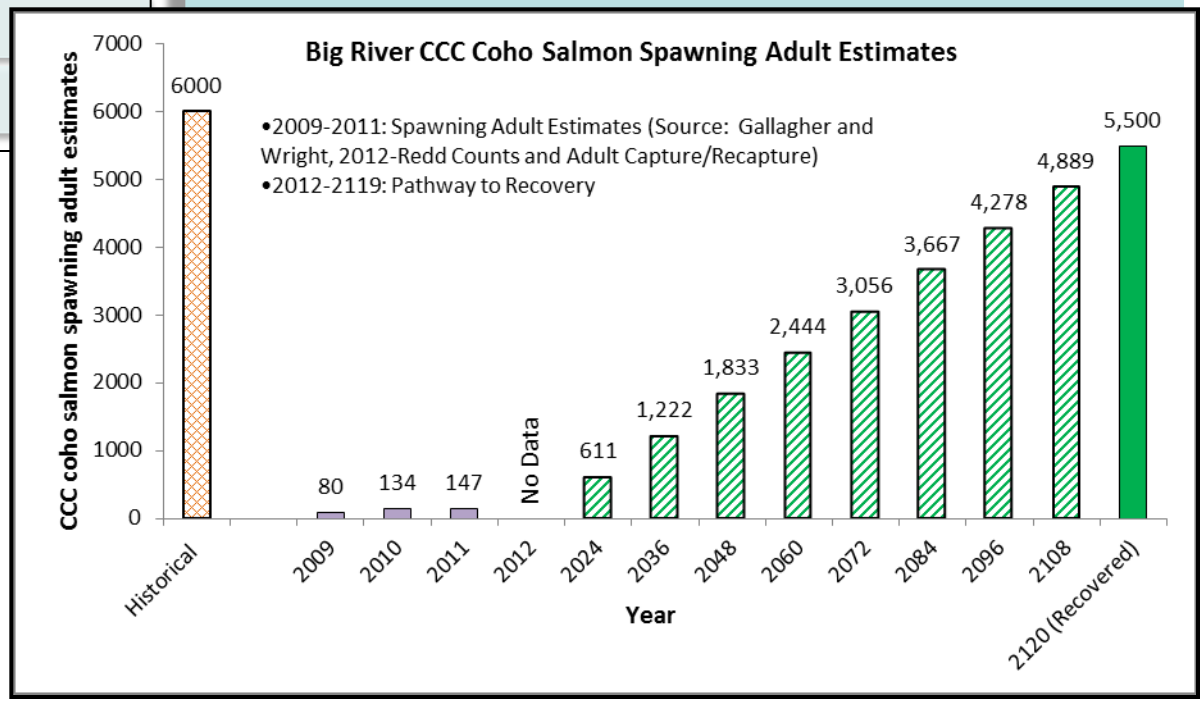
Recovery Goals

✓ Conduct spawner and/or juvenile surveys

Big River
Adult Spawner Targets

Downlisting to Threatened
2,750

Recovery
5,500



STEELHEAD: YES
CHINOOK SALMON: YES

Big River

Potential Habitat: 214.8 miles
Recovery Target: 5,500 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	POOR	POOR	GOOD	POOR	GOOD

Preventing Extinction & Improving Conditions

Priority 1: Immediate Restoration Actions

- Promote restoration projects to create or restore off channel habitats
- Retain, recruit and actively input large wood into streams
- Eliminate depletion of summer flows
- Modify two barriers on James Creek
- Develop riparian improvement projects
- Develop a sediment reduction plan

Priority 2 & 3: Long-Term Restoration Actions

- Encourage landowners to implement restoration projects as part of ongoing operations
- Protect and re-vegetate the native riparian plant community within inset floodplains and riparian corridors
- Address road network to minimize rate of sediment input

Recovery Partners

Jackson Demonstration State Forest,
CDFG

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

Big River

Potential Habitat: 214.8 miles
Recovery Target: 5,500 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	MEDIUM	LOW	NA	LOW	MEDIUM	NA	LOW	LOW	HIGH	HIGH	MEDIUM

Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- Address season of diversion, off-stream reservoirs, and bypass flows to be more protective of coho salmon

Priority 2 & 3: Long-Term Threat Abatement Actions

- Minimize increased landscape disturbance from timber harvest
- Develop a Road Sediment Reduction Plan
- Develop critical flow values to support to support juvenile rearing
- Conservation programs should be initiated to reduce current and future rates of water consumption.

Improved culvert crossing of James Creek.
Photo courtesy of Mendocino County.

Conservation Highlights

- California State Parks, Blencowe Forestry, Trout Unlimited (TU), and the NOAA Restoration Center collaborated on placement of large woody debris in the watershed.
- Mendocino Redwood Company, the Conservation Fund, California State Parks, and Coastal Ridges have upgraded roads, and improved passage at undersized and poorly designed crossings.

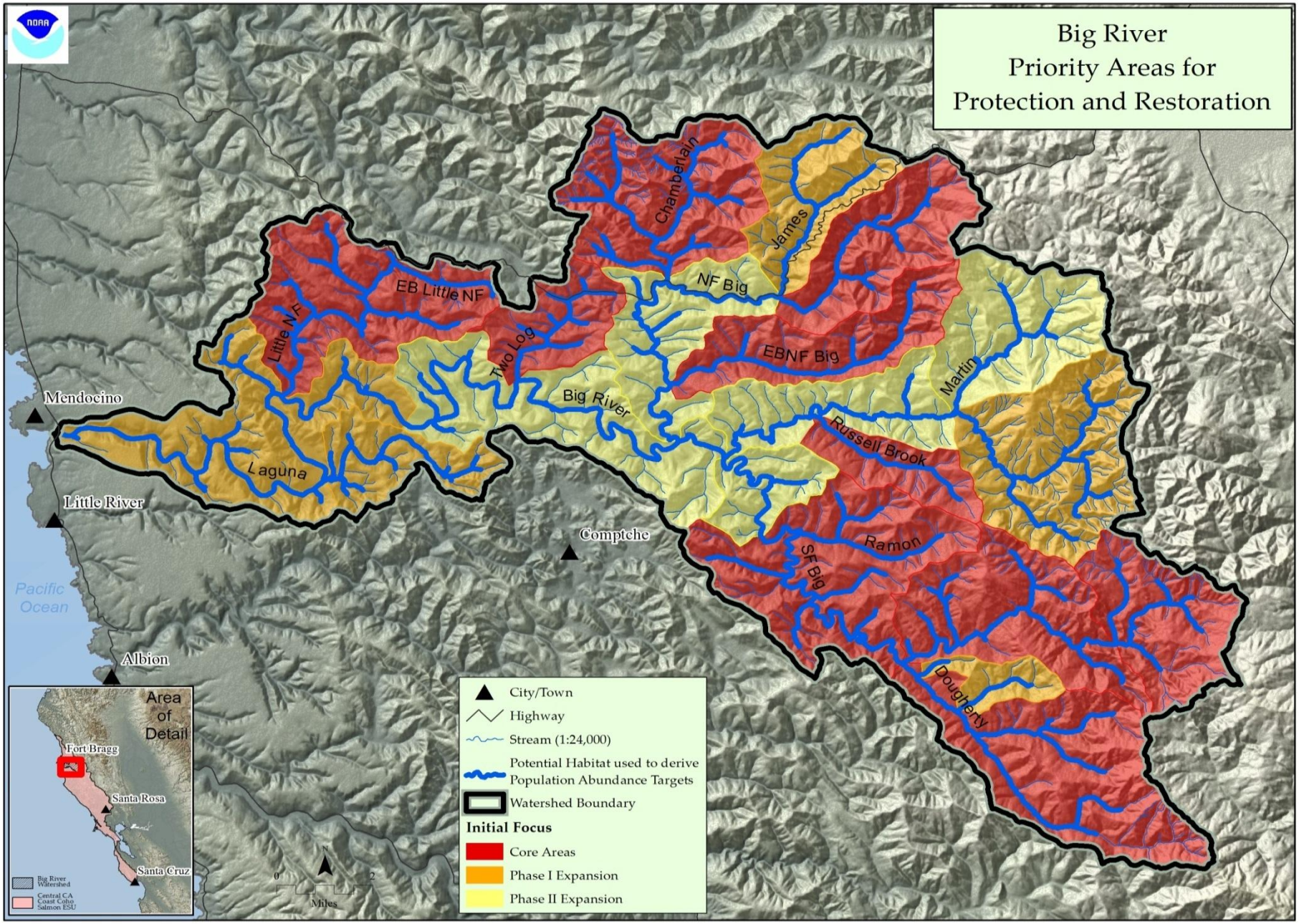


Figure 1: Map of Big River

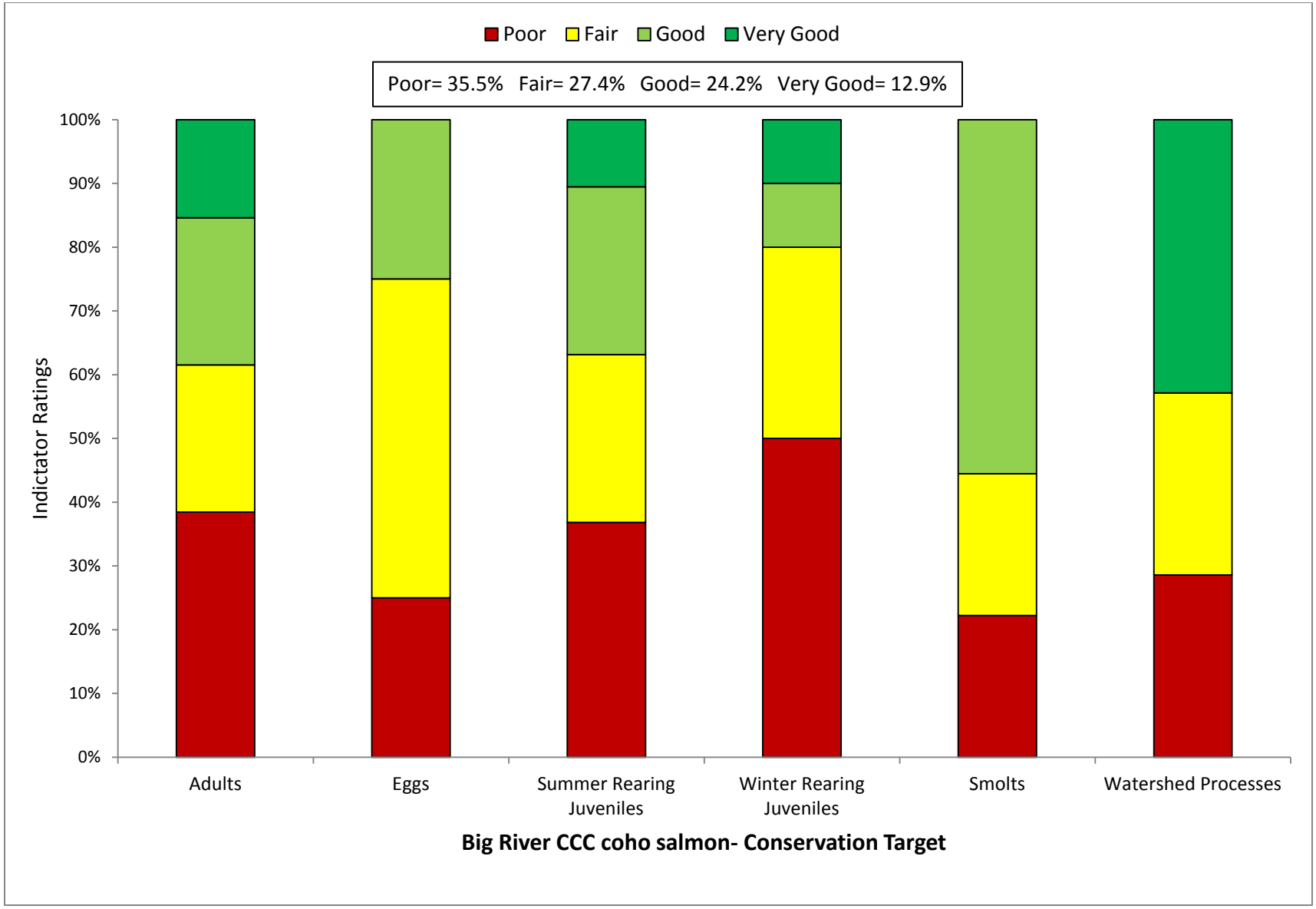


Figure 2 Viability Results by Lifestage

Table 1: CAP Viability Results ~ Big River

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	**<4 Key Pieces/100m**	Poor	NMFS Expert Estuary/Lagoon Panel	6 to 11 key pcs/100m
Adults	Habitat Complexity	Large Wood Frequency (BFW 10-100 meters)	**<1 Key Pieces/100m**	Poor	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**<5% of streams/ IP-km (>30% Pools; >20% Riffles)**	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	**<50% of streams/ IP-km (>80 stream average)**	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>80 stream average)
Adults	Hydrology	Passage Flows	**Risk Factor Score =42**	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	**99.1% 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)	**40% Class 5 & 6 across IP-km**	Fair	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% IP-km to 90% IP-km accessible**	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 spawners per IP-km**	Poor	SEC Analysis/CDFG Data	low risk spawner density per Spence (2008)
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor score =42**	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	**Risk Factor Score 51-75**	Fair	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)	**47% streams; 51% 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)	**4.26 Key Pieces/100m**	Fair	NMFS Instream Flow Analysis	6 to 11 key pcs/100m
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	**0.32% Key Pieces/ 100m**	Poor	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	**10% streams; 24% 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	**<53% streams/ 43% IP-km (>30% Pools; >20% Riffles)**	Poor	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Summer Rearing Juveniles	Habitat Complexity	Shelter Rating	**7% of streams/ IP-km (>80 stream average)**	Poor	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>80 stream average)
Summer Rearing Juveniles	Hydrology	Flow Conditions (Baseflow)	**Risk Factor Score =75**	Fair	NMFS Instream Flow Analysis	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Flow Conditions (Instantaneous Condition)	**Risk Factor Score =42**	Good	NMFS Watershed Characterization	NMFS Flow Protocol: Risk Factor Score 35-50
Summer Rearing Juveniles	Hydrology	Number, Condition and/or Magnitude of Diversions	**0.03 Diversions/10 IP-km**	Good	NMFS Watershed Characterization	0.01 - 1 Diversions/10 IP km
Summer Rearing Juveniles	Passage/Migration	Passage at Mouth or Confluence	**75% of IP-km to 90% of IP-km accessible**	Good	NMFS Watershed Characterization	75% of IP-Km to 90% of IP-km
Summer Rearing Juveniles	Passage/Migration	Physical Barriers	**>90% 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	**46% of streams/ IP-km (>85% average stream canopy)**	Poor	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)	**40 - 54% Class 5 & 6 across IP-km**	Fair	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)	**43% of streams/ IP-km (>50% stream average scores of 1 & 2)**	Poor	SEC or PAD/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)

Summer Rearing Juveniles	Water Quality	Temperature (MWMT)	**<50% IP-km (<16 C MWMT)**	Poor	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	**>90% of streams/ IP-km maintains severity score of 3 or lower**	Very Good	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Summer Rearing Juveniles	Viability	Density	**0.2-0.6 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)	**4.26 Key Pieces/100m**	Fair	NMFS Watershed Characterization/CWHR	6 to 11 key pcs/100m
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	**<50% of IPkm meets LWD target**	Poor	NMFS Watershed Characterization/CWHR	1.3 to 4 Key Pieces/100 meters
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	**<50% of streams/ IP-km (>30% Pools; >20% Riffles)**	Poor	NMFS Watershed Characterization/CWHR	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Winter Rearing Juveniles	Habitat Complexity	Shelter Rating	**<50% of streams/ IP-km (>80 stream average)**	Poor	CDF Vegetation Maps/BPJ	75% to 90% of streams/ IP-Km (>80 stream average)
Winter Rearing Juveniles	Passage/Migration	Physical Barriers	**>90% 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)	**40 - 54% Class 5 & 6 across IP-km**	Fair	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)	**43% of 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	**<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% to 74% of streams/ IP-km maintains severity score of 3 or lower**	Fair	NMFS Watershed Characterization	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower

Smolts	Estuary/Lagoon	Quality & Extent	**Impaired but functioning**	Fair	SEC Analysis/CDFG Data	Properly Functioning Condition
Smolts	Habitat Complexity	Shelter Rating	**<50% of streams/ IP-km (>80 stream average)**	Poor	Population Profile	75% to 90% of streams/ IP-Km (>80 stream average)
Smolts	Hydrology	Number, Condition and/or Magnitude of Diversions	**0.03 Diversions/10 IP-km**	Good	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	**Risk Factor Score =42**	Good	TRT Spence (2008)	NMFS Flow Protocol: Risk Factor Score 35-50
Smolts	Passage/Migration	Passage at Mouth or Confluence	**75% of IP-km to 90% of IP-km accessible**	Good	TRT Spence (2008)	75% of IP-Km to 90% of IP-km
Smolts	Smoltification	Temperature	**75-90% IP-Km (>6 and <16 C)**	Good	TRT Spence (2008)	75-90% IP-Km (>6 and <16 C)
Smolts	Water Quality	Toxicity	**No Acute or Chronic**	Good	TRT Spence (2008)	No Acute or Chronic
Smolts	Water Quality	Turbidity	**50% to 74% of streams/ IP-km maintains severity score of 3 or lower**	Fair	EPA/RWQCB/NMFS Criteria	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Smolts	Viability	Abundance	**Abundance leading to high risk spawner density = 0**	Poor	Newcombe and Jensen 2003	Smolt abundance to produce low risk spawner density per Spence (2008)
Watershed Processes	Hydrology	Impervious Surfaces	**<1% 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	**26-35% of Watershed in Timber Harvest**	Fair	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	**<1% of watershed >1 unit/20 acres**	Very Good	EPA/RWQCB/NMFS Criteria	8-11% of watershed >1 unit/20 acres
Watershed Processes	Riparian Vegetation	Species Composition	**25-50% Historical Species Composition**	Fair	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	**6.3 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)	**8.7 Miles/Square Mile**	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

Table 2: CAP Threats Results ~ Big River

	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	Medium	Low	Medium	Medium
3	Disease, Predation and Competition	Low	-	Medium	Low	Low	Low	Low
4	Fire, Fuel Management and Fire Suppression	Low	Low	Medium	Low	Low	Medium	Medium
5	Fishing and Collecting	Low	-	Low	-	Low	-	Low
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	Medium	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	Low	Low
12	Roads and Railroads	Low	High	Medium	Medium	Low	High	High
13	Severe Weather Patterns	Medium	High	Medium	Medium	Low	High	High
14	Water Diversion and Impoundments	Medium	Low	Medium	Low	Medium	Low	Medium
	Threat Status for Targets and Project	Medium	High	High	Medium	Medium	High	High

Central CA Coast Coho Salmon ~ Big River

ACTIONS FOR RESTORING HABITATS

1. Restoration- Estuary

No species-specific actions were developed.

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

2.1.1.3. **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:** Improve frequency of primary pools, LWD, and shelter ratings.

3.1.1.1. **Action Step:** Identify historic CCC coho salmon habitats lacking in channel complexity, and promote restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover. Prioritize Core areas first followed by Phase I areas.

3.1.1.2. **Action Step:** Fund a watershed coordinator.

3.1.1.3. **Action Step:** Install properly sized large woody debris to meet targets specified in recovery plan.

3.1.1.4. **Action Step:** Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.

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

3.1.2.1. **Action Step:** Increase the frequencies to 75% of the streams within the watershed

4. Restoration- Hydrology

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

4.1.1. **Recovery Action:** Reduce the number, conditions, and/or magnitude of diversions

4.1.1.1. **Action Step:** Identify and eliminate depletion of summer base flows from unauthorized water uses.

4.1.1.2. **Action Step:** Improve coordination between agencies and others to address the season of water diversions, off-stream reservoirs, and bypass flows to better protect coho salmon and their habitats (CDFG 2004).

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

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

4.1.2. **Recovery Action:** Reduce the number, conditions, and/or magnitude of diversions

4.1.2.1. **Action Step:** Assess and map water diversions (CDFG 2004).

4.1.2.2. **Action Step:** Request that SWRCB review and/or modify water use based on the needs of coho salmon and authorized diverters (CDFG 2004).

4.1.2.3. **Action Step:** Require streamflow gauging devices to determine the current streamflow condition.

5. Restoration- Landscape Patterns

No species-specific actions were developed.

6. Restoration- Passage

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

6.1.1. **Recovery Action:** Modify or remove physical passage barriers

6.1.1.1. **Action Step:** Modify two barriers on James Creek. One barrier is one-half mile from the mouth of James Creek and is a bedrock cascade that needs modification for adult coho salmon passage. The second barrier is on the North Fork of James Creek and is located where Highway 20 encroaches on the stream channel and has created a barrier.

6.1.1.2. **Action Step:** Identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a).

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

8.1.1.2. **Action Step:** Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to ameliorate instream temperature and provide a source of future large woody debris recruitment.

8.1.1.3. **Action Step:** Ensure that adequate streamside protection measures are implemented to provide shade canopy and reduce heat inputs to the North and South Forks Big River, mainstem Big River, and Daugherty Creek.

8.1.1.4. **Action Step:** Develop riparian improvement projects along James Creek to increase canopy levels.

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:** Develop a Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with survey focused on slides and other non-road related sediment sources in the watershed.

9.1.1.2. **Action Step:** Treat high priority slides and landings identified in credible landowner assessments. Focus efforts in the South Daugherty and Chamberlain Creek subbasins.

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

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:** Conduct monitoring activities to determine the population status of adult and salmonid smolts in Core and Phase 1 areas.

10.1.1.2. **Action Step:** Implement standardized assessment protocols (i.e., CDFG habitat assessment protocols) to ensure ESU-wide consistency. Prioritize Core tributaries first, followed by Phase I and Phase II areas as appropriate.

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:** Improve stream temperature conditions

11.1.1.1. **Action Step:** Plant native vegetation to promote streamside shade where otherwise deficient. Focus on tributaries in the Middle and Inland subbasins that do not meet canopy target of 70 percent. Use CDFG habitat typing data/reports to determine tributaries that do not meet canopy target.

11.1.1.2. **Action Step:** Promote streamside conservation measures, including conservation easements, setbacks, and increased riparian buffers (CDFG 2004).

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 inadequacy of existing regulatory mechanisms.

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

19.1.1.1. **Action Step:** Establish greater oversight for pre and post-harvest monitoring by the permitting agency for operations within Core, Phase I and Phase II CCC coho salmon areas.

19.1.1.2. **Action Step:** Assign NMFS staff to conduct THP reviews of the highest priority areas.

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

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

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/food productivity (impaired gravel quality and quantity)

23.1.1.1. **Action Step:** Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions.

23.1.1.2. **Action Step:** Continue efforts such as road improvements, and decommissioning to reduce sediment delivery to Big River and its tributaries. CDFG stream surveys indicated Kidwell Gulch, Two Log Creek, and Saurkraut Creek have road sediment inventory and control as a top tier tributary improvement recommendation.

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:** Limit winter use of unsurfaced roads and recreational trails by unauthorized users to decrease fine sediment loads.

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

24. Threat- Severe Weather Patterns

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

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

24.1.1.1. **Action Step:** During Drought years CDFG, SWRCB, RWQCB, CalFire, Caltrans, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting that could impact coho salmon. These agencies should use existing regulations or other mechanisms to minimize water use during the summer months.

24.1.1.2. **Action Step:** Develop critical flow values that are the basis for minimum bypass flow requirements to support juvenile rearing habitat conditions in the summer and fall months. Focus stream gaging efforts on the South Fork Big River.

24.1.1.3. **Action Step:** Critical flow values should include minimum bypass flow requirements to support upstream adult migration during winter months and juvenile rearing in the summer and fall months.

24.1.1.4. **Action Step:** If predicted flows are below a level considered critical to maintain habitat conditions for coho salmon, measures to reduce water consumption should be initiated by users in the watershed through conservation programs.

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 ~ Big River

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	
BR-CCC-2.1	**Objective**	**Floodplain Connectivity**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range.**										
BR-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
BR-CCC-2.1.1.1	Action Step	Floodplain Connectivity	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	10	CDFG, MMWD, SPAWN	50.00	50.00				100	Existing program (e.g. SPAWN) could be expanded at minimal cost. Estimate additional monitoring costs at $10K/year.
BR-CCC-2.1.1.2	Action Step	Floodplain Connectivity	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	3	10	California Coastal Conservancy, CDFG, Jackson Demonstration State Forest, Mendocino Redwood Company, NMFS, Private Landowners, RWQCB, State Parks						TBD	Costs depend on level of technical assistance required and types of projects proposed. Many salmon recovery efforts and management programs are currently ongoing. It is possible that there could be additional salmon restoration costs identified based on recovery needs of the species; however, at this time we do no have sufficient information to estimate those potential costs or identify the actions under which they might fall.
BR-CCC-2.1.1.3	Action Step	Floodplain Connectivity	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	20	California Coastal Conservancy, CDFG, Jackson Demonstration State Forest, Mendocino Redwood Company, NOAA RC, Private Landowners, State Parks, Trout Unlimited						TBD	Initiate projects should target stream reaches with high IP-km values, however, consideration should be also given to mainstem Big River, particularly mainstem reaches above the estuary.
BR-CCC-3.1	**Objective**	**Habitat Complexity**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
BR-CCC-3.1.1	Recovery Action	Habitat Complexity	Improve frequency of primary pools, LWD, and shelter ratings.										

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	
BR-CCC-3.1.1.1	Action Step	Habitat Complexity	Identify historic CCC coho salmon habitats lacking in channel complexity, and promote restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover. Prioritize Core areas first followed by Phase I areas.	2	10	California Coastal Conservancy, CDFG, Mendocino Land Trust, Mendocino Redwood Company, NOAA RC, Private Landowners, State Parks	56.00	56.00				112	These data would be most effective if combined into a central repository and restoration projects were prioritized according to highest restoration priority. Cost for fish/habitat monitoring is estimated at $111,192/project.
BR-CCC-3.1.1.2	Action Step	Habitat Complexity	Fund a watershed coordinator.	2	10	California Coastal Conservancy, CDFG, Jackson Demonstration State Forest, Mendocino County, Mendocino County Fish and Wildlife Advisory Board, RCD, RWQCB, State Parks, Trout Unlimited	300.00	300.00				600	Currently, Big River is managed by five or six larger landowners - including State, private, and non-profit. A coordinator is likely necessary to focus actions and resources in key areas and to apply for grants that will span multiple landowners.
BR-CCC-3.1.1.3	Action Step	Habitat Complexity	Install properly sized large woody debris to meet targets specified in recovery plan.	1	20	California Coastal Conservancy, CDFG, Jackson Demonstration State Forest, Mendocino Land Trust, Mendocino Redwood Company, NOAA RC, Private Landowners, State Parks, UC Extension	225.00	225.00	225.00	225.00		900	Cost based on treating 36 miles (assume 50% High IP) at a rate of $25,000/mile. Costs may vary significantly due to access, varying paucity of large wood between sub-watersheds, and installation techniques. Much of Big River has been habitat typed and thus the stream reaches lacking wood can be readily identified. Permitting should be streamlined because of programmatic biological opinions for these types of actions. Many key areas in Big River have been targeted for LWD enhancement through the MRC HCP and on JDSF and total costs may be significantly less than projected.

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	
BR-CCC-3.1.1.4	Action Step	Habitat Complexity	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	2	60	CalFire, CDFG, Mendocino County, Mendocino County Department of Public Works, Mendocino Land Trust, Mendocino Redwood Company, NOAA RC, Private Landowners, RWQCB, State Parks						In-Kind	Costs will vary with site specific conditions (such as access and availability of materials). However, significant cost saving could result if projects are implemented when other land management action are planned.
BR-CCC-3.1.2	Recovery Action	Habitat Complexity	Improve pool/riffle/flatwater ratios (hydraulic diversity)										
BR-CCC-3.1.2.1	Action Step	Habitat Complexity	Increase the frequencies to 75% of the streams within the watershed	2	20	Campbell Timberland Management, CDFG, NMFS, NOAA RC, Private Landowners						TBD	Cost should be accounted for in increase LWD frequency and primary pools.
BR-CCC-4.1	**Objective**	**Hydrology**	**Address the inadequacy of existing regulatory mechanisms**										
BR-CCC-4.1.1	Recovery Action	Hydrology	Reduce the number, conditions, and/or magnitude of diversions										
BR-CCC-4.1.1.1	Action Step	Hydrology	Identify and eliminate depletion of summer base flows from unauthorized water uses.	1	20	CDFG, CDFG Law Enforcement, NMFS OLE, Private Landowners, SWRCB						TBD	
BR-CCC-4.1.1.2	Action Step	Hydrology	Improve coordination between agencies and others to address the season of water diversions, off-stream reservoirs, and bypass flows to better protect coho salmon and their habitats (CDFG 2004).	2	10	CDFG, NMFS, Private Landowners, SWRCB, USFWS						In-Kind	Cost of additional coordination is expected to be minimal.
BR-CCC-4.1.1.3	Action Step	Hydrology	Require compliance with the most recent update of NMFS' Water Diversion Guidelines.	2	60	NMFS, NMFS OLE, Private Landowners, SWRCB						TBD	Further analysis is needed to determine cost to landowners to comply with guidelines for new diversions.
BR-CCC-4.1.1.4	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	1	10	NOAA RC, Private Landowners, RCD, SWRCB						TBD	Focus on Landowners in the South Fork Big River subbasin.

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	
BR-CCC-4.1.2	Recovery Action	Hydrology	Reduce the number, conditions, and/or magnitude of diversions										
BR-CCC-4.1.2.1	Action Step	Hydrology	Assess and map water diversions (CDFG 2004).	2	2	CDFG, NMFS, SWRCB	20.00					20	Rough cost estimate for Big River watershed only. This exercise should include Riparian and Appropriative diversions. The majority of the estimated cost would result from attempting to identify unreported Riparian diversions.
BR-CCC-4.1.2.2	Action Step	Hydrology	Request that SWRCB review and/or modify water use based on the needs of coho salmon and authorized diverters (CDFG 2004).	2	10	SWRCB						TBD	Additional analysis needed.
BR-CCC-4.1.2.3	Action Step	Hydrology	Require streamflow gauging devices to determine the current streamflow condition.	2	10	NMFS, SWRCB, USGS	150.00	150.00				300	Cost based on 30k per year for two stations. This information could provide baseline information that would be useful in evaluating changes to baseflow over time.
BR-CCC-6.1	**Objective**	**Passage**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
BR-CCC-6.1.1	Recovery Action	Passage	Modify or remove physical passage barriers										
BR-CCC-6.1.1.1	Action Step	Passage	Modify two barriers on James Creek. One barrier is one-half mile from the mouth of James Creek and is a bedrock cascade that needs modification for adult coho salmon passage. The second barrier is on the North Fork of James Creek and is located where Highway 20 encroaches on the stream channel and has created a barrier.	1	5	CDFG, Jackson Demonstration State Forest, NMFS HCD, NMFS PRD	300.00					300	Cost based on providing passage at the mouth of James Creek at a rate of $98,633/unit and passage at Highway 20 at a rate of $197,266/unit.
BR-CCC-6.1.1.2	Action Step	Passage	Identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a).	2	20							TBD	Cost could be partially accounted for in fish/habitat monitoring. A total of 8 impassable barriers are currently known.
BR-CCC-8.1	**Objective**	**Riparian**	**Address the present or threatened destruction, modification or curtailment of the species habitat or range**										
BR-CCC-8.1.1	Recovery Action	Riparian	Improve canopy cover										

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	
BR-CCC-8.1.1.1	Action Step	Riparian	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	3	20	CDFG, Coastal Ridges, Conservation Fund, Mendocino Redwood Company, Private Landowners, Redwood Forest Foundation, State Parks, The Nature Conservancy						TBD	Cost cannot be estimated because overall amount of landowner participation is unknown (particularly for conservation easements).
BR-CCC-8.1.1.2	Action Step	Riparian	Promote the re-vegetation of the native riparian plant community within inset floodplains and riparian corridors to ameliorate instream temperature and provide a source of future large woody debris recruitment.	2	20	CalFire, CalTrans, Conservation Fund, Mendocino County, Mendocino Land Trust, Mendocino Redwood Company, NMFS, NRCS, Private Landowners, RWQCB, State Parks	803	803	803	803		3,210	Particular attention should be directed at implementing this action along mainstem Big River. Mainstem temperatures are very warm, particularly in the lower reaches, and it will take a considerable time to grow the riparian canopy to sufficient size to add in overall stream shading. Cost based on treating 2 miles (assume 80 acres/mile in 5% High IP) at a rate of $20,057/acre.
BR-CCC-8.1.1.3	Action Step	Riparian	Ensure that adequate streamside protection measures are implemented to provide shade canopy and reduce heat inputs to the North and South Forks Big River, mainstem Big River, and Daugherty Creek.	2		CalFire, Private Landowners						In-Kind	
BR-CCC-8.1.1.4	Action Step	Riparian	Develop riparian improvement projects along James Creek to increase canopy levels.	2	20	CDFG, Jackson Demonstration State Forest, NOAA RC, Trout Unlimited	400.00	400.00	400.00	400.00		1,600	Recommendation from DFG coastal watershed report. Cost based on treating 1 mile (assume 80 acres/mile in 5% High IP with a 1 mile minimum) at a rate of $20,057/acre.
BR-CCC-9.1	**Objective**	**Sediment**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range.**										
BR-CCC-9.1.1	Recovery Action	Sediment	Improve instream gravel quality and food productivity.										

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	
BR-CCC-9.1.1.1	Action Step	Sediment	Develop a Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with survey focused on slides and other non-road related sediment sources in the watershed.	1	5	CalFire, Coastal Ridges, Conservation Fund, Jackson Demonstration State Forest, Mendocino County, Mendocino Redwood Company, NMFS, Private Landowners, RWQCB, USEPA						TBD	This sediment reduction plan could be part of a larger road and sediment reduction plan. This plan should tier off recommendations in the Big River TMDL.
BR-CCC-9.1.1.2	Action Step	Sediment	Treat high priority slides and landings identified in credible landowner assessments. Focus efforts in the South Daugherty and Chamberlain Creek subbasins.	2		CDFG, NOAA RC, Private Landowners, Trout Unlimited						TBD	A sediment assessment will identify high priority slides and landings.
BR-CCC-9.1.1.3	Action Step	Sediment	Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.	2	60	CDFG, Conservation Fund, Jackson Demonstration State Forest, Mendocino County, Mendocino County Department of Public Works, RWQCB, State Parks	250.00	250.00	250.00	250.00	250.00	3,000	This infrastructure is likely present in much of the Big River subwatersheds. Additional sites may be installed as part of the timber harvest plan process and the cost for construction will likely be absorbed on a harvest plan by harvest plan basis. Ongoing maintenance will likely occur as part of yearly evaluation prior to the winter period. Maintenance costs are estimated at $50,000/yr. Most of these costs are not anticipated to be additional costs to landowners but should be viewed as expenses incurred for maintenance of existing infrastructure.
BR-CCC-10.1	**Objective**	**Viability**	**Address the inadequacy of existing regulatory mechanisms.**										
BR-CCC-10.1.1	Recovery Action	Viability	Increase spatial structure and diversity										
BR-CCC-10.1.1.1	Action Step	Viability	Conduct monitoring activities to determine the population status of adult and salmonid smolts in Core and Phase 1 areas.	2	12	CDFG, Conservation Fund, Jackson Demonstration State Forest, Mendocino Redwood Company, NMFS, Private Landowners, State Parks	83.33	83.33	33.33			200	Cost may total on 100k per year for both adult and smolt surveys. However, due to other monitoring efforts in adjacent diversity stratum watersheds - Noyo in particular - monitoring in Big River may be of a lesser intensity. Monitoring in the Big River watershed should be closely coordinated and complementary with other ongoing monitoring efforts in the Lost Coast Diversity Stratum. Cost for annual spawning ground survey for N. Central Coast diversity stratum estimated at $16,650/year.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25	Entire Duration	
BR-CCC-10.1.1.2	Action Step	Viability	Implement standardized assessment protocols (i.e., CDFG habitat assessment protocols) to ensure ESU-wide consistency. Prioritize Core tributaries first, followed by Phase I and Phase II areas as appropriate.		10	CDFG, Mendocino Redwood Company, Private Landowners						In-Kind	
BR-CCC-10.1.2	Recovery Action	Viability	Increase abundance										
BR-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, Mendocino Redwood Company, NMFS, Private Landowners						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.
BR-CCC-11.1	**Objective**	**Water Quality**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
BR-CCC-11.1.1	Recovery Action	Water Quality	Improve stream temperature conditions										
BR-CCC-11.1.1.1	Action Step	Water Quality	Plant native vegetation to promote streamside shade where otherwise deficient. Focus on tributaries in the Middle and Inland subbasins that do not meet canopy target of 70 percent. Use CDFG habitat typing data/reports to determine tributaries that do not meet canopy target.	2	10	CDFG, Mendocino Redwood Company, Private Landowners, RCD, Trout Unlimited							Cost accounted for in RIPARIAN.
BR-CCC-11.1.1.2	Action Step	Water Quality	Promote streamside conservation measures, including conservation easements, setbacks, and increased riparian buffers (CDFG 2004).	3	100	Campbell Timberland Management, CDFG, NOAA RC, Trout Unlimited						In-Kind	
BR-CCC-19.1	**Objective**	**Logging**	**Address the inadequacy of existing regulatory mechanisms.**										
BR-CCC-19.1.1	Recovery Action	Logging	Prevent increased landscape disturbance										
BR-CCC-19.1.1.1	Action Step	Logging	Establish greater oversight for pre and post-harvest monitoring by the permitting agency for operations within Core, Phase I and Phase II CCC coho salmon areas.	3								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	
BR-CCC-19.1.1.2	Action Step	Logging	Assign NMFS staff to conduct THP reviews of the highest priority areas.	1	20	NMFS PRD						In-Kind	
BR-CCC-19.1.1.3	Action Step	Logging	Extend the monitoring period and upgrade THP road maintenance after harvest.	3								In-Kind	
BR-CCC-19.1.1.4	Action Step	Logging	Discourage Counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	3								In-Kind	
BR-CCC-23.1	**Objective**	**Roads/Railroads**	**Address the present or threatened destruction, modification, or curtailment of the species habitat or range**										
BR-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
BR-CCC-23.1.1.1	Action Step	Roads/Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions.	2	10	CalFire, California Geological Survey, Conservation Fund, Jackson Demonstration State Forest, Mendocino County, Mendocino Land Trust, Mendocino Redwood Company, RWQCB, State Parks	295.00	295.00				590	This plan should leverage the Big River TMDL. If most of the TMDL recommendations are adopted the total cost of this plan would likely be significantly less than that estimated here. Cost for road inventory is estimated at $927/mile (assume 50% of road network).
BR-CCC-23.1.1.2	Action Step	Roads/Railroads	Continue efforts such as road improvements, and decommissioning to reduce sediment delivery to Big River and its tributaries. CDFG stream surveys indicated Kidwell Gulch, Two Log Creek, and Saurkraut Creek have road sediment inventory and control as a top tier tributary improvement recommendation.	3								TBD	
BR-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).	2	10		19.00	19.00				38	Cost based on decommissioning 3.1 miles of riparian road network at a rate of $12,000/mile. If upgraded, cost would be $65,534.
BR-CCC-23.1.1.4	Action Step	Roads/Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized users to decrease fine sediment loads.	3								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	
BR-CCC-23.1.1.5	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	3	100							In-Kind	
BR-CCC-24.1	**Objective**	**Severe Weather Patterns**	**Address the inadequacy of existing regulatory mechanisms**										
BR-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to watershed hydrology										
BR-CCC-24.1.1.1	Action Step	Severe Weather Patterns	During Drought years CDFG, SWRCB, RWQCB, CalFire, Caltrans, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting that could impact coho salmon. These agencies should use existing regulations or other mechanisms to minimize water use during the summer months.		20	CDFG, CDFG Law Enforcement, Mendocino County, NMFS OLE, NOAA RC, Private Landowners, SWRCB						In-Kind	
BR-CCC-24.1.1.2	Action Step	Severe Weather Patterns	Develop critical flow values that are the basis for minimum bypass flow requirements to support juvenile rearing habitat conditions in the summer and fall months. Focus stream gaging efforts on the South Fork Big River.	2	5	CDFG, NMFS, SWRCB	63.00					63	Initial efforts should be focused in upper South Fork Big River where numerous small landowners are believed to divert from Big River for domestic purposes. Cost for stream flow modeling estimated at $63,005/project
BR-CCC-24.1.1.3	Action Step	Severe Weather Patterns	Critical flow values should include minimum bypass flow requirements to support upstream adult migration during winter months and juvenile rearing in the summer and fall months.	2	10	CDFG, NMFS, SWRCB							Cost accounted for in other recovery actions.
BR-CCC-24.1.1.4	Action Step	Severe Weather Patterns	If predicted flows are below a level considered critical to maintain habitat conditions for coho salmon, measures to reduce water consumption should be initiated by users in the watershed through conservation programs.	2	60	CDFG, NMFS, Private Landowners, SWRCB						TBD	Stream flow modeling will determine critical low flow levels. Conservation programs are contingent upon water users participation and feasibility of water conservation practices.