

Pudding Creek



Location	• Mendocino County
Watershed Area	• 18.0 Square Miles
Potential Habitat	• 118.5 Stream Miles
Vegetation	• 74% Coniferous • 4% Riparian or Montane Forest
Erodability	• Moderately Low
Ownership Patterns	• 100% Private
Dominant Land Uses	• Timber
Housing Density	• Low
TMDL Pollutants	• Temperature



Pudding Creek estuary
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 Gabrielle Adelman, California Coastal
 Records Project.
www.californiacostline.org

Pudding Creek Coho Salmon: Persistent – moderately abundant

Recovery Goals

- ✓ Continue funding the life cycle monitoring station
- ✓ Evaluate effects of habitat restoration efforts
- ✓ Evaluate effects of the impoundment on over wintering survival and passage

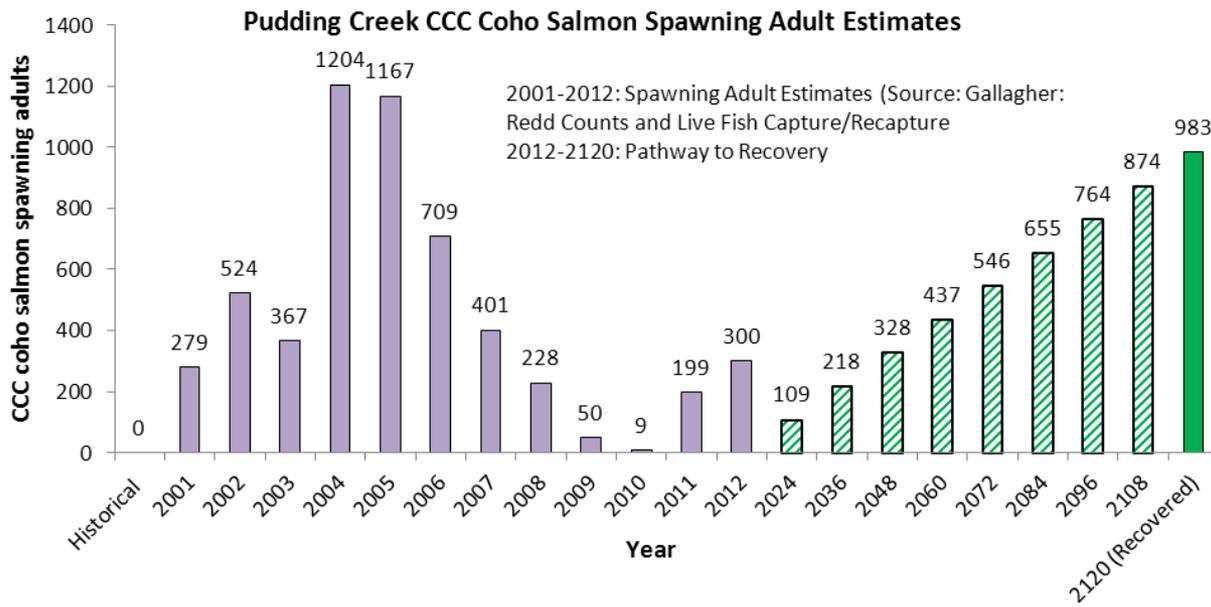


Pudding Creek Adult Spawner Targets

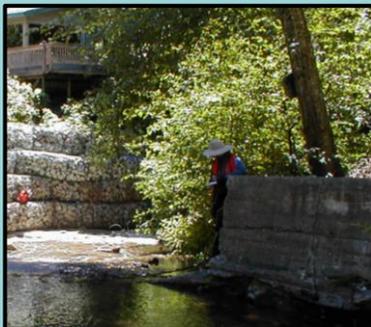
Downlisting to Threatened
492

Recovery
983

STEELHEAD: YES
CHINOOK SALMON: NO



Current Instream, Watershed and Population Conditions



Preventing Extinction & Improving Conditions

Priority 1: Immediate Restoration Actions

- Evaluate lower Pudding Creek impoundment and its contribution/effect to coho salmon survival
- Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats
- Evaluate channel restoration opportunities in the Little Valley subwatershed
- Retain, recruit and actively input large wood into stream
- Continue ongoing life cycle monitoring station at the Pudding Creek dam
- Continue juvenile monitoring originally initiated by CDFG in 1980's near the Slaughterhouse Gulch confluence

Priority 2 & 3: Long-Term Restoration Actions

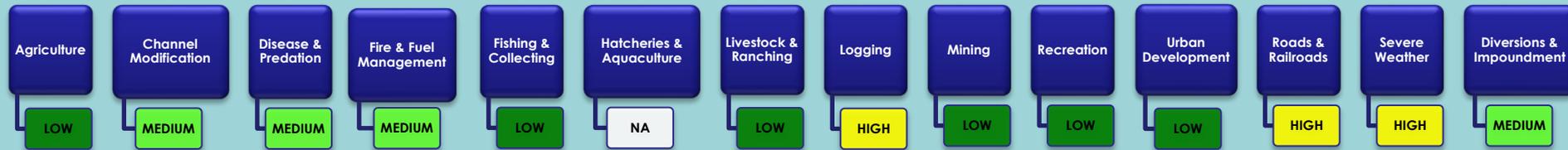
- Improve dissolved oxygen concentrations in the Pudding Creek impoundment
- Decommission elevated road alignments through riparian zones or adjacent to stream channels which functionally limit seasonal floodplain access
- Protect riparian plant community within inset floodplains and riparian corridors
- Conduct conifer release to promote growth of larger diameter trees where appropriate
- Develop a Road Sediment Reduction Plan to evaluate and treat roads and skid trails



Recovery Partners



Future Threats



Reducing Future Threats

Priority 1: Immediate Threat Abatement Actions

- Implement actions to restore channel meander and instream complexity
- Discourage future forestland conversions.

Priority 2 & 3: Long-Term Threat Abatement Actions

- Protect headwater channels with larger buffers and encourage tree retention on the axis of headwall swales
- Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities
- Use available best management practices for road construction, maintenance, management and decommissioning
- Fully maintain all roads with inside ditches unless these roads have been properly decommissioned
- Limit winter use of unsurfaced roads and recreational trails
- Ensure Pudding Creek fish ladder will pass migrating fish during drought conditions



Salmon at the lifecycle station.

Photo courtesy: Campbell Timberland

Conservation Highlights

- Campbell Timberland Management is working restore habitat complexity through placement of large woody debris structures and sediment remediation projects. They will also conduct effectiveness monitoring.
- Campbell Timberland Management and the California Department of Fish and Game have collaborated on adult and smolt coho salmon surveys.

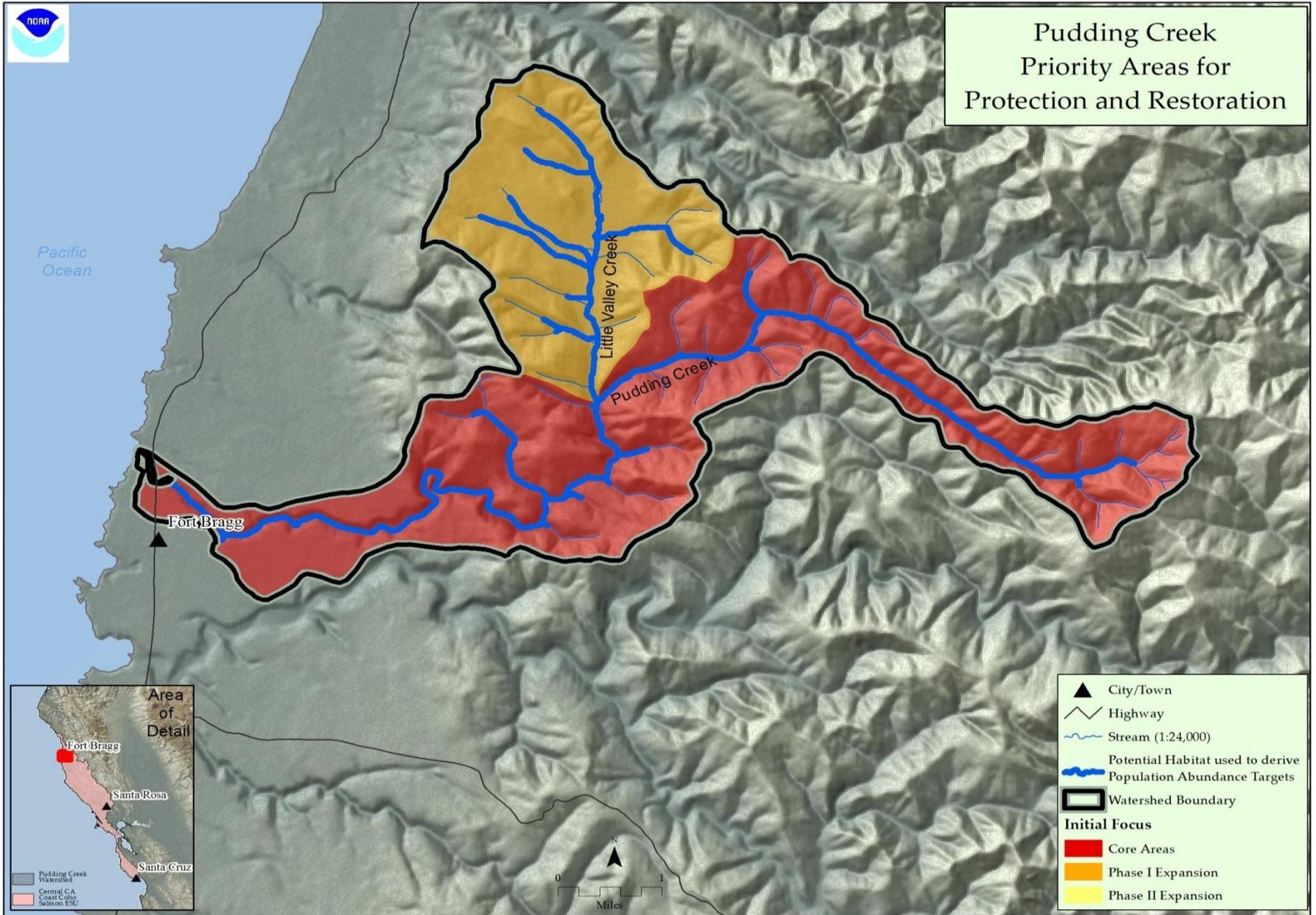


Figure 1: Map of Pudding Creek
Pudding Creek

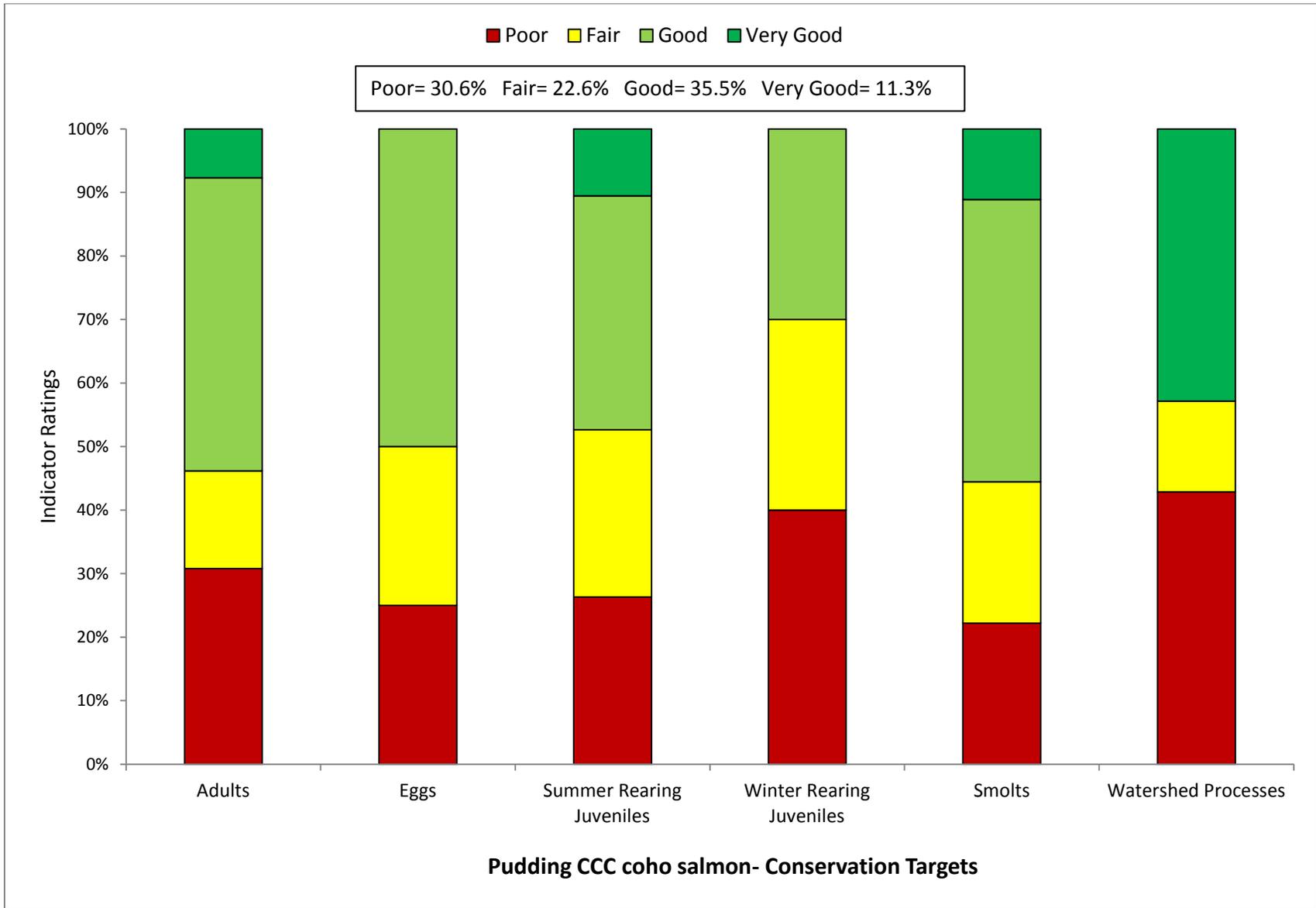


Figure 2: Viability Results by Lifestage

Table 1: CAP Viability Results ~ Pudding Creek

Target	Attribute	Indicator	Result	Rating	Method	Desired Criteria
Adults	Habitat Complexity	Large Wood Frequency (BFW 0-10 meters)	0.38 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 to 1.3 Key Pieces/ 100m	Fair	NMFS Expert Estuary/Lagoon Panel	1.3 to 4 Key Pieces/100 meters
Adults	Habitat Complexity	Pool/Riffle/Flatwater Ratio	50% by streams 86% by IP-km (>30% Pools; >20% Riffles)	Good	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>30% Pools; >20% Riffles)
Adults	Habitat Complexity	Shelter Rating	43% 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	75% of IP-km to 90% of IP-km accessible	Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Passage/Migration	Physical Barriers	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)	37% Class 5 & 6 across IP-km	Poor	SEC Analysis/CDFG Data	55 - 69% Class 5 & 6 across IP-km
Adults	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Adults	Sediment	Quantity & Distribution of Spawning Gravels	75% of IP-km to 90% of IP-km accessible	Good	SEC Analysis/CDFG Data	75% of IP-Km to 90% of IP-km
Adults	Velocity Refuge	Floodplain Connectivity	> 80% Response Reach Connectivity	Good	SEC Analysis/CDFG Data	>80% Response Reach Connectivity
Adults	Water Quality	Toxicity	No Acute or Chronic	Good	SEC Analysis/CDFG Data	No Acute or Chronic
Adults	Water Quality	Turbidity	75% to 90% of streams/ IP-km maintains severity score of 3 or lower	Poor	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km maintains severity score of 3 or lower
Adults	Viability	Density	1-20 spawner per IP-km	Fair	SEC Analysis/CDFG Data	low risk spawner density per Spence (2008)
Eggs	Hydrology	Flow Conditions (Instantaneous Condition)	Risk Factor Score =50	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50
Eggs	Hydrology	Redd Scour	Risk Factor Score =35-50	Good	SEC Analysis/CDFG Data	NMFS Flow Protocol: Risk Factor Score 35-50

Eggs	Sediment	Gravel Quality (Bulk)	>17% (0.85mm) and >30% (6.4mm)	Poor	NMFS Instream Flow Analysis	12-14% (0.85mm) and <30% (6.4mm)
Eggs	Sediment	Gravel Quality (Embeddedness)	50% streams 86% IP-km (>50% stream average scores of 1 & 2)	Fair	NMFS Instream Flow Analysis	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Summer Rearing Juveniles	Estuary/Lagoon	Quality & Extent	Impaired but functioning	Fair	NMFS Instream Flow Analysis	Properly Functioning Condition
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 0-10 meters)	0.38 Key Pieces/ 100m	Poor	NMFS Instream Flow Analysis	6 to 11 key pcs/100m
Summer Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<1 to 1.3 Key Pieces/ 100m	Fair	NMFS Instream Flow Analysis	1.3 to 4 Key Pieces/100 meters
Summer Rearing Juveniles	Habitat Complexity	Percent Primary Pools	<50% of streams IP-km (>49% of pools are primary pools)	Poor	NMFS Instream Flow Analysis	75% to 89% of streams/ IP-Km (>49% of pools are primary pools)
Summer Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	50% streams 86% 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	43% 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 =58	Fair	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	0.69 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	70-80% of streams/IP with average canopy >85%	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)	37% Class 5 & 6 across IP-km	Poor	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Summer Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	0	SEC or PAD/CDFG Data	≥80% Density rating "D" across IP-km
Summer Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	50% streams 86% IP-km (>50% stream average scores of 1 & 2)	Fair	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)	75 to 89% IP km (<16 C MWMT)	Good	Population Profile/BPJ	75 to 89% IP km (<16 C MWMT)
Summer Rearing Juveniles	Water Quality	Toxicity	No Acute or Chronic	Good	NMFS Watershed Characterization/CWHR	No Acute or Chronic
Summer Rearing Juveniles	Water Quality	Turbidity	75% to 90% of streams/ IP-km maintains severity score of 3 or lower	Poor	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)	0.38 Key Pieces/100m	Poor	NMFS Watershed Characterization/CWHR	6 to 11 key pcs/100m
Winter Rearing Juveniles	Habitat Complexity	Large Wood Frequency (Bankfull Width 10-100 meters)	<1 to 1.3 Key Pieces/ 100m	Fair	NMFS Watershed Characterization/CWHR	1.3 to 4 Key Pieces/100 meters
Winter Rearing Juveniles	Habitat Complexity	Pool/Riffle/Flatwater Ratio	50% streams 86% 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	43% 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	Good	Population Profile/BPJ	75% of IP-Km to 90% of IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (North of SF Bay)	37% Class 5 & 6 across IP-km	Poor	Population Profile/BPJ	55 - 69% Class 5 & 6 across IP-km
Winter Rearing Juveniles	Riparian Vegetation	Tree Diameter (South of SF Bay)	NA	0	SEC Analysis/CDFG Data	≥80% Density rating "D" across IP-km
Winter Rearing Juveniles	Sediment (Food Productivity)	Gravel Quality (Embeddedness)	50% streams 86% IP-km (>50% stream average scores of 1 & 2)	Fair	SEC Analysis/CDFG Data	75% to 90% of streams/ IP-Km (>50% stream average scores of 1 & 2)
Winter Rearing Juveniles	Velocity Refuge	Floodplain Connectivity	50-80% Response Reach Connectivity	Fair	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	43% 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	0.69 Diversions/10 IP-km	Good	Population Profile	0.01 - 1 Diversions/10 IP km
Smolts	Hydrology	Passage Flows	Risk Factor Score =50	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	> 90% IP-km (>6 and <16 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	Smolt abundance which produces moderate risk spawner density	Fair	Newcombe and Jensen 2003	Smolt abundance to produce low risk spawner density per Spence (2008)
Watershed Processes	Hydrology	Impervious Surfaces	1.4% 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	35% of Watershed in Timber Harvest	Fair	Newcombe and Jensen 2003	25-15% of Watershed in Timber Harvest
Watershed Processes	Landscape Patterns	Urbanization	33% of watershed >1 unit/20 acres	Poor	EPA/RWQCB/NMFS Criteria	8-11% of watershed >1 unit/20 acres
Watershed Processes	Riparian Vegetation	Species Composition	> 75% Historical Species Composition	Very Good	Newcombe and Jensen 2003	51-74% Intact Historical Species Composition
Watershed Processes	Sediment Transport	Road Density	9.4 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)	9.7 Miles/Square Mile	Poor	Newcombe and Jensen 2003	0.1 to 0.4 Miles/Square Mile

Table 2: CAP Threats Results ~ Pudding Creek

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

Central CA Coast Coho Salmon ~ Pudding 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:** Increase the extent of estuarine habitat

1.1.1.1. **Action Step:** Evaluate Pudding Creek impoundment and its contribution/effect to coho salmon survival (CDFG 2004).

1.1.1.2. **Action Step:** Evaluate habitat potential and benefits of providing passage under Highway 1 to the impoundment at Ocean Lake Mobile Home Park.

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

1.1.2.1. **Action Step:** Repair dam as appropriate to maintain over wintering habitat in the estuary (CDFG 2004).

1.1.3. **Recovery Action:** Develop and implement programs to address water quality concerns.

1.1.3.1. **Action Step:** Improve dissolved oxygen concentrations in the Pudding Creek impoundment from installation of aeration devices (such as SolarBees)

1.1.3.2. **Action Step:** Minimize water drafting from the Pudding Creek impoundment.

2. Restoration- Floodplain Connectivity

2.1. **Objective:** Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.

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

2.1.1.3. **Action Step:** Evaluate channel restoration opportunities in the Little Valley subwatershed and evaluate potential benefits to juvenile rearing habitats.

3. Restoration- Habitat Complexity

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

3.1.1. **Recovery Action:** Increase large wood frequency

3.1.1.1. **Action Step:** Implement a large woody debris supplementation programs to increase stream complexity and gravel retention, and improve pool frequency and depth (CDFG 2004).

- 3.1.1.2. **Action Step:** Incorporate large woody material into stream bank protection projects, where appropriate. Do not use aqua logs (cylindrical concrete rip rap).
- 3.1.1.3. **Action Step:** If log jams are modified for fish passage, retain LWD for instream enhancement projects that address poor shelter rating for juveniles and smolts.
- 3.1.2. **Recovery Action:** Improve shelter rating and percent primary pools
 - 3.1.2.1. **Action Step:** Promote growth of larger diameter trees where appropriate.
 - 3.1.2.2. **Action Step:** Protect existing riparian areas to maintain LWD supply and canopy.
 - 3.1.2.3. **Action Step:** Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004).

4. [Restoration- Hydrology](#)

No species-specific actions were developed.

5. [Restoration- Landscape Patterns](#)

- 5.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range
 - 5.1.1. **Recovery Action:** Reduce adverse impacts to watershed processes associated with road density
 - 5.1.1.1. **Action Step:** Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas in historical habitats.
 - 5.1.2. **Recovery Action:** Prevent landscape disturbance
 - 5.1.2.1. **Action Step:** Utilize BMP's which prevent fracturing of landscapes and interruption of natural function in forested watersheds, riparian corridors, and stream systems
 - 5.1.2.2. **Action Step:** Avoid new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas
 - 5.1.2.3. **Action Step:** Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements

6. [Restoration- Passage](#)

No species-specific actions were developed.

7. [Restoration- Pool Habitat](#)

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

8. [Restoration- Riparian](#)

- 8.1. **Objective:** Address the present or threatened destruction, modification, or curtailment of the species habitat or range
 - 8.1.1. **Recovery Action:** Improve tree diameter
 - 8.1.1.1. **Action Step:** Conduct conifer release to promote growth of larger diameter trees where appropriate.

- 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.

9. Restoration- Sediment

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

- 9.1.1. **Recovery Action:** Improve instream gravel quality

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

- 9.1.1.2. **Action Step:** Decommission Slaughterhouse Gulch riparian road.

- 9.1.1.3. **Action Step:** Evaluate all roads and skid trails throughout the winter period on their lands.

- 9.1.1.4. **Action Step:** Permitting agencies should evaluate all authorized erosion control measures during the winter period.

10. Restoration- Viability

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

- 10.1.1. **Recovery Action:** Increase spawner density

- 10.1.1.1. **Action Step:** Continue ongoing life cycle monitoring station at Pudding Creek dam (CDFG 2004). Establish consistent reporting methods to ensure ESU-wide consistency.

- 10.1.1.2. **Action Step:** Re-evaluate spawner density targets pending completion of Little Valley habitat suitability report.

- 10.1.1.3. **Action Step:** Continue juvenile monitoring originally initiated by CDFG in 1980's near the Slaughterhouse Gulch confluence.

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:** Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Include County of Mendocino in regards to inclusion of Sherwood Ridge Road.

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 floodplain connectivity (impaired quality & extent)

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

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

19.1.2.1. **Action Step:** Timber management should be designed to allow trees in riparian areas to age, die, and naturally recruit into the stream.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

23.1.2.1. **Action Step:** Adopt NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and appropriate barrier databases when developing new or retrofitting existing road crossings.

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

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

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

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

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:** Ensure all diversions in the watershed are in compliance with all applicable laws and policies.

24.1.1.2. **Action Step:** 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. 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 (CDFG 2004).

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

24.1.2.1. **Action Step:** Ensure Pudding Creek fish ladder to performing sufficiently to pass migrating fish during drought conditions.

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

24.1.3.1. **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.

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

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 ~ Pudding Creek

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-1.1	Objective	Estuary	Address the present or threatened destruction, modification, or curtailment of the species habitat or range.										
PC-CCC-1.1.1	Recovery Action	Estuary	Increase the extent of estuarine habitat										
PC-CCC-1.1.1.1	Action Step	Estuary	Evaluate Pudding Creek impoundment and its contribution/effect to coho salmon survival (CDFG 2004).	1	5	Campbell Timberland Management, CDFG, NMFS, Private Consultants	180.00					180	The impoundment at Pudding Creek may function as winter habitat for coho salmon and possibly as summer rearing habitat at the upper end of the impoundment. Water quality near the dam is often poor during the summer/fall low flow period. Evaluation should include a component to assess native and exotic predators and determine if levels of predation are detrimental to viability targets. Evaluation should include potential benefits/detriments to tidewater goby and steelhead as well as sculpin movement. Evaluation should include potential impacts to emigrating juvenile attempting to move upstream in the estuarine reach, description of the significance of various impacts, and whether the estuary promotes conditions suitable to delayed migration (and possible missing year class benefits). Cost based on juvenile migration monitoring at a rate of \$178,344.
PC-CCC-1.1.1.2	Action Step	Estuary	Evaluate habitat potential and benefits of providing passage under Highway 1 to the impoundment at Ocean Lake Mobile Home Park.	3	20	CalTrans, CDFG, Mendocino County							
PC-CCC-1.1.2	Recovery Action	Estuary	Increase and enhance estuarine habitat complexity features										
PC-CCC-1.1.2.1	Action Step	Estuary	Repair dam as appropriate to maintain over wintering habitat in the estuary (CDFG 2004).	3	10	CA Coastal Commission, Georgia-Pacific, USACE						TBD	Ideally, the dam should only be repaired following completion of evaluation study and only if benefits are found to outweigh the detriments to the Pudding Creek coho salmon population. If evaluation study concludes the dam does not facilitate improved rearing conditions compared to an unimpaired estuary for coho salmon, the dam should be removed, and the estuary restored to historical conditions.
PC-CCC-1.1.3	Recovery Action	Estuary	Develop and implement programs to address water quality concerns.										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-1.1.3.1	Action Step	Estuary	Improve dissolved oxygen concentrations in the Pudding Creek impoundment from installation of aeration devices (such as SolarBees)	2	5	Campbell Timberland Management, CDFG, Georgia- Pacific	80.00					80	Dissolved oxygen levels may limit salmonid use of the Pudding Creek impoundment during the summer- increasing dissolved oxygen concentration may increase the total amount of rearing area for juvenile salmonids in the watershed. This evaluation should be considered in conjunction with a comprehensive evaluation of the impoundment. Poor oxygen concentrations are presumably due to the large quantities of decomposing (non-native) aquatic vegetation in the impoundment.
PC-CCC-1.1.3.2	Action Step	Estuary	Minimize water drafting from the Pudding Creek impoundment.	3	100	CDFG, City of Fort Bragg, Georgia-Pacific, SWRCB						In-Kind	The water right holder should evaluate the potential impacts of their water diversion to rearing juvenile coho salmon. This will only likely need to occur if future diversions are markedly increased over current diversions.
PC-CCC-2.1	Objective	Floodplain Connectivity	Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.										
PC-CCC-2.1.1	Recovery Action	Floodplain Connectivity	Rehabilitate and enhance floodplain connectivity										
PC-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.	1	10	Campbell Timberland Management, CDFG, NOAA RC, Private Landowners	55.00	55.00				110	Cost based on treating 3 miles (assume 1 project/mile in 25% High IP) at a rate of \$36,046/mile.
PC-CCC-2.1.1.2	Action Step	Floodplain Connectivity	De-commission elevated road alignments through riparian zones or adjacent to stream channels which functionally limit seasonal floodplain access.	2	20	CalFire, Campbell Timberland Management	6.00	6.00	6.00	6.00		24	Cost based on decommissioning 2 miles of riparian road network at a rate of \$12,000/mile.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-2.1.1.3	Action Step	Floodplain Connectivity	Evaluate channel restoration opportunities in the Little Valley subwatershed and evaluate potential benefits to juvenile rearing habitats.	1	7	Campbell Timberland Management, CDFG, NOAA RC, RWQCB, Trout Unlimited	21.43	8.57				30	The evaluation should consider all available historical documentation and include input from geomorphologists and restoration experts. The evaluation should include a series of recommendation to restore channel complexity in Little Valley if restoration is determined to have a net benefit to juvenile rearing condition and quantity. Water extraction from Little Valley should also be evaluated and compliance with State Water Law determined. Campbell Timberland Management has initiated some beneficial "passive" restoration efforts in Little Valley a number of years ago. These efforts have consisted of removing all cattle and ceasing agricultural activities in the floodplain and terrace. The grassland meadows are no longer moved in an effort to allow riparian vegetation to recolonize the riparian terrace and valley. According to Campbell's analysis of historical aerial photography, the entire Little Valley Creek stream channel was ditched and straightened in the 1950s/1960s. Most sinuous reaches were bypassed but can still be observed in present aerial photos.
PC-CCC-3.1	Objective	Habitat Complexity	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-3.1.1	Recovery Action	Habitat Complexity	Increase large wood frequency										
PC-CCC-3.1.1.1	Action Step	Habitat Complexity	Implement a large woody debris supplementation programs to increase stream complexity and gravel retention, and improve pool frequency and depth (CDFG 2004).	1	5	Campbell Timberland Management, CDFG, Trout Unlimited	150.00					150	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 if 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. Cost based on treating 6 miles (assume 1 project/mile in 50% High IP) at a rate of \$25,000/mile.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-3.1.1.2	Action Step	Habitat Complexity	Incorporate large woody material into stream bank protection projects, where appropriate. Do not use aqua logs (cylindrical concrete rip rap).	3	100	Campbell Timberland Management, CDFG, RWQCB, USACE						In-Kind	Evaluate road relocation as an option prior to initiating stream bank stabilization in Pudding Creek watershed. This recommendation should be standard practice for current or future stream bank protection projects.
PC-CCC-3.1.1.3	Action Step	Habitat Complexity	If log jams are modified for fish passage, retain LWD for instream enhancement projects that address poor shelter rating for juveniles and smolts.	3	100	Campbell Timberland Management, CDFG, NMFS						In-Kind	Retention of wood could result in cost savings for future restoration projects. Significant oversight and evaluation should occur prior to removal of any large wood structure.
PC-CCC-3.1.2	Recovery Action	Habitat Complexity	Improve shelter rating and percent primary pools										
PC-CCC-3.1.2.1	Action Step	Habitat Complexity	Promote growth of larger diameter trees where appropriate.	3	20	Campbell Timberland Management, CDFG, NMFS, Private Landowners						In-Kind	Cost of initial dialog is expected to be minimal.
PC-CCC-3.1.2.2	Action Step	Habitat Complexity	Protect existing riparian areas to maintain LWD supply and canopy.	3	20	Campbell Timberland Management, CDFG, NMFS, Private Landowners						In-Kind	
PC-CCC-3.1.2.3	Action Step	Habitat Complexity	Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (CDFG 2004).	2	60	Campbell Timberland Management, CDFG, NMFS, Private Landowners						In-Kind	
PC-CCC-5.1	Objective	Landscape Patterns	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-5.1.1	Recovery Action	Landscape Patterns	Reduce adverse impacts to watershed processes associated with road density										
PC-CCC-5.1.1.1	Action Step	Landscape Patterns	Reduce road densities by 10 percent over the next 20 years, prioritizing high risk areas in historical habitats.	3	10	CalFire, Campbell Timberland Management, Private Landowners	115.00	115.00				230	Costs may be significant and benefits should be weighed against additional upland disturbance and overall costs. This recommendation is more feasible within Pudding Creek watershed because a large portion of the watershed is owned by one landowner. Cost based on decommissioning 19 miles of road network at a rate of \$12,000/mile.
PC-CCC-5.1.2	Recovery Action	Landscape Patterns	Prevent landscape disturbance										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-5.1.2.1	Action Step	Landscape Patterns	Utilize BMP's which prevent fracturing of landscapes and interruption of natural function in forested watersheds, riparian corridors, and stream systems	3	100	Campbell Timberland Management, NMFS, Private Landowners						In-Kind	
PC-CCC-5.1.2.2	Action Step	Landscape Patterns	Avoid new development, or road construction within floodplains, riparian areas, unstable soils or other sensitive areas	3	100	Campbell Timberland Management, NMFS, Private Landowners						In-Kind	
PC-CCC-5.1.2.3	Action Step	Landscape Patterns	Conserve open space in un-fractured landscapes, protect floodplain areas and riparian corridors, and develop conservation easements	3	100	Campbell Timberland Management, NMFS, Private Landowners						In-Kind	
PC-CCC-8.1	Objective	Riparian	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-8.1.1	Recovery Action	Riparian	Improve tree diameter										
PC-CCC-8.1.1.1	Action Step	Riparian	Conduct conifer release to promote growth of larger diameter trees where appropriate.	2	10	CalFire, Campbell Timberland Management	102.50	102.50				205	Historical logging practices effectively removed all of the original conifer overstory (principally redwood) throughout the basin. As a result, no old-growth riparian stands remain within the watershed. Loss of the original forest changed the rate of recruitment and the quality of instream habitat forming features (e.g., old growth redwoods can persist instream for hundreds of years as LWD, and due to their large size create significant habitat forming features). Tree recruitment into the stream channel is likely at a slower rate than under historical conditions, due, in part, to the much younger age of the extant riparian stands. Conifer release must take a comprehensive approach and should only be initiated in stream reaches with adequate canopy cover and where increases in instream temperatures are unlikely. Conifer release will ultimately promote the natural recruitment of large wood into the tributaries and mainstem areas. Cost based on treating 1.8 miles (assume 80 acres/mile in 15% High IP) at a rate of \$1,442/acre. Cost could be minimal if incorporated into ongoing timber harvest plans.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-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	Campbell Timberland Management, CDFG	401.25	401.25	401.25	401.25		1,605	Most of the riparian areas along mainstem Pudding Creek is under forest management and do not require replanting. However, if restoration of the Little Valley is anticipated, efforts should be directed at replanting the areas along riparian corridors in Little Valley. Little Valley was cleared for agricultural purposes and cattle grazing. Currently, cattle grazing is a minor land use in the area. Cost based on treating 1 mile (assume 80 acres/mile in 5% High IP) at a rate of \$20,057/acre.
PC-CCC-9.1	Objective	Sediment	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-9.1.1	Recovery Action	Sediment	Improve instream gravel quality										
PC-CCC-9.1.1.1	Action Step	Sediment	Locations for sediment catchment basins should be identified, developed and maintained, where appropriate.	3	100	CalFire, Campbell Timberland Management, Private Landowners, RWQCB						TBD	Sediment basins must be maintained on a yearly basis. A limited number of areas may be suitable for sediment catchment basins, but where feasible, they should be used to retain and remove potentially chronic fine sediment sources that impact primary stream channels.
PC-CCC-9.1.1.2	Action Step	Sediment	Decommission Slaughterhouse Gulch riparian road.	3	10	CalFire, California Geological Survey, Campbell Timberland Management, RWQCB	25.00	25.00				50	Total cost is not expected to exceed \$50K. Slaughterhouse Gulch was identified as IP-km (lower value) and it is currently a subwatershed where spawning occurs. However, juvenile rearing is unlikely in all but the wettest water years.
PC-CCC-9.1.1.3	Action Step	Sediment	Evaluate all roads and skid trails throughout the winter period on their lands.	2	60	CDFG, NMFS, RWQCB						In-Kind	This should be considered a standard business practice.
PC-CCC-9.1.1.4	Action Step	Sediment	Permitting agencies should evaluate all authorized erosion control measures during the winter period.	2	60	CalFire, CDFG, RWQCB						In-Kind	This recommendation should be considered standard practice.
PC-CCC-10.1	Objective	Viability	Address the inadequacy of existing regulatory mechanisms										
PC-CCC-10.1.1	Recovery Action	Viability	Increase spawner density										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-10.1.1.1	Action Step	Viability	Continue ongoing life cycle monitoring station at Pudding Creek dam (CDFG 2004). Establish consistent reporting methods to ensure ESU-wide consistency.	1	10	Campbell Timberland Management, CDFG, NMFS, Trout Unlimited	117.30	117.30				235	Cost for life cycle monitoring station estimated at \$234,600.
PC-CCC-10.1.1.2	Action Step	Viability	Re-evaluate spawner density targets pending completion of Little Valley habitat suitability report.	3	10	NMFS	110.00	110.00				220	Overall quantity of IP-km in Pudding Creek may need adjustment if it is determined that Little Valley did not provide adequate summer rearing habitat historically. Cost based on conducting spawner surveys for 18.9 km of High IP at a rate of \$1,150/km.
PC-CCC-10.1.1.3	Action Step	Viability	Continue juvenile monitoring originally initiated by CDFG in 1980's near the Slaughterhouse Gulch confluence.	1	10	Campbell Timberland Management, CDFG	60.00	60.00				120	This location is a long-term monitoring site and should be continued. Cost based on juvenile outmigration monitoring at a cost of \$58,404/year.
PC-CCC-11.1	Objective	Water Quality	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-11.1.1	Recovery Action	Water Quality	Reduce turbidity and suspended sediment										
PC-CCC-11.1.1.1	Action Step	Water Quality	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Include County of Mendocino in regards to inclusion of Sherwood Ridge Road.	2	5	CalFire, CalTrans, Campbell Timberland Management, CDFG, Mendocino County Department of Public Works, Private Landowners						TBD	This rapid implementation of this recommendation is more feasible within the Pudding Creek watershed because a large portion of the watershed is owned by one landowner.
PC-CCC-19.1	Objective	Logging	Address the present or threatened destruction, modification or curtailment of the species habitat or range										
PC-CCC-19.1.1	Recovery Action	Logging	Prevent impairment to floodplain connectivity (impaired quality & extent)										
PC-CCC-19.1.1.1	Action Step	Logging	Timber harvest planning should evaluate and avoid or minimize adverse impacts to offchannel habitats, floodplains, ponds, and oxbows.	2	100	CalFire, Campbell Timberland Management						In-Kind	Timber harvest remains a threat to coho salmon habitat in Pudding Creek watershed, but at diminished levels compared to historical practices. Even with application of new California Forest Practice Rules this threat is anticipated to continue.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-19.1.2	Recovery Action	Logging	Prevent impairment to habitat complexity										
PC-CCC-19.1.2.1	Action Step	Logging	Timber management should be designed to allow trees in riparian areas to age, die, and naturally recruit into the stream.	3	100	CalFire, Campbell Timberland Management						In-Kind	The current Forest Practice Rules require retention of a proportion of the largest diameter trees adjacent to water courses. This practice should continue and potential expansion of the number left for future recruitment should be considered.
PC-CCC-19.1.3	Recovery Action	Logging	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
PC-CCC-19.1.3.1	Action Step	Logging	Protect headwater channels with larger buffers to minimize sediment delivery downstream.	2	100	CalFire, Campbell Timberland Management						In-Kind	This recommendation should be a standard practice.
PC-CCC-19.1.3.2	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.	2	100	CalFire, Campbell Timberland Management						In-Kind	This recommendation should be a standard practice.
PC-CCC-19.1.3.3	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, Campbell Timberland Management	17.00	17.00				34	Identification of unstable areas will provide critical information for future THP planning and road construction and road decommissioning actions. Identification of high risk areas will provide important information for future road decommissioning grant funds by identify areas for prioritization. Cost based on erosion assessment monitoring (assume 25% of total watershed acres) at a rate of \$12/acre.
PC-CCC-19.1.4	Recovery Action	Logging	Prevent adverse alterations to riparian species composition and structure										
PC-CCC-19.1.4.1	Action Step	Logging	Manage riparian areas for their site potential composition and structure.	2	100	CalFire, Campbell Timberland Management						In-Kind	
PC-CCC-19.1.5	Recovery Action	Logging	Prevent increased landscape disturbance										
PC-CCC-19.1.5.1	Action Step	Logging	Encourage low impact timber harvest techniques such as full-suspension cable yarding (to improve canopy cover; reduce sediment input, etc.).	3	100	CalFire, Campbell Timberland Management						In-Kind	
PC-CCC-19.2	Objective	Logging	Address the inadequacy of existing regulatory mechanisms.										

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-19.2.1	Recovery Action	Logging	Prevent increased landscape disturbance										
PC-CCC-19.2.1.1	Action Step	Logging	Until no-take rules are developed or the State has a secured HCP or GCP, assign NMFS staff to conduct THP reviews and provide no-take recommendations by using revised "Guidelines for NMFS staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS draft, 2004) or "Short Term HCP Guidelines" (NMFS 1999).	3	10	NMFS						In-Kind	The need for this action may change if the California Forest Practice Rules change and reach a no-take standard or the state receives incidental take authorization through the HCP process.
PC-CCC-19.2.1.2	Action Step	Logging	Encourage timber landowners to implement restoration projects as part of their ongoing timber management practices in Core area stream reaches where large woody material is deficient.	2	100	CalFire, Campbell Timberland Management							Restoration during harvest activities provides a unique opportunity to access key areas that are relatively undisturbed in comparison to areas of the watershed with a large rural residential footprint.
PC-CCC-19.2.1.3	Action Step	Logging	Discourage Mendocino County from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	1	100	CDFG, Mendocino County, RWQCB, SWRCB						In-Kind	
PC-CCC-23.1	Objective	Roads/Railroads	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-23.1.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
PC-CCC-23.1.1.1	Action Step	Roads/Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Weaver and Hagans, 1994; Sommarstrom et al., 2002; Oregon Department of Transportation, 1999).	2	100	CalFire, Campbell Timberland Management, Private Landowners						TBD	Legacy roads from past logging activity continue to impact Pudding Creek watershed.
PC-CCC-23.1.1.2	Action Step	Roads/Railroads	Fully maintain all roads with inside ditches unless these roads have been properly decommissioned. All roads with inside ditches should be evaluated, and problems addressed, prior to the winter season.	2	100	CalFire, Campbell Timberland Management						In-Kind	Many roads in the watershed have inside ditches. Cost should be considered part of road maintenance costs.
PC-CCC-23.1.1.3	Action Step	Roads/Railroads	Install and maintain adequate energy dissipaters for culverts and other drainage pipe outlets where needed.	3	20	CalFire, Campbell Timberland Management, Private Landowners						TBD	Particular care should be directed to ensuring water outfalls avoid unstable slopes. Conduct an assessment of number and extent of dissipaters to determine cost for upgrade.

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs (\$K)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-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	100	CalFire, Campbell Timberland Management, Private Landowners						TBD	Sediment traps will require a significant maintenance commitment.
PC-CCC-23.1.2	Recovery Action	Roads/Railroads	Prevent impairment to passage and migration										
PC-CCC-23.1.2.1	Action Step	Roads/Railroads	Adopt NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and appropriate barrier databases when developing new or retrofitting existing road crossings.	3	100	CalFire, Campbell Timberland Management, Private Landowners						In-Kind	
PC-CCC-23.2	Objective	Roads/Railroads	Address the inadequacy of existing regulatory mechanisms										
PC-CCC-23.2.1	Recovery Action	Roads/Railroads	Prevent impairment to instream substrate/food productivity (impaired gravel quality and quantity)										
PC-CCC-23.2.1.1	Action Step	Roads/Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.	2	100	CalFire, Campbell Timberland Management, Private Landowners						In-Kind	This action is part of ongoing road maintenance and should be directed at the entire road network.
PC-CCC-23.2.1.2	Action Step	Roads/Railroads	Limit winter use of unsurfaced roads and recreational trails to decrease fine sediment loads.	2	100	CalFire, Campbell Timberland Management, Mendocino County, Mendocino Redwood Company, Private Landowners						In-Kind	Due to proximity of Fort Bragg to Pudding Creek, unauthorized trail use by off road vehicles is a common occurrence. Implement measures to ensure Sherwood Ridge Road remains closed during the winter period. The Noyo Watershed Alliance has worked to maintain winter closures. Ongoing management practices in the watershed include maintenance of existing gate and other forms of road closure.
PC-CCC-24.1	Objective	Severe Weather Patterns	Address the present or threatened destruction, modification, or curtailment of the species habitat or range										
PC-CCC-24.1.1	Recovery Action	Severe Weather Patterns	Prevent impairment to stream hydrology (impaired water flow)										
PC-CCC-24.1.1.1	Action Step	Severe Weather Patterns	Ensure all diversions in the watershed are in compliance with all applicable laws and policies.	3	10	CDFG, Mendocino County, RWQCB, SWRCB						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)					Entire Duration	Comments
							FY 1-5	FY 6-10	FY 11-15	FY 16-20	FY 21-25		
PC-CCC-24.1.1.2	Action Step	Severe Weather Patterns	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. 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 (CDFG 2004).	3	10	CalFire, Campbell Timberland Management, CDFG, RWQCB, SWRCB	31.50	31.50				63	Few if any water diversions are present along mainstem Pudding Creek aside from the diversion lower in the watershed at the Pudding Creek dam. Cost based on stream flow gauging at a cost of \$63,005..
PC-CCC-24.1.2	Recovery Action	Severe Weather Patterns	Prevent impairment to passage and migration										
PC-CCC-24.1.2.1	Action Step	Severe Weather Patterns	Ensure Pudding Creek fish ladder to performing sufficiently to pass migrating fish during drought conditions.	2	20	Campbell Timberland Management, CDFG, Georgia-Pacific	178.00	178.00	178.00	178.00		712	Evaluation should include an evaluation of existing maintenance requirements and development of landowner agreements where appropriate. Cost based on escapement monitoring at a cost of \$35,563.
PC-CCC-24.1.3	Recovery Action	Severe Weather Patterns	Reduce turbidity and suspended sediment										
PC-CCC-24.1.3.1	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	CalFire, Campbell Timberland Management						In-Kind	This recommendation should be considered standard practice.
PC-CCC-24.1.3.2	Action Step	Severe Weather Patterns	Protect high-risk shallow-seeded landslide areas and surfaces prone to erosion from being mobilized by intense storm events.	3	100	CalFire, Campbell Timberland Management						TBD	Conduct an assessment of high-risk shallow-seeded landslide areas to determine extent and protective measures.