REDWOOD CREEK

Redwood Creek

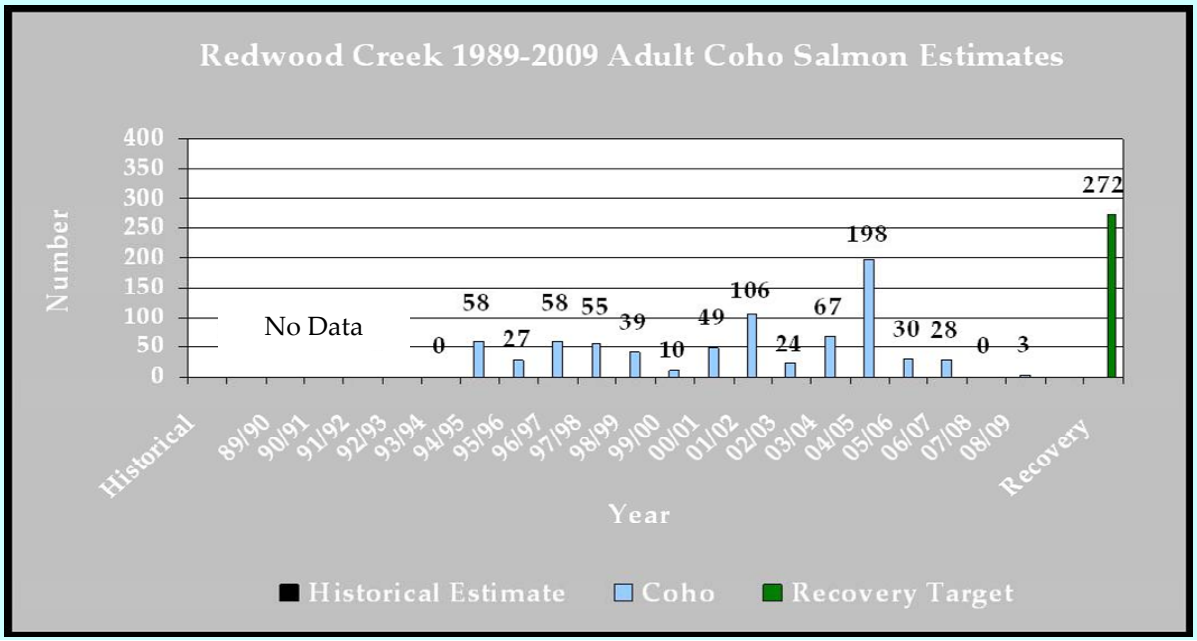
Dependent Population
8.0 IP-km of potential coho salmon habitat
Coho salmon and steelhead present

Redwood Creek drains approximately nine square miles of Mount Tamalpais in western Marin County. Redwood Creek enters the Pacific Ocean at Muir Beach, about 13 miles north of San Francisco. Vegetation in the Redwood Creek watershed consists of about 32 percent shrub, 31 percent coniferous forest, 18 percent montane or riparian hardwood forest, and 12 percent grassland. Only five percent of the Redwood Creek watershed is in private ownership. State- and federally owned forest lands, local water district lands, and military lands make up the rest of the watershed area which includes the Muir Woods National Monument. Redwood Creek provides a critical spawning and rearing habitat for endangered coho salmon. Decades of agricultural activity, channel straightening and levee construction resulted in the loss or degradation of large areas of floodplain woodland, riparian vegetation and in-channel complexity. Today the dominant land use within the Redwood Creek watershed is recreational activities. Housing development within the Redwood Creek watershed is low; approximately 150 housing units are present in the watershed. There are 18 barriers to salmon migration caused by road crossings, diversions, and natural structures. Impassable barriers block salmonids from less than ten percent of the watershed.

Redwood Creek
Photo provided by KRIS Information System, and is used with permission

The Watershed at a Glance

Spawning Quantity & Quality:	**GOOD**
Summer Water Temperatures:	**GOOD**
Depth & Shelter of Pools:	**POOR**
Large Wood Frequency:	**FAIR to VERY GOOD**
Riparian Canopy:	**POOR to Fair**
off channel/Floodplain Quality:	**POOR**
Estuary Function:	**POOR**



Redwood Creek

Recovery Target: 272 Adult Coho Salmon

Increasing the survival of coho salmon

requires **protecting** all individuals from threats that are jeopardizing coho salmon. The highest ranked threats are:

- Droughts
- Channel Modification
- Roads and Railroads
- Climate Change
- Fire and Fuel Management

Preventing the extinction of coho salmon

means **restoring** many key habitat attributes within the Redwood Creek watershed that are in poor condition. The highest priorities for restoration are to:

- Improve and increase pool habitat
- Increase and improve off channel habitat types
- Enhance the estuary habitat
- Improve riparian shading to cool streams
- Decrease the number of roads near the stream and reduce impacts from remaining roads
- Eliminate sources of sediment

Redwood Creek estuary
Photo provided by KRIS Information System, and is used with permission

Advancing recovery of coho

salmon in Redwood Creek requires these priority **recovery actions:**

- Support efforts of NPS to restore functional floodplain and lagoon habitat in the lower portion of the watershed.
- Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.
- Address sediment sources from road networks and other actions that deliver sediment to stream channels.
- Avoid and/or minimize the adverse effects of water diversion on CCC coho salmon.

. . . in these **core areas:** entire Redwood Creek planning watershed

Conservation Highlights

- Estuary and floodplain restoration activities
- Agricultural Best Management Practices have been developed and implemented in the watershed
- Acquisition of key areas for the conservation of habitat
- Annual juvenile abundance surveys conducted by National Park Service provides important population data on coho salmon in the Redwood Creek watershed.

A volunteer planting riparian vegetation along Redwood Creek
Photo provided by KRIS Information System, and is used with permission

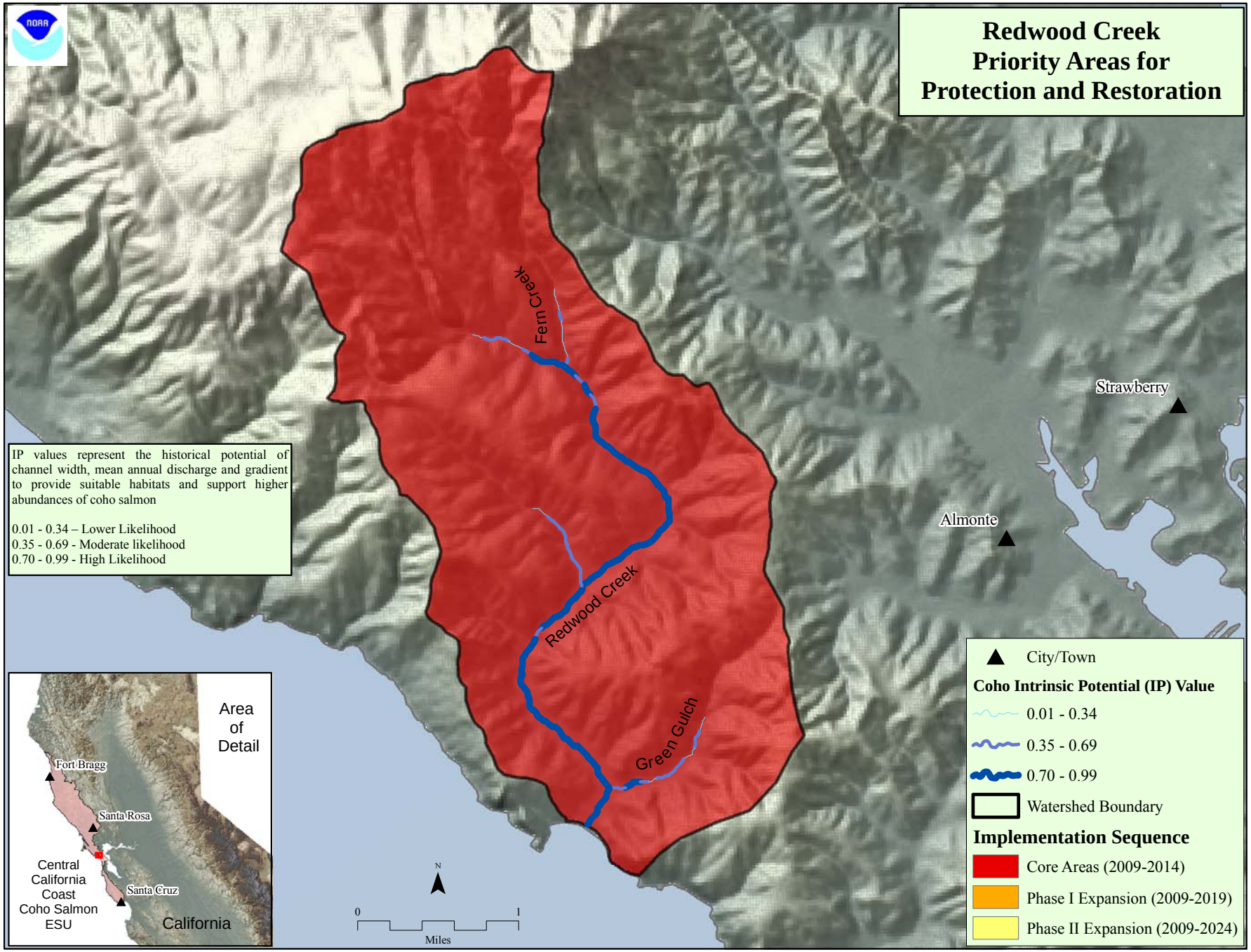
Recovery Partners

NPS
State Parks
DFG
NMFS
Marin RCD

Immediate Needs

Assess and prioritize sediment sources from road networks √

Assess and map water diversions √


Redwood Creek
Priority Areas for
Protection and Restoration
Fern Creek
Redwood Creek
Green Gulch
Strawberry
Almonte
IP values represent the historical potential of channel width, mean annual discharge and gradient to provide suitable habitats and support higher abundances of coho salmon
0.01 - 0.34 – Lower Likelihood
0.35 - 0.69 - Moderate likelihood
0.70 - 0.99 - High Likelihood
City/Town
Coho Intrinsic Potential (IP) Value
0.01 - 0.34
0.35 - 0.69
0.70 - 0.99
Watershed Boundary
Implementation Sequence
Core Areas (2009-2014)
Phase I Expansion (2009-2019)
Phase II Expansion (2009-2024)
Area of Detail
Fort Bragg
Santa Rosa
Santa Cruz
Central California Coast Coho Salmon ESU
California
N
0
1
Miles

CCC Coho Salmon
Redwood Creek
CAP Viability Table Results

Analyst	Source	Result	Rating	Target	Habitat Attribute	Indicator	Poor	Fair	Good	Very Good
Flow Panel	Decision Matrix	50	Good	Spawning Adults	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	PSMFC Database	100%	Very Good	Spawning Adults	Passage	Physical Barriers	<50% of IP-km	50-70% of IP-km	70-90% of IP-km	>90% of IP-km
NCWAP	Decision Matrix	60-90 days	Good	Spawning Adults	Passage	Passage at Mouth	<30 days	30-60 days	60-90 days	>90 days
SEC	CDFG HAB 8	400-800 m^2	Good	Spawning Adults	Sediment	Amount of Gravel*	<100 m^2	100-400 m^2	400-800 m^2	>800 m^2
NMFS	Best Prof. judgment	<5%	Good	Spawning Adults	Viability	Freshwater Harvest	>10% of pop.	5-10%	<5%	
Flow Panel	Decision Matrix	42	Good	Eggs	Hydrology	Instantaneous Condition	>75 (score)	51-75	35-50	<35
Flow Panel	Decision Matrix	50	Good	Eggs	Hydrology	Redd Scour	>75 (score)	51-75	35-50	<35
SEC	Many Sources	NA	Very Good	Eggs	Sediment	Gravel Quality	>17% 0.85mm and or >30% 6.3mm	15-17% 0.85	12-14% 0.85mm and or <30% 6.3mm	<12% 0.85
SEC	CDFG HAB 8	NA	NA	Eggs	Sediment	Gravel Quality (Embeddedness)	<25% of scores 1s&2s	25-50% of scores 1s&2s	>50% of scores 1s&2s	
Flow Panel	Decision Matrix	51-75	Fair	Summer Rearing	Hydrology	Baseflow	>75 (score)	51-75	35-50	<35
SEC	CDFG HAB 8	<60 avg. rating	Poor	Summer Rearing	Pool Habitat	Shelter Rating	<60 avg. rating	60-80	80-100	>100
SEC	CDFG HAB 8	<30% pools by length	Poor	Summer Rearing	Pool Habitat	Primary Pools	<30% pools by length	30-40%	40-50%	>50%
SEC/NMFS	Many Sources	NA	Good	Summer Rearing	Water Quality	Temperature	>30% of IP > 17 C MWMT	Does not meet Good or Very Good	30-60% of IP < 15C MWMT	>60% of IP < 15C MWMT
SEC	CDFG HAB 8	Poor	Poor	Winter Rearing	Floodplain	Complex Habitat**	<50% Connected	50-80% connected	>80% connected	
NMFS	NCWAP	Poor	Poor	Smolts	Estuary	Estuary				
Flow Panel	Decision Matrix	50	Good	Smolts	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	SWRCB	8.76/10 IP-km	Poor	Smolts	Passage	# of Diversions**	>5 / 10 IP km	1.1-5	0.01-1	0
SEC	CDFG HAB 8	<60 avg. rating	Poor	Multiple Life Stages	Pool Habitat	Shelter Rating	<60 avg. rating	60-80	80-100	>100
NMFS	Best Prof. judgment	<50%	Poor	Multiple Life Stages	Floodplain	Floodplain Connectivity	<50%	50-80%	>80%	not defined
NMFS	CDF CWHR	0%	Good	Multiple Life Stages	Hydrology	Stand Age			>40 years old	
SEC	NLCDB	1.73%	Very Good	Multiple Life Stages	Hydrology	Impervious Surfaces	>12.01% of WS by area	7.01-12%	3.01-7%	0-3%
SEC	FMMP	1.26%	Good	Multiple Life Stages	Land disturbance	Agriculture	>30% of WS by area	10-30%	0.1-10%	<0.1%
NMFS	CDF THP Dataset	10 - 25%	Good	Multiple Life Stages	Land disturbance	Timber Harvest	>35% of WS by area	25 - 35%	10 - 25%	<10%
SEC	Many Sources	14.6 / 100m	Very Good	Multiple Life Stages	Pool Habitat	LWD Freq. (BFW 0-10)	<4key pcs/100m	4-6/100m	6-11/100m	>11/100m
SEC	Best Prof. judgment	NA	Fair	Multiple Life Stages	Pool Habitat	LWD Freq. (BFW 10-100)	<1/100m	1-1.3/100m	1.3-4/100m	>4/100m
NMFS	CDF CWHR	25-50%	Fair	Multiple Life Stages	Riparian Veg.	Species Composition	<25%	25-50%	>50%	Historical Conditions
NMFS	CDF CWHR	0%	Fair	Multiple Life Stages	Riparian Veg.	DBH	<39% Class 5 and 6	40-54%	55-69%	>69%
SEC	CDFG HAB 8	<60%	Poor	Multiple Life Stages	Riparian Veg.	Canopy Cover	<45 % avg. over IP-km	75-85%	85-95%	>95%
NMFS	CDF THP Dataset	4.1 mi/sq.mi.	Poor	Multiple Life Stages	Sediment Transport	Road Density	>3 miles/sq. mile	3 to 2.5	2.5 to 1.6	<1.6
NMFS	CDF THP Dataset	4.9 mi/sq.mi.	Poor	Multiple Life Stages	Sediment Transport	Road density 100	>1 miles/sq. mile	1-0.5	0.5-0.1	<0.1
NMFS	Many Sources	Fair	Fair	Multiple Life Stages	Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No evidence of toxins or Contaminants
NMFS	Best Prof. judgment	1-20 per IP-km	Fair	Spawning Adults	Viability	Adult Density	<1 per IP-km	1-20 per IP-km	20-40 per IP-km	>40 per IP-km
NMFS	Best Prof. judgment	< 0.2 fish/m^2	Poor	Summer Rearing	Viability	Juvenile Density	< 0.2 fish/m^2	0.2-0.5 fish/m^2	0.5-1.0 fish/m^2	>1.0 fish/m^2
NMFS	Best Prof. judgment	20-34%	Fair	Summer Rearing	Viability	Juvenile Distribution	<20% IP-km occupied	20-34%	35-50%	>50%

See Appendix C for a full description of the analysis methods for the Viability Table Reports

* = watershed specific numbers

** = Ratings defined by the distribution of results

Redwood Creek Threats Across Targets		Spawning Adults	Eggs	Summer Rearing Juveniles	Winter Rearing Juveniles	Smolts	Multiple Life Stages			Overall Threat Rank
Project-specific threats		1	2	3	4	5	6	7	8	
1	Droughts	Medium	Low	Very High	Medium	High	Very High			Very High
2	Channel Modification	Medium	Low	High	High	High	Very High			Very High
3	Roads and Railroads	Medium	Low	Medium	Medium	High	Very High			High
4	Climate Change	Medium	Low	High	Medium	High	High			High
5	Fire and Fuel Management	Medium	Low	High	Medium	High	Medium			High
6	Residential and Commercial Development	Medium	Low	Medium	Medium	Medium	High			Medium
7	Agricultural Practices	Medium	Low	Medium	Medium	Medium	Medium			Medium
8	Livestock Farming and Ranching	Medium	Low	Medium	Medium	Medium	Medium			Medium
9	Logging and Wood Harvesting	Medium	Low	Medium	Medium	Medium	Medium			Medium
10	Recreational Areas and Activities	Medium	Low	Medium	Medium	Medium	Medium			Medium
11	Storms and Flooding	Medium	Low	Medium	Medium	Medium	Medium			Medium
12	Water Diversion and Impoundment	Medium	Low	Medium	Medium	Medium	Medium			Medium
13	Mining	Low	Low	Low	Medium	Low	-			Low
14	Hatcheries and Aquaculture	-	-	-	Low	Low	Low			Low
15	Fishing and Collecting	-	-	-	Low	Low	-			Low
16	Disease, Predation, and Competition	-	-	-	-	-	Low			Low
Threat Status for Targets and Project		High	Low	Very High	High	Very High	Very High	-	-	Very High

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-1.1	Objective	Estuary	Restore and enhance estuary habitat in the watershed.										
ReC-A-1.1.1	Recovery Action	Estuary	Enhance and restore estuary function by improving complex habitat features.	1	30	Marin County, NPS						TBD	
ReC-A-1.1.2	Recovery Action	Estuary	Develop Estuary Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration. Restore estuarine habitat and the associated wetlands and sloughs by providing fully functioning habitat (DFG 2004).										
ReC-A-1.1.2.1	Action Step	Estuary	Continue restoration efforts on Big Lagoon to benefit coho salmon during all life stages and seasons.	1	30	NPS	167	167	167	167	167	5,000	
ReC-A-1.1.2.2	Action Step	Estuary	Where appropriate, remove structures and/or modify practices which impair or reduce the historical tidal prism and/or estuarine function where feasible and where benefits to coho salmon and/or the estuarine environment are predicted.	1	60	NPS						TBD	
ReC-A-1.1.2.3	Action Step	Estuary	Support efforts of NPS to restore functional floodplain and lagoon habitat in the lower portion of the watershed.	1	60	Marin County, Marin RCD, NPS						TBD	
ReC-A-2.1	Objective	Floodplain	Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.										
ReC-A-2.1.1	Recovery Action	Floodplain	Create flood refuge habitat, such as hydrologically connected floodplains with riparian forest, or remove or setback levees, and use streamway concept where appropriate.										
ReC-A-2.1.1.1	Action Step	Floodplain	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	5	NPS	20.00	20.00	20.00	20.00	20.00	100	
ReC-A-2.1.1.2	Action Step	Floodplain	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	1	60	Marin County, Marin RCD, NPS						TBD	
ReC-A-2.1.1.3	Action Step	Floodplain	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	2	60	CDFG, Marin County, Marin RCD, NMFS, NPS						TBD	
ReC-A-2.1.1.4	Action Step	Floodplain	Institutionalize programs to purchase land/conservation easements to encourage the re-establishment and/or enhancement of natural riparian communities.	2	60	CDFG, NMFS, NPS, USFWS						TBD	
ReC-A-2.1.2	Recovery Action	Floodplain	Counties and municipalities should adopt a policy of "managed retreat" (removal of problematic infrastructure and replacement with native vegetation or flood tolerant land uses) for areas highly susceptible to, or previously damaged from, flooding.										
ReC-A-2.1.2.1	Action Step	Floodplain	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.	1	60	Marin County, NPS						TBD	
ReC-A-2.1.3	Recovery Action	Floodplain	Existing areas with floodplains or off channel habitats should be protected from future urban development of any kind.	1	60	Marin County, NPS						TBD	
ReC-A-2.1.4	Recovery Action	Floodplain	Restore channel function in the lower watershed to create off channel habitat.										
ReC-A-2.1.4.1	Action Step	Floodplain	Identify potential sites for construction/restoration of alcoves, backwaters, etc. based on land use and geomorphic constraints.	1	60	Marin County, Marin RCD, NPS						TBD	
ReC-A-2.1.4.2	Action Step	Floodplain	Evaluate, develop solutions and implement immediate needs to address problems resulting from channelization.	2	10	Marin County, Marin RCD, NPS						TBD	
ReC-A-2.1.4.3	Action Step	Floodplain	Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NMFS and/or DFG geomorphologist on design features and implementation techniques.	1	10	Marin County, NPS	1,000	1,000	1,000	1,000	1,000	10,000	

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-2.1.4.4	Action Step	Floodplain	Continue to monitor restored reaches in the "Bowling Alley" and "Upper Alley" sections to promote off channel habitat formation. Consult with NMFS and or DFG geomorphologist before and during the design and implementation phase.	1	20	NPS	25.00	25.00	25.00	25.00	25.00	500	
ReC-A-2.1.4.5	Action Step	Floodplain	Remove riprap and gabion rock at lowest end of watershed.	2	20	Marin County, Marin RCD, NPS						TBD	
ReC-A-2.1.5	Recovery Action	Floodplain	Restore connectivity and enhance habitat in Green Gulch.	1	10	CDFG, NOAA RC, Private Landowners	40.00	40.00	40.00	40.00	40.00	400	
ReC-A-3.1	Objective	Hydrology	Improve survival at all life stages by restoring the historical spatial and temporal pattern of surface flows throughout spawning, rearing, and migration areas.										
ReC-A-3.1.1	Recovery Action	Hydrology	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.										
ReC-A-3.1.1.1	Action Step	Hydrology	Maintain water operations agreements between NPS, DFG, and MBCSD to operate in a manner that does not alter summer surface flow	2	60	CDFG, MBCSD, NPS, State Parks						TBD	
ReC-A-3.1.2	Recovery Action	Hydrology	Promote, via technical assistance and/or regulatory action, the reduction of water use affecting the natural hydrograph, development of alternative water sources, and implementation of diversion regimes protective of the natural hydrograph.										
ReC-A-3.1.2.1	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	1	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-3.1.2.2	Action Step	Hydrology	Promote conjunctive use of water with water projects whenever possible to maintain or restore coho salmon habitat.	2	60	Marin County, Marin RCD, NPS, NRCS, State Parks						TBD	
ReC-A-3.1.2.3	Action Step	Hydrology	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (DFG 2004).	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-3.1.2.4	Action Step	Hydrology	Evaluate requests for on-stream dams above coho migratory reaches for effects on the natural hydrograph and the supply of spawning gravel for recruitment downstream (DFG 2004).	3	60	CDFG, DWR, NMFS PRD, RWQCB, SWRCB						TBD	
ReC-A-3.1.3	Recovery Action	Hydrology	Improve compliance with existing water resource regulations via monitoring and enforcement.										
ReC-A-3.1.3.1	Action Step	Hydrology	Identify and eliminate depletion of summer base flows from unauthorized water uses.	2	30	CDFG, DWR, Marin County, Marin RCD, NMFS, RWQCB, SWRCB						TBD	
ReC-A-3.1.3.2	Action Step	Hydrology	Improve coordination between agencies and others to address season of diversion, off-stream reservoirs, bypass flows protective of coho salmon and their habitats, and avoidance of adverse impacts caused by water diversion (DFG 2004).	1	60	CA Coastal Commission, CDFG, DWR, Farm Bureau, Marin County, Marin RCD, NPS, RWQCB, State Parks, SWRCB						TBD	
ReC-A-3.1.3.3	Action Step	Hydrology	Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-3.1.4	Recovery Action	Hydrology	Monitor, identify problems, and prioritize need for changes to water diversion on current or potential coho streams (DFG 2004).										
ReC-A-3.1.4.1	Action Step	Hydrology	Assess and map water diversions (DFG 2004).	1	5	Marin County, Marin RCD, NPS, State Parks	40.00	40.00	40.00	40.00	40.00	200	

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-3.1.4.2	Action Step	Hydrology	Establish a comprehensive stream flow evaluation program to determine instream flow needs for coho salmon.	2	10	CDFG, DWR, Marin County, Marin RCD, NMFS, NPS, RWQCB, State Parks, SWRCB	25.00	25.00	25.00	25.00	25.00	250	
ReC-A-3.1.5	Recovery Action	Hydrology	Provide incentives to water rights holders willing to convert some or all of their water right to instream use via petition change of use and §1707 (DFG 2004).	1	60	CDFG, DWR, RWQCB, State Parks, SWRCB						TBD	
ReC-A-3.2	Objective	Hydrology	Evaluate existing and future stream crossings and support full replacement and bridges over retrofits to achieve more natural function without maintenance.										
ReC-A-6.1	Objective	Pool Habitat	Improve summer rearing, winter rearing, and smolt survival by increasing instream channel complexity in potential rearing and migration reaches. Additionally, improve egg survival by reducing redd scour in streams characterized by high bedload mobility.										
ReC-A-6.1.1	Recovery Action	Pool Habitat	Encourage the development and implementation of large woody debris supplementation programs to increase stream complexity and gravel retention, and improve pool frequency and depth (DFG 2004).										
ReC-A-6.1.1.1	Action Step	Pool Habitat	Incorporate large woody material into stream bank protection projects, where appropriate. Do not use aqua logs (cylindrical concrete rip rap).	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-6.1.1.2	Action Step	Pool Habitat	Educate landowners, land managers, and County and municipal staffs on the importance of LWD to coho survival and recovery, and watershed processes.	2	5	Marin County, Marin RCD, NPS, Private Landowners, State Parks	60.00	60.00	60.00	60.00	60.00	300	
ReC-A-6.1.1.3	Action Step	Pool Habitat	Install properly sized large woody debris to appropriate viability table targets.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-6.1.1.4	Action Step	Pool Habitat	Fully implement the Programmatic Section 7 consultation for restoration projects administered by the NOAA Restoration Center that permits placement of instream large woody debris.	2	60	Marin County, Marin RCD, NMFS PRD, NOAA RC, NPS, State Parks						TBD	
ReC-A-6.1.1.5	Action Step	Pool Habitat	Cable in large logs with root wads to trap additional debris to create fixed pool locations.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-6.1.1.6	Action Step	Pool Habitat	Place unsecured LWD in the stream and monitor how it is distributed in the watershed.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-6.1.1.7	Action Step	Pool Habitat	Engage in riprap removal and LWD placement to restore channel processes within the Muir Woods National Monument as per Kimbell and Kondolf, 2002.	2	10	NPS, State Parks						TBD	
ReC-A-6.1.2	Recovery Action	Pool Habitat	Encourage retention and recruitment of large woody debris for all historic CCC coho salmon streams to maintain and enhance current stream complexity, pool frequency, and depth. Consult a hydrologist and qualified fisheries biologist before removing wood from streams.										
ReC-A-6.1.2.1	Action Step	Pool Habitat	Implement education programs and modify policies and procedures to improve riparian corridor protection, maintain channel integrity, implement alternatives to hard bank protection, and retain large woody debris.	3	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-6.1.3	Recovery Action	Pool Habitat	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-6.2	Objective	Pool Habitat	Assess and prioritize restoration of channelized sections to enhance pool depths in Redwood Creek through Muir Woods while maintaining the historic resource to the greatest degree possible.										
ReC-A-7.1	Objective	Riparian Vegetation	Improve the structure and composition of riparian areas to provide shade, large woody debris input, nutrient input, bank stabilization, and other CCC coho salmon needs.										
ReC-A-7.1.1	Recovery Action	Riparian Vegetation	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-7.1.2	Recovery Action	Riparian Vegetation	Assess riparian canopy and impacts of exotic vegetation (e.g., Arundo donax, etc.), prioritize and develop riparian habitat reclamation and enhancement programs (DFG 2004).	3	5	State Parks	60.00	60.00	60.00	60.00	60.00	300	
ReC-A-7.1.3	Recovery Action	Riparian Vegetation	Maintain and enhance riparian vegetation related to agricultural activities.										
ReC-A-7.1.3.1	Action Step	Riparian Vegetation	Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream).	3	20	Marin County, Marin RCD, NPS, State Parks	50.00	50.00	50.00	50.00	50.00	1,000	
ReC-A-7.1.3.2	Action Step	Riparian Vegetation	Locate water sources away from riparian areas.	2	60	Marin County, NPS, State Parks						TBD	
ReC-A-7.1.3.3	Action Step	Riparian Vegetation	Plant native vegetation to promote streamside shade.	3	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-7.1.3.4	Action Step	Riparian Vegetation	Promote bio-engineering solutions as appropriate (e.g. where critical infrastructure is located) for bank hardening projects.	3	60	CDFG, Marin County, Marin RCD, NMFS, NPS, State Parks						TBD	
ReC-A-7.1.4	Recovery Action	Riparian Vegetation	Review and develop preferred protocols for Pierce's Disease Control that would maintain a native riparian corridor and develop an outreach program (DFG 2004).	3	60	Marin County, NPS, State Parks						TBD	
ReC-A-8.1	Objective	Sediment	Improve habitat conditions at multiple life stages by reducing sediment inputs to the stream at the watershed scale.										
ReC-A-8.1.1	Recovery Action	Sediment	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.										
ReC-A-8.1.1.1	Action Step	Sediment	Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity.	3	5	Marin County, Marin RCD, NPS, State Parks	100	100	100	100	100	500	
ReC-A-8.1.1.2	Action Step	Sediment	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with a road survey focused on inner gorge roads followed by roads in other settings.	3	5	Marin County, Marin RCD, NPS, State Parks	80.00	80.00	80.00	80.00	80.00	400	
ReC-A-8.1.1.3	Action Step	Sediment	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (DFG 2004).	2	30	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-8.1.1.4	Action Step	Sediment	Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.	2	60	Marin County, NPS, State Parks						TBD	
ReC-A-8.1.2	Recovery Action	Sediment	Re-establish natural sediment delivery processes by assessing sediment delivery sources at the sub-watershed scale and prioritizing sediment reduction activities.										
ReC-A-8.1.2.1	Action Step	Sediment	Identify areas at increased risk of mass wasting and elevated fine sediment load, and decrease sediment from transportation projects and land management activities in those areas (DFG 2004).	2	10	Marin County, Marin RCD, NPS, State Parks	80.00	80.00	80.00	80.00	80.00	800	

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-8.1.2.2	Action Step	Sediment	Fence riparian areas and upslope areas prone to erosion.	3	30	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-8.1.3	Recovery Action	Sediment	Evaluate whether proposed stabilization projects will lead to additional instability either up- or downstream.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-8.1.4	Recovery Action	Sediment	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Hagans & Weaver, 1994; Sommarstrom, 2002; Oregon Department of Transportation, 1999).	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-9.1	Objective	Viability	Develop and implement a monitoring program to evaluate the performance of recovery efforts.										
ReC-A-9.1.1	Recovery Action	Viability	Measure or estimate key habitat attributes across the watershed.										
ReC-A-9.1.1.1	Action Step	Viability	Refine assessment methods to more accurately identify and measure key habitat attributes.	2	2	NPS	5.00	5.00				10	
ReC-A-9.1.1.2	Action Step	Viability	Utilize standardized assessment protocols (i.e., DFG habitat assessment protocols) to ensure ESU-wide consistency.	2	60	NPS						TBD	
ReC-A-9.1.1.3	Action Step	Viability	Conduct standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas. Encourage all major landowners to participate	2	2	CDFG, NPS	10.00	10.00				20	
ReC-A-9.1.2	Recovery Action	Viability	Conduct a comprehensive assessment of watershed processes (e.g., hydrology, geology, fluvial-geomorphology, water quality, and vegetation), instream habitat, and factors limiting coho salmon production (DFG 2004).	2	5	Marin County, Marin RCD, NPS, State Parks	50.00	50.00	50.00	50.00	50.00	250	
ReC-A-9.1.3	Recovery Action	Viability	Monitor population status.										
ReC-A-9.1.3.1	Action Step	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed. Surveys should include all three cohorts.	1	60	NPS						TBD	
ReC-A-9.1.3.2	Action Step	Viability	Conduct periodic, standardized smolt outmigration surveys to estimate smolt abundance in the watershed. Surveys should occur during the same period as adult spawning surveys.	1	60	NPS						TBD	
ReC-A-9.1.3.3	Action Step	Viability	Evaluate feasibility of installing a lifecycle station in an appropriate location within the watershed.	1	10	NPS						TBD	
ReC-A-10.1	Objective	Water Quality	Improve summer rearing survival by reducing instream temperatures in potential rearing reaches. See also strategies for restoring and enhancing riparian vegetation.										
ReC-A-10.1.1	Recovery Action	Water Quality	Implement actions to maintain and restore water temperatures to meet habitat requirements for CCC coho salmon in specific streams (DFG 2004).										
ReC-A-10.1.1.1	Action Step	Water Quality	Conduct conifer release to promote growth of larger diameter trees where appropriate.	2	60	NPS, State Parks						TBD	
ReC-A-10.1.1.2	Action Step	Water Quality	Improve riparian and instream conditions in rearing habitats by establishing riparian protection zones that extend the distance of a site potential tree height from the outer edge of a channel, and by adding LWD.	3	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-10.1.1.3	Action Step	Water Quality	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	2	60	Marin County, NPS, State Parks						TBD	
ReC-A-10.2	Objective	Water Quality	Evaluate and reduce nutrient and pathogen loading from upstream areas to minimize oxygen demand in lower Redwood Creek.	2	2	NPS						TBD	
ReC-A-12.1	Objective	Channel Modification	Improve education and awareness of agencies, landowners and the public regarding salmonid protection and habitat requirements.										

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-12.1.1	Recovery Action	Channel Modification	Develop a Salmon Certification Program for road maintenance staff.	2	5	FishNet 4C						TBD	
ReC-A-12.2	Objective	Channel Modification	Restore or minimize impacts to watershed processes (e.g., riparian, sediment transport, hydrology and estuary function).										
ReC-A-12.2.1	Recovery Action	Channel Modification	Eliminate the use of gabion baskets and undersized rock within the bankfull channel.	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-12.2.2	Recovery Action	Channel Modification	Encourage development and implementation of a program similar to the County of Santa Cruz's Integrated Vegetation Management Plan for Roads Near Perennial Waters (URS Corporation, 2008) regarding roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.	2	20	Marin County						TBD	
ReC-A-12.2.3	Recovery Action	Channel Modification	Evaluate existing and future stream crossings to identify threats to natural hydrologic processes and support efforts to replace or retrofit bridges to achieve more natural conditions without maintenance.	2	15	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-12.3	Objective	Channel Modification	All proposed development projects should include habitat protection, and/or alternatives that minimize impacts to salmon habitat.										
ReC-A-12.3.1	Recovery Action	Channel Modification	Flood control projects or other modifications facilitating new development (as opposed to protecting existing infrastructure) should be avoided.	3	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-12.3.2	Recovery Action	Channel Modification	Thoroughly investigate the ultimate cause of channel instability prior to engaging in site specific channel modifications and maintenance. Identify and target remediation of watershed process disruption as an overall priority.	2	20	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-15.1	Objective	Droughts	All Federal, State and local, planning should include considerations and allowances that ensure continued operations during droughts while also providing for CCC coho salmon recovery needs.										
ReC-A-15.1.1	Recovery Action	Droughts	Establish an emergency drought operations center (EDOC), (e.g., Washington Department of Fish and Wildlife, 2001), comprised of the SWRCB, DFG, NMFS, and others to develop emergency rules for augmenting water supplies and mitigating the effects of drought on fish.										
ReC-A-15.1.1.1	Action Step	Droughts	Work with DFG, Counties, other agencies, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.	3	10	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-15.1.1.2	Action Step	Droughts	Work with water managers on regulated streams to assure adequate and proper consideration is given to fish needs. Develop agreements, which will minimize water-use conflicts and impacts on fish and wildlife resources during drought conditions.	2	60	CDFG, DWR, Marin County, Marin RCD, NPS, RWQCB, State Parks, SWRCB						TBD	
ReC-A-15.1.1.3	Action Step	Droughts	Use the emergency drought operations center (EDOC) or other similar group to help discourage poaching of coho salmon by measures to: Cooperate with and provide incentives to landowners to maintain road and trail closures to be effective against trespass; Encourage monitoring of road closures and timely repair of defective or damaged road closure systems; Promote CalTIP, especially how it might apply to spawning coho salmon; and report un-permitted road use to local, State, and federal enforcement personnel during periods when coho salmon are migrating (DFG 2004).	2	60	Marin County, Marin RCD, NPS, State Parks						TBD	
ReC-A-15.1.2	Recovery Action	Droughts	Support the development of new regulations to minimize impacts on summer baseflow from riparian water rights users.										

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-15.1.2.1	Action Step	Droughts	DFG, SWRCB, RWQCB, CalFire, Caltrans, and other agencies and landowners, in cooperation with NMFS, should evaluate the rate and volume of water drafting for dust control in streams or tributaries and where appropriate, minimize water withdrawals that could impact coho salmon. These agencies should consider existing regulations or other mechanisms when evaluating alternatives to water as a dust palliative (including EPA-certified compounds) that are consistent with maintaining or improving water quality (DFG 2004).	2	15	CalFire, CalTrans, CDFG, RWQCB, SWRCB						TBD	
ReC-A-15.1.3	Recovery Action	Droughts	Identify and eliminate depletion of summer base flows from unauthorized water uses.										
ReC-A-15.1.3.1	Action Step	Droughts	Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.	2	60	Marin County, Marin RCD, NPS, State Parks, SWRCB						TBD	
ReC-A-16.1	Objective	Fire and Fuels Management	Implement sediment reduction techniques in concert with prescribed fire techniques to minimize sediment impacts to various coho salmon life stages.										
ReC-A-16.1.1	Recovery Action	Fire and Fuels Management	Maintain and expand existing riparian areas to buffer excess fine sediment delivery from both naturally occurring and managed fires.										
ReC-A-16.1.1.1	Action Step	Fire and Fuels Management	Use managed fire to promote revegetation of species that filter out fine sediment.	3	60	NPS, State Parks						TBD	
ReC-A-16.1.1.2	Action Step	Fire and Fuels Management	Immediately implement appropriate sediment control measures following completion of fire suppression while fire fighters and fire fighting equipment are on site.	3	1	NPS, State Parks						TBD	
ReC-A-16.2	Objective	Fire and Fuels Management	Follow accepted procedures for protecting fish populations and critical habitat during pre-planning, initial attack, prolonged attack and rehabilitation phases of fire control efforts.										
ReC-A-16.2.1	Recovery Action	Fire and Fuels Management	Prevent adverse impacts by advance knowledge & avoidance: know natural resources at risks, know infrastructure (roads, developed water sites, potential facility locations), and plan.										
ReC-A-16.2.1.1	Action Step	Fire and Fuels Management	Maximize use of existing crossings. Funnel equipment through as few crossings as feasible. Cross where substrate is cobble dominated. Cross where stream banks are naturally low angled and where not subject to direct flow. Cross at flow “crossover points” (avoiding valuable pools, and minimizing bank disturbance at locations where high flow velocity will impinge). Rehabilitate temporary stream crossings as soon as possible, prior to the onset of winter rains if all possible.	3	60	NPS, State Parks						TBD	
ReC-A-16.2.2	Recovery Action	Fire and Fuels Management	Adopt the following guidelines for fire lines and back fires to protect streams.										
ReC-A-16.2.2.1	Action Step	Fire and Fuels Management	Avoid initiating backfires in streamside zones unless backfire will help protect streams and streamside zone from approaching wildfires – use backfires as a tool to protect streams and streamside zones from approaching wildfire.	2	60	NPS, State Parks						TBD	
ReC-A-16.2.2.2	Action Step	Fire and Fuels Management	If construction of fire lines involves falling trees near streams, dropping some into streams and/or stream-side zones is appropriate for short term LWD recruitment and erosion control.	3	60	NPS, State Parks						TBD	
ReC-A-16.2.2.3	Action Step	Fire and Fuels Management	Do not remove or fell standing dead or apparently dying trees in stream-side zone. Upslope, felling and leaving these along the contour may intercept sediment and runoff.	2	60	NPS, State Parks						TBD	
ReC-A-16.2.2.4	Action Step	Fire and Fuels Management	Reduce erosion from fire prevention or suppression activities by maintaining existing natural topography to the extent possible.	3	60	NPS, State Parks						TBD	
ReC-A-16.2.3	Recovery Action	Fire and Fuels Management	Adopt the following guidelines for facilities associated with fire control and suppression.										

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-16.2.3.1	Action Step	Fire and Fuels Management	Locate chemicals, petroleum products, latrines, camp sites, etc., as far from fish bearing streams and tributary watercourses as possible. Place on naturally flat ground.	2	60	NPS, State Parks						TBD	
ReC-A-16.2.3.2	Action Step	Fire and Fuels Management	Consult local DFG biologists or other experts to determine: presence of sensitive species and habitats, recommendations for avoiding or minimizing impacts associated with wildfire suppression, etc.	1	60	NPS, State Parks						TBD	
ReC-A-16.2.3.3	Action Step	Fire and Fuels Management	Re-contour any new facility sites as soon as possible after site clean up and fire.	3	60	NPS, State Parks						TBD	
ReC-A-16.2.4	Recovery Action	Fire and Fuels Management	Adopt the following guidelines for fire suppression activities.										
ReC-A-16.2.4.1	Action Step	Fire and Fuels Management	Obtain water from non-fish bearing waters if at all possible. In larger fish-bearing streams, excavate active channel areas outside of wetted width to create off-stream pools for water source. Mandate in equipment contract specs that water trucks/tenders be fitted with DFG and NMFS approved fish screens when water is acquired at fish bearing streams. Put up a silt fence or other erosion controls around the water extraction locations. Avoid significantly lower stream flows during water drafting.	2	60	NPS, State Parks						TBD	
ReC-A-16.2.5	Recovery Action	Fire and Fuels Management	Adopt the following guidelines for rehabilitation of watersheds after fire suppression activities have been implemented.										
ReC-A-16.2.5.1	Action Step	Fire and Fuels Management	Ensure DFG and NMFS participate on rehabilitation planning teams. During rehabilitation, consider leaving felled trees in streams as LWD source. Re-contour any massively modified areas. Storm-proof roads immediately after use. Where organic materials need disposal, windrow on disturbed soils on contour. Where larger organic material is available, place in severely burned-out class II and III watercourses (assure DFG/NMFS is a part of this design and decision). Seeding, preferably with local seed-stock, at high hazard/risk areas should be done whenever feasible.	2	60	CDFG, NPS, State Parks						TBD	
ReC-A-16.3	Objective	Fire and Fuels Management	Work with County planners to define future impacts of proposed urban and infrastructure development on fire suppression and fuel load buildup.	2	60	Marin County, NPS, State Parks						TBD	
ReC-A-16.4	Objective	Fire and Fuels Management	Review prescribed fire plans to ensure they provide adequate protection for riparian corridors.	2	60	NPS, State Parks						TBD	
ReC-A-16.5	Objective	Fire and Fuels Management	Avoid use of aerial fire retardants and foams within 300 feet of riparian areas throughout the current range of CCC coho salmon.										
ReC-A-16.5.1	Recovery Action	Fire and Fuels Management	Analyze the cumulative impacts of fire retardants on fish populations exposed to fire stress conditions (Low DO, high temperatures, high ammonia and ash) so that the impacts of fire retardants can be assessed in the context of fire impacts.										
ReC-A-16.5.1.1	Action Step	Fire and Fuels Management	Use non-toxic retardants. Avoid dropping fire retardant into streams. To the maximum extent feasible, orient air drops so that the drop goes perpendicular to streams as opposed to parallel.	1	60	CalFire, NPS, State Parks						TBD	
ReC-A-16.6	Objective	Fire and Fuels Management	Increase coordination between NMFS and NPS on National Park lands in the Redwood Creek watershed.										
ReC-A-16.6.1	Recovery Action	Fire and Fuels Management	Reconcile differences between USFS fire retardant and suppression guidelines with recommendations in the NPS EIR for fire management on National Park lands within the Lagunitas, Pine Gulch, and Redwood Creek watersheds.										

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-16.6.1.1	Action Step	Fire and Fuels Management	Encourage the NPS to adopt the ESA emergency consultation guidelines and biological resource protection so that ESA consultations are initiated whenever coho salmon resources are at risk from fires and/or fire suppression activities.	1	60	NPS						TBD	
ReC-A-16.7	Objective	Fire and Fuels Management	Set up a comprehensive fire monitoring program that follows the guidelines in the Fire Monitoring Handbook.	3	60	NPS, State Parks						TBD	
ReC-A-16.8	Objective	Fire and Fuels Management	Identify historical fire frequency, intensities and durations and manage fuel loads in a manner consistent with historical parameters.	2	60	NPS, State Parks						TBD	
ReC-A-16.9	Objective	Fire and Fuels Management	Conduct fuel load monitoring and compare the results to estimated historical fuel loads.	2	60	NPS, State Parks						TBD	
ReC-A-17.1	Objective	Fishing and Collecting	Require maintenance of the existing recreational fishing closures within the Redwood Creek watershed.										
ReC-A-22.1	Objective	Recreational Areas and Activities	Evaluate trail crossings to ensure bridges are constructed to support horses.										
ReC-A-22.2	Objective	Recreational Areas and Activities	Eliminate horse access to creeks for watering or as fords.										
ReC-A-22.3	Objective	Recreational Areas and Activities	Increase education to the equestrian community regarding impacts to riparian and instream habitat from horse manure and hooves.										
ReC-A-22.4	Objective	Recreational Areas and Activities	Recreational trails should be set back from the creek and built to reduce erosion and minimize stream crossings.										
ReC-A-24.1	Objective	Roads and Railroads	Conduct outreach and education regarding the adverse effects of roads, and the types of best management practices protective of salmonids.										
ReC-A-24.1.1	Recovery Action	Roads and Railroads	Continue education of Caltrans, County road engineers, and County maintenance staff regarding watershed processes and the adverse effects of improper road construction and maintenance on salmonids and their habitats.										
ReC-A-24.1.1.1	Action Step	Roads and Railroads	Support efforts to remove levees on the Banducci property to create backwater and alcove habitat by having the county raise the lower section of Muir Woods road where it meets Highway One. Raising the road will address flooding and create vital off channel habitat in this section of creek. Coordinate with the NMFS and/or DFG geomorphologist on design features and implementation techniques.										
ReC-A-24.1.1.2	Action Step	Roads and Railroads	Develop a Salmon Certification Program for road maintenance staff.										
ReC-A-24.1.2	Recovery Action	Roads and Railroads	Encourage development and implementation of a program similar to the County of Santa Cruz's Integrated Vegetation Management Plan for Roads Near Perennial Waters (URS Corporation, 2008) regarding roadside maintenance activities to discourage or eliminate unwanted vegetation and promote desirable (native) vegetation.										
ReC-A-24.1.3	Recovery Action	Roads and Railroads	Expand the NRCS/RCD coordinated permit program to a statewide programmatic ESA consultation that allows funding and technical expertise to small land owners and rural residential property owners.										
ReC-A-24.2	Objective	Roads and Railroads	Reduce road densities by 10 percent over the next 10 years, prioritizing high risk areas in historical habitats or Core CCC coho salmon watersheds.										
ReC-A-24.2.1	Recovery Action	Roads and Railroads	Address sediment sources from road networks and other actions that deliver sediment to stream channels.										

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-24.2.1.1	Action Step	Roads and Railroads	Revaluate the high priority treatment recommendations for unpaved roads from the PWA assessment, and implement recommended treatments if they are still relevant. If not, reassess and make new recommendations for treatment. Push for decommissioning when feasible.										
ReC-A-24.3	Objective	Roads and Railroads	Conduct actions that hydrologically disconnect roads in Core areas within five years (from 2010).										
ReC-A-24.3.1	Recovery Action	Roads and Railroads	Conduct road and sediment reduction assessments to identify sediment-related and runoff-related problems and determine level of hydrologic connectivity.										
ReC-A-24.3.1.1	Action Step	Roads and Railroads	NMFS and other stakeholders will work with RCD or NRCS to encourage hiring of consultants to conduct road assessments (first for subwatersheds in Core areas, then for Phase I areas).										
ReC-A-24.3.2	Recovery Action	Roads and Railroads	Implement the most effective best management practices to conduct sediment reduction actions.										
ReC-A-24.3.3	Recovery Action	Roads and Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions. Begin with a road survey focused on inner gorge roads followed by roads in other settings.										
ReC-A-24.3.3.1	Action Step	Roads and Railroads	Use available best management practices for road construction, maintenance, management and decommissioning (e.g. Hagans & Weaver, 1994; Sommarstrom, 2002; Oregon Department of Transportation, 1999).										
ReC-A-24.3.4	Recovery Action	Roads and Railroads	Remove levees along Big Lagoon and Pacific Way. Address issues with culverts, road network, and development within the Big Lagoon Area.										
ReC-A-24.4	Objective	Roads and Railroads	Reduce sediment sources from road networks, maintenance activities, and other actions that deliver sediment to stream channels through improved, or new, laws and policies, and/or enforcement of existing laws and policies.										
ReC-A-24.4.1	Recovery Action	Roads and Railroads	Establish a moratorium on new road construction within floodplains, riparian areas, unstable soils or other sensitive areas until a watershed specific and/or agency/company specific road management plan is created and implemented.										
ReC-A-24.4.2	Recovery Action	Roads and Railroads	Develop a road upgrade fund to supplement FEMA emergency repair funding so problem roads could be upgraded to reduce sediment loading and improve road reliability. The Counties should seek amendment of FEMA policies to allow improvements that prevent erosion and failure, particularly in watersheds with endangered salmonid habitat.										
ReC-A-24.4.3	Recovery Action	Roads and Railroads	For all rural (unpaved) and seasonal dirt roads apply (at a minimum) the road standards outlined in the California Forest Practice Rules.										
ReC-A-24.4.4	Recovery Action	Roads and Railroads	Bridges associated with new roads or replacement bridges (including railroad bridges) should be free span or constructed with the minimum number of bents feasible in order to minimize drift accumulation and facilitate fish passage.										
ReC-A-24.5	Objective	Roads and Railroads	Evaluate existing and future stream crossings to identify threats to natural hydrologic processes and support efforts to replace or retrofit bridges to achieve more natural conditions without maintenance.										
ReC-A-24.6	Objective	Roads and Railroads	Evaluate existing and future stream crossings to identify threats to natural hydrologic processes and support efforts to replace or retrofit bridges to achieve more natural conditions without maintenance.										

Redwoord Creek (Coastal) Threats and Associated Recovery Actions

Recovery Strategy Number	Level	Targeted Attribute or Threat	Action Description	Priority Number	Action Duration (Years)	Recovery Partners	Costs ($K)						Comments
							FY1	FY2	FY3	FY4	FY5	Entire Duration	
ReC-A-26.1	Objective	Water Diversion and Impoundment	Avoid and/or minimize the adverse effects of water diversion on CCC coho salmon.										
ReC-A-26.1.1	Recovery Action	Water Diversion and Impoundment	Work with the Muir Beach CSD and Green Gulch farm to eliminate water diversions that affect flow within Redwood Creek.										