PINE GULCH CREEK

Pine Gulch Creek

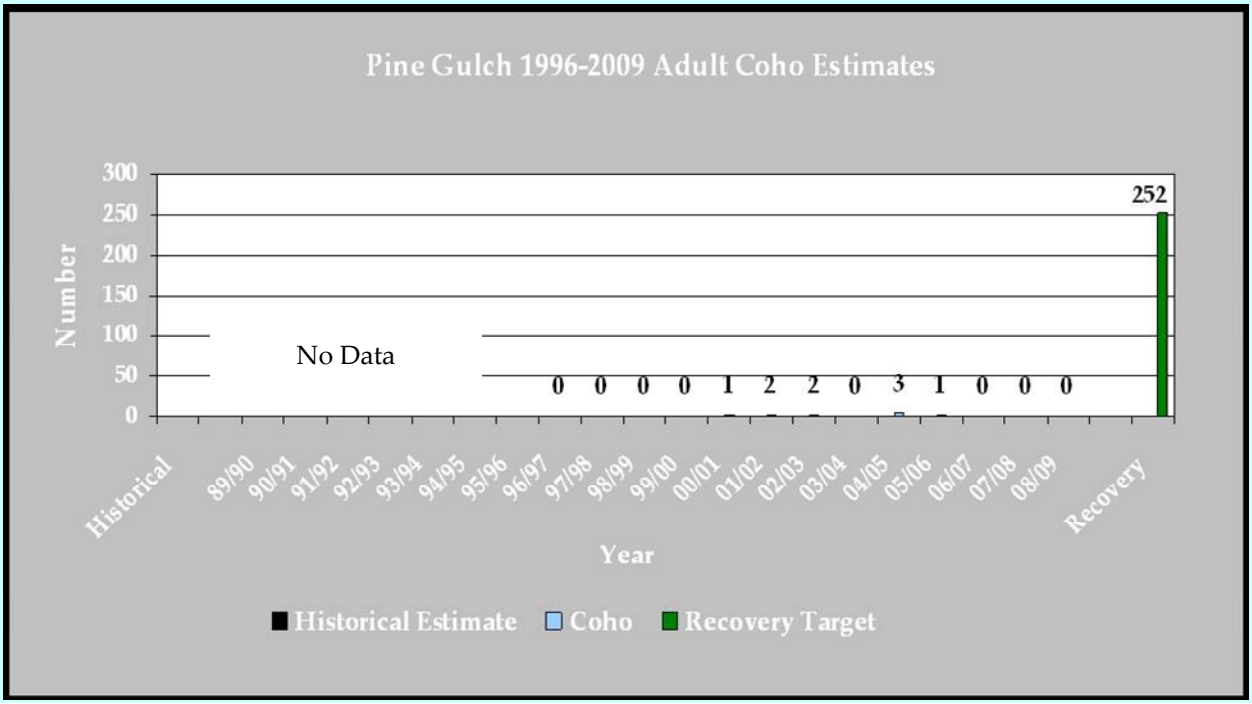
Dependent Population
7.4 Km of potential coho salmon habitat
Coho salmon and steelhead present

Pine Gulch Creek drains approximately 17 square miles of northern Marin County, and drains into Bolinas Lagoon. Approximately 50 percent of the Pine Gulch Creek watershed is coniferous forest, about 22 percent is riparian hardwood forest, and about 13 percent is grassland. Seventy-eight percent of the Pine Gulch Creek watershed is in state, local, or federally owned lands; the remaining 22 percent is in private ownership. The dominant land use within the Pine Gulch Creek watershed is recreational activities. Housing development within the Pine Gulch Creek watershed is low to moderate; approximately 50 housing units are present in the watershed. There are 12 barriers to salmon migration caused by road crossings and water diversions. Impassable barriers block salmonids from less than 10 percent of the watershed.

Pine Gulch Creek
Photo National Park Service, Point Reyes

The Watershed at a Glance

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



Pine Gulch Creek

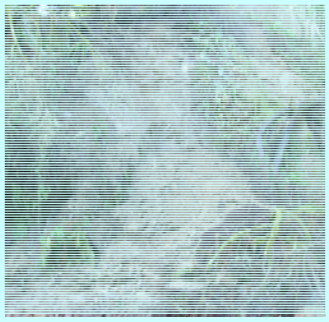
Recovery Target: 252 Adult Coho Salmon

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

- Droughts
- Water Diversion and Impoundment
- Channel Modification

Preventing the extinction of coho salmon means **restoring** many key habitat attributes within the Lagunitas Creek watershed that are in poor condition. The highest priorities for restoration are to:

- Increase pool frequency for summer rearing
- Improve the quality and extent of the estuary
- Increase riparian shading
- Increase the frequency of large wood in streams



Landslide near Pine Gulch Creek
Photo by National Park service, Point Reyes

Advancing recovery of coho salmon in Pine Gulch Creek requires these priority **recovery actions:**

- Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.
- Improve summer rearing survival by reducing in-stream temperatures in potential rearing reaches.
- Develop off channel water storage for farming operation within the watershed to increase summer pool habitat in the lower portion of the watershed
- Conduct restoration activities that extend the duration of summer flow and provide refuge from high winter flows by restoring channels, floodplains, and meadows.

. . . in these **core areas:** the entire Pine Gulch planning watershed.

Conservation Highlights

•Private landowners are augmenting flow in Pine Gulch Creek to improve hydrology for coho salmon

We Need Your Photo Here

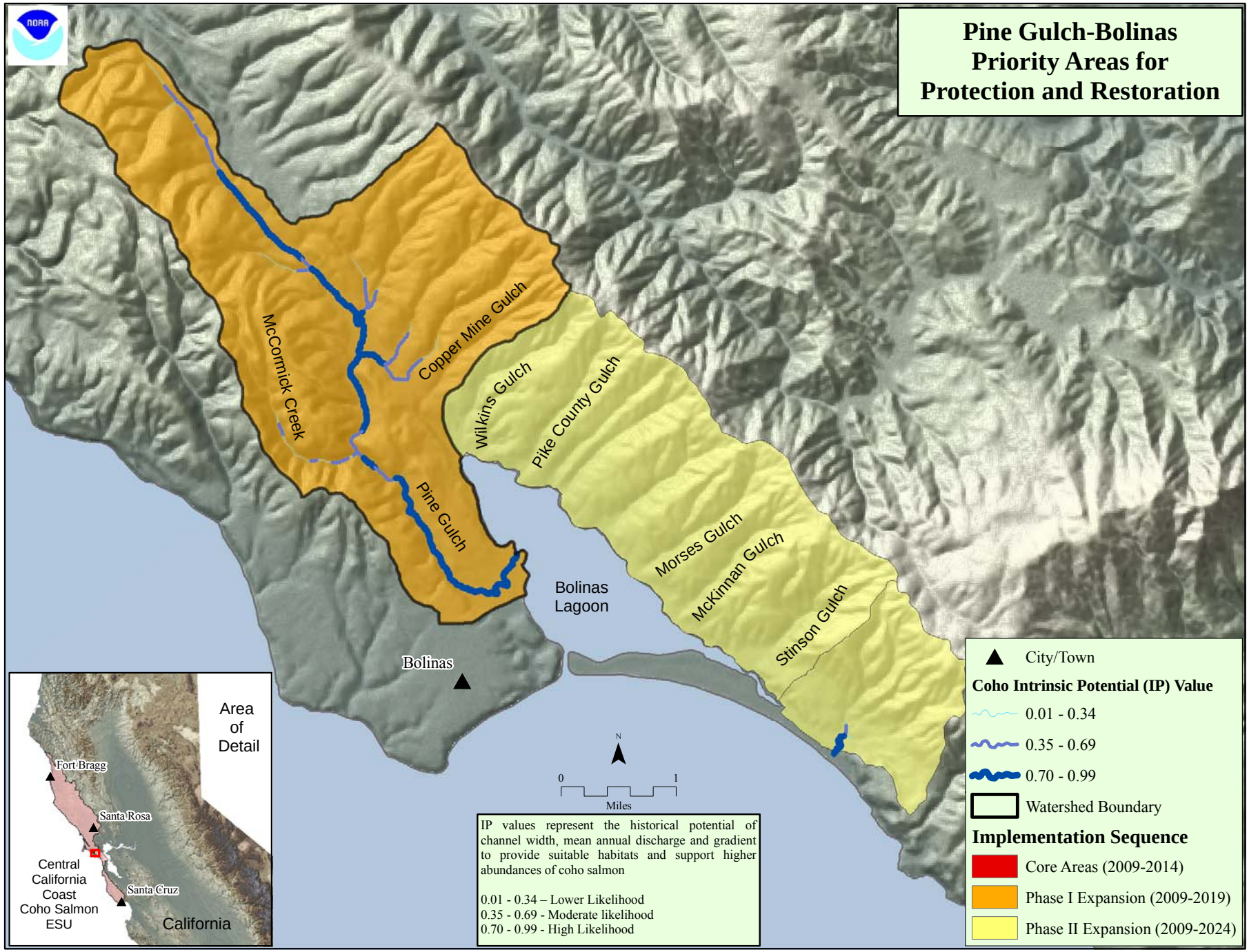
Pine Gulch Creek
Photo © Your Name Here, AFFIL

Immediate Needs

√ Implement the Pine Gulch Creek Watershed Enhancement project
√ Conduct presence/absence monitoring and genetic identification of coho year classes
√ Increase capacity of estuarine habitat in Bolinas Lagoon

Recovery Partners

Tomales Bay Watershed Council
MMWD
SPAWN
NPS
County of Marin
California State Parks


Pine Gulch-Bolinas
Priority Areas for
Protection and Restoration
McCormick Creek
Copper Mine Gulch
Wilkins Gulch
Pike County Gulch
Pine Gulch
Morses Gulch
McKinnan Gulch
Stinson Gulch
Bolinas
Lagoon
Bolinas
Area
of
Detail
Fort Bragg
Santa Rosa
Santa Cruz
Central
California
Coast
Coho Salmon
ESU
California
N
0
1
Miles
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)

CCC Coho Salmon
Pine Gulch-Bolinas
CAP Viability Table Results

Analyst	Source	Result	Rating	Target	Habitat Attribute	Indicator	Poor	Fair	Good	Very Good
Flow Panel	Decision Matrix	42	Good	Spawning Adults	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	PSMFC Database	96%	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	>90 days	Very 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	<35	Very Good	Eggs	Hydrology	Redd Scour	>75 (score)	51-75	35-50	<35
SEC	Many Sources	NA	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	58	Fair	Summer Rearing	Hydrology	Baseflow	>75 (score)	51-75	35-50	<35
SEC	CDFG HAB 8	60-80	Fair	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	Fair	Fair	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	2.58/10 IP-km	Fair	Smolts	Passage	# of Diversions**	>5 / 10 IP km	1.1-5	0.01-1	0
SEC	CDFG HAB 8	60-80	Fair	Multiple Life Stages	Pool Habitat	Shelter Rating	<60 avg. rating	60-80	80-100	>100
NMFS	Best Prof. judgment	50-80%	Fair	Multiple Life Stages	Floodplain	Floodplain Connectivity	<50%	50-80%	>80%	not defined
NMFS	CDF CWHR		Good	Multiple Life Stages	Hydrology	Stand Age			>40 years old	
SEC	NLCDB	1.65%	Very Good	Multiple Life Stages	Hydrology	Impervious Surfaces	>12.01% of WS by area	7.01-12%	3.01-7%	0-3%
SEC	FMMP	19.31%	Fair	Multiple Life Stages	Land disturbance	Agriculture	>30% of WS by area	10-30%	0.1-10%	<0.1%
NMFS	CDF THP Dataset	<10%	Very Good	Multiple Life Stages	Land disturbance	Timber Harvest	>35% of WS by area	25 - 35%	10 - 25%	<10%
SEC	Best Prof. judgment	NA	Fair	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	Poor	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	>50%	Good	Multiple Life Stages	Riparian Veg.	Species Composition	<25%	25-50%	>50%	Historical Conditions
NMFS	CDF CWHR	3%	Poor	Multiple Life Stages	Riparian Veg.	DBH	<39% Class 5 and 6	40-54%	55-69%	>69%
SEC	CDFG HAB 8	60-70%	Poor	Multiple Life Stages	Riparian Veg.	Canopy Cover	<45 % avg. over IP-km	75-85%	85-95%	>95%
NMFS	CDF THP Dataset	1.4 mi/sq.mi.	Very Good	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	0.9 mi/sq.mi.	Fair	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 per IP-km	Poor	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% IP-km occupied	Poor	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

Pine Gulch 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	Very High	Low	Very High	Medium	Medium	Very High			Very High
2	Water Diversion and Impoundment	Low	Low	Very High	Medium	Low	Medium			High
3	Channel Modification	High	Low	High	Medium	Low	High			High
4	Climate Change	Medium	Low	Medium	Medium	Medium	Medium			Medium
5	Fire and Fuel Management	Medium	Low	Medium	Medium	Medium	Medium			Medium
6	Recreational Areas and Activities	Medium	Low	Medium	Medium	Medium	Medium			Medium
7	Agricultural Practices	Medium	Low	Medium	Medium	Low	Medium			Medium
8	Livestock Farming and Ranching	Medium	Low	Medium	Medium	Low	Medium			Medium
9	Logging and Wood Harvesting	Medium	Low	Medium	Medium	Low	Medium			Medium
10	Storms and Flooding	Low	Medium	Medium	Medium	Low	Medium			Medium
11	Mining	Medium	Low	Medium	Medium	Low	Low			Medium
12	Residential and Commercial Development	Low	Low	Medium	Medium	Low	Medium			Medium
13	Roads and Railroads	Low	Low	Medium	Medium	Low	Medium			Medium
14	Disease, Predation, and Competition	-	-	Medium	-	-	-			Low
15	Hatcheries and Aquaculture	-	-	-	Low	Low	Low			Low
16	Fishing and Collecting	-	-	-	Low	Low	-			Low
Threat Status for Targets and Project		High	Medium	Very High	High	Medium	Very High	-	-	Very High

Pine Gulch 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	
PGC-A-1.1	Objective	Estuary	Restore and enhance estuary habitat in the watershed.										
PGC-A-1.1.1	Recovery Action	Estuary	Develop Estuary Protection and Enhancement Guidelines to maintain estuary function and provide information for estuary restoration.										
PGC-A-1.1.1.1	Action Step	Estuary	Increase capacity of estuarine habitat in Bolinas Lagoon according to the recommendations in the Gulf of the Farallones National Marine Sanctuary preferred alternative.	2	40	NPS						TBD	
PGC-A-1.1.1.2	Action Step	Estuary	Continue restoration efforts on Bolinas lagoon to benefit coho salmon during all life phases and seasons.	2	10	NPS	800	800	800	800	800	8,000	
PGC-A-2.1	Objective	Floodplain	Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.										
PGC-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.										
PGC-A-2.1.1.1	Action Step	Floodplain	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	2	20	NPS, State Parks	500	500	500	500	500	10,000	
PGC-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.	2	20	Marin County						TBD	
PGC-A-2.1.3	Recovery Action	Floodplain	Rehabilitate stream channel to increase the frequency of instream and off channel pools.										
PGC-A-2.1.3.1	Action Step	Floodplain	Restore channel function in the lower watershed to create off channel habitat.	2	20	NPS, State Parks						TBD	
PGC-A-2.1.3.2	Action Step	Floodplain	Identify potential sites for construction/restoration of alcoves, backwaters, etc. based on land use and geomorphic constraints.	2	20	NPS, State Parks						TBD	
PGC-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.										
PGC-A-3.1.1	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.										
PGC-A-3.1.1.1	Action Step	Hydrology	Implement the Pine Gulch Creek Watershed Enhancement Project. The proposed project includes appropriation of water to storage during the winter season, controlled riparian diversion between April and July 1, and no diversion between July 1 and December 15 of each year.	1	40	Marin RCD, Private Landowners						TBD	
PGC-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.										
PGC-A-6.1.1	Recovery Action	Pool Habitat	Develop a Large Wood Recruitment Plan that assesses instream wood needs, and sites potentially responsive to wood recruitment or placement, and develop a riparian strategy to ensure long term natural recruitment of wood via large tree retention.										
PGC-A-6.1.1.1	Action Step	Pool Habitat	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	2	40	Marin County, Marin RCD, NPS, State Parks						TBD	
PGC-A-6.1.1.2	Action Step	Pool Habitat	Install LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (DFG 2004).	3	10	Marin RCD, NPS, State Parks	800	800	800	800	800	8,000	100 projects at 80K per project

Pine Gulch 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	
PGC-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.										
PGC-A-7.1.1	Recovery Action	Riparian Vegetation	Restore and protect riparian vegetation to improve migration and summer/overwintering habitat for coho salmon (DFG 2004).	2	30	Marin County, Marin RCD, NPS, Private Landowners, State Parks						TBD	
PGC-A-9.1	Objective	Viability	Monitor population status for response to recovery actions.	2	40	NPS						TBD	Continue to support ongoing monitoring efforts by NPS
PGC-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.										
PGC-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).										
PGC-A-10.1.1.1	Action Step	Water Quality	Assess the water temperature regime during the summer season for three to five years to determine the role of water temperature as a limiting factor in coho salmon production (DFG 2004).	3	5	NPS, State Parks						TBD	
PGC-A-10.1.1.2	Action Step	Water Quality	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	2	20	NPS, State Parks						TBD	
PGC-A-12.1	Objective	Channel Modification	Restore or minimize impacts to watershed processes (e.g., riparian, sediment transport, hydrology and estuary function).										
PGC-A-12.1.1	Recovery Action	Channel Modification	Agencies should develop large woody debris retention programs and move away from the practice of removing instream large woody debris under high flow “emergencies”.	2	10	NPS						TBD	
PGC-A-12.1.2	Recovery Action	Channel Modification	Conduct restoration activities that restore channels, floodplains and meadows to extend the duration of the summer flow and provide refuge from high winter flows.	2	30	Marin County, Marin RCD, NPS, State Parks						TBD	
PGC-A-12.2	Objective	Channel Modification	Ensure current populations of CCC coho salmon are protected from harm or take and protect all historical habitats from further habitat degradation.										
PGC-A-12.2.1	Recovery Action	Channel Modification	Modify Federal, State, city and county regulatory and planning processes to eliminate provisions allowing new construction of permanent infrastructure that will adversely affect watershed processes, particularly within the 100-year flood prone zones in all historic CCC coho salmon watersheds.										
PGC-A-12.2.1.1	Action Step	Channel Modification	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.	2	20	Marin County						TBD	
PGC-A-12.2.1.2	Action Step	Channel Modification	Encourage counties to develop a Sensitive Habitat Ordinance similar to that in place for the County of Santa Cruz.	2	10	Marin County						TBD	
PGC-A-12.3	Objective	Channel Modification	All proposed development projects should include habitat protection, and/or alternatives that minimize impacts to salmon habitat.		10	Marin County, NPS, State Parks						TBD	
PGC-A-15.1	Objective	Droughts	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.	1	10	Marin RCD						TBD	
PGC-A-15.2	Objective	Droughts	All local and state planning and development should consider, and provide contingencies for, droughts in a manner compatible with CCC coho salmon recovery needs.	1	20	Marin County, NPS, State Parks						TBD	
PGC-A-26.1	Objective	Water Diversion and Impoundment	Provide incentives to improve instream flows for coho salmon:.										
PGC-A-26.1.1	Recovery Action	Water Diversion and Impoundment	Develop off channel water storage for farming operation within the watershed to increase summer pool habitat in the lower portion of the watershed.	1	30	Marin RCD, Private Landowners						TBD	

Pine Gulch 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	
PGC-A-26.2	Objective	Water Diversion and Impoundment	Improve the education and awareness of agencies, landowners, and the public regarding water conservation and use.										
PGC-A-26.2.1	Recovery Action	Water Diversion and Impoundment	Promote the use of reclaimed water for agricultural or other uses.	1	20	Marin RCD, NRCS						TBD	