WALKER CREEK

Walker Creek

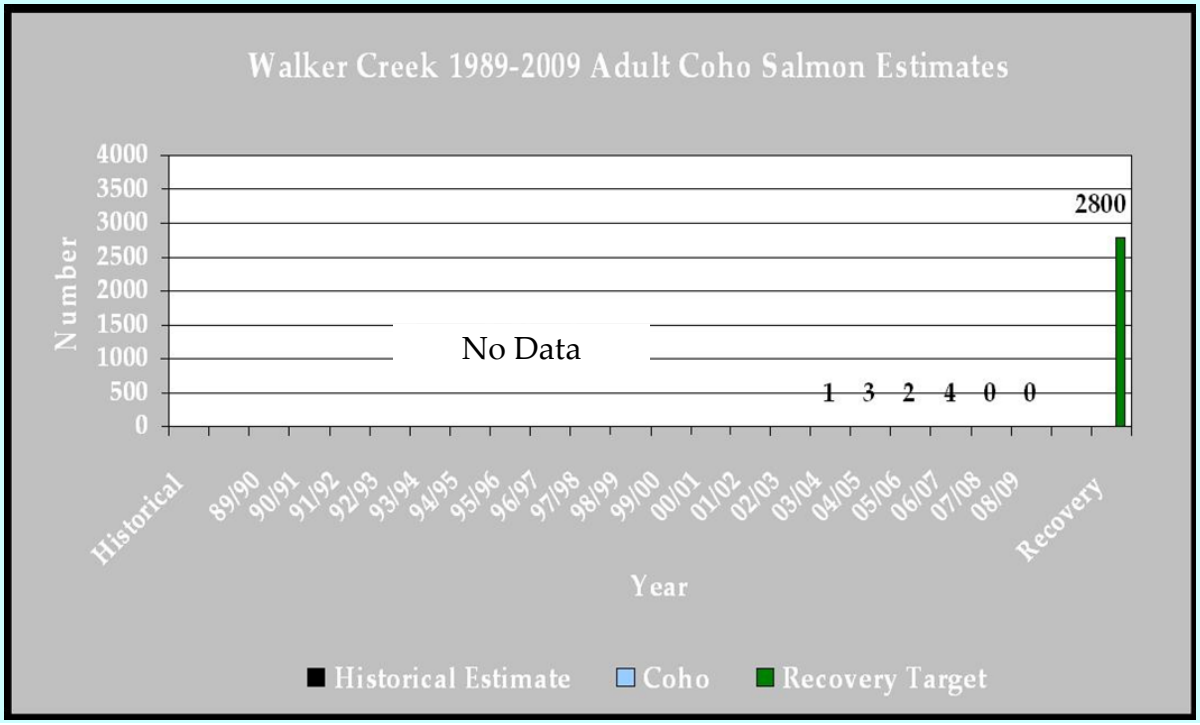
Independent Population
76.2 IP-km of potential coho salmon habitat
Coho salmon and steelhead present

Walker Creek drains approximately 75 square miles of northern Marin County and empties into Tomales Bay. Approximately 61 percent of the Walker Creek watershed is grassland and about 24 percent of the watershed area is either montane or riparian hardwood forest. The Walker Creek watershed has low to moderate erodibility after considering slope, precipitation, and the susceptibility of failure of underlying geology. The SWRCB listed the lower 16 miles of the Walker Creek watershed as having water quality impaired for mercury, nutrients, and sediment in 2003. The water quality impairment listing determined that mercury, nutrients, and sediment were impairing habitats beneficial to coho salmon, including migration, spawning, and rearing habitats, and identified surface mining, mine tailings, and agricultures as the probable causes. Ninety-six percent of the Walker Creek watershed is in private ownership; the remaining four percent is state and local owned lands. The dominant land use within the Walker Creek watershed is dairy rangeland. Housing development within the Walker Creek watershed is low; approximately 300 housing units are present in the watershed. There are three dams within the watershed that impede or block salmon migration, and additional numerous partial barriers to salmon migration caused by road crossings and water diversions. Impassable barriers block salmonids from 30 to 50 percent of the watershed.

Walker Creek
Photo by Bob Coey, NMFS

The Watershed at a Glance

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



Walker 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 only threat that ranked high in the Walker Creek waterhshed was:

- Livestock Farming and Ranching

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

- Improve spawning habitat
- Increase frequency of pool habitat
- Increase riparian shading to cool streams
- Improve flows
- Promote riparian vegetation conservation
- Reduce impacts to the streams from agriculture
- Increase the amount of large wood in and near streams
- Decrease the number of roads near streams and reduce the impacts of existing roads
- Eliminate sources of sediment and toxins

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

- Develop site-specific recommendations, including incentives, to remedy high temperatures and implement (DFG 2004) initially in core areas, following with Phase 1 and 2 areas.
- Implement high priority coho salmon enhancement projects for the reduction of sediment delivery and the restoration of riparian corridors as listed in the Walker Creek Enhancement Plan
- Address water quality and nutrient loading issues by encouraging sustainable land management practices, controlling sediment sources, protecting riparian zones and employing BMPs that encourage permeability and infiltration
- Promote grazing and ranching practices that protect and restore CCC coho salmon habitats.

. . . in these **core areas:** Walker Creek are above Chileno Creek of the Lower Walker Creek planning watershed; Mainstem Walker Creek and Frink Canyon of the Upper Walker Creek planning watershed

Conservation Highlights

- Coho salmon from broodstock programs were released into the watershed
- Erosion control efforts are taking place to control sediment in the watershed
- Dairy and farming Best Management Practices have been developed and implemented in the Walker Creek Watershed

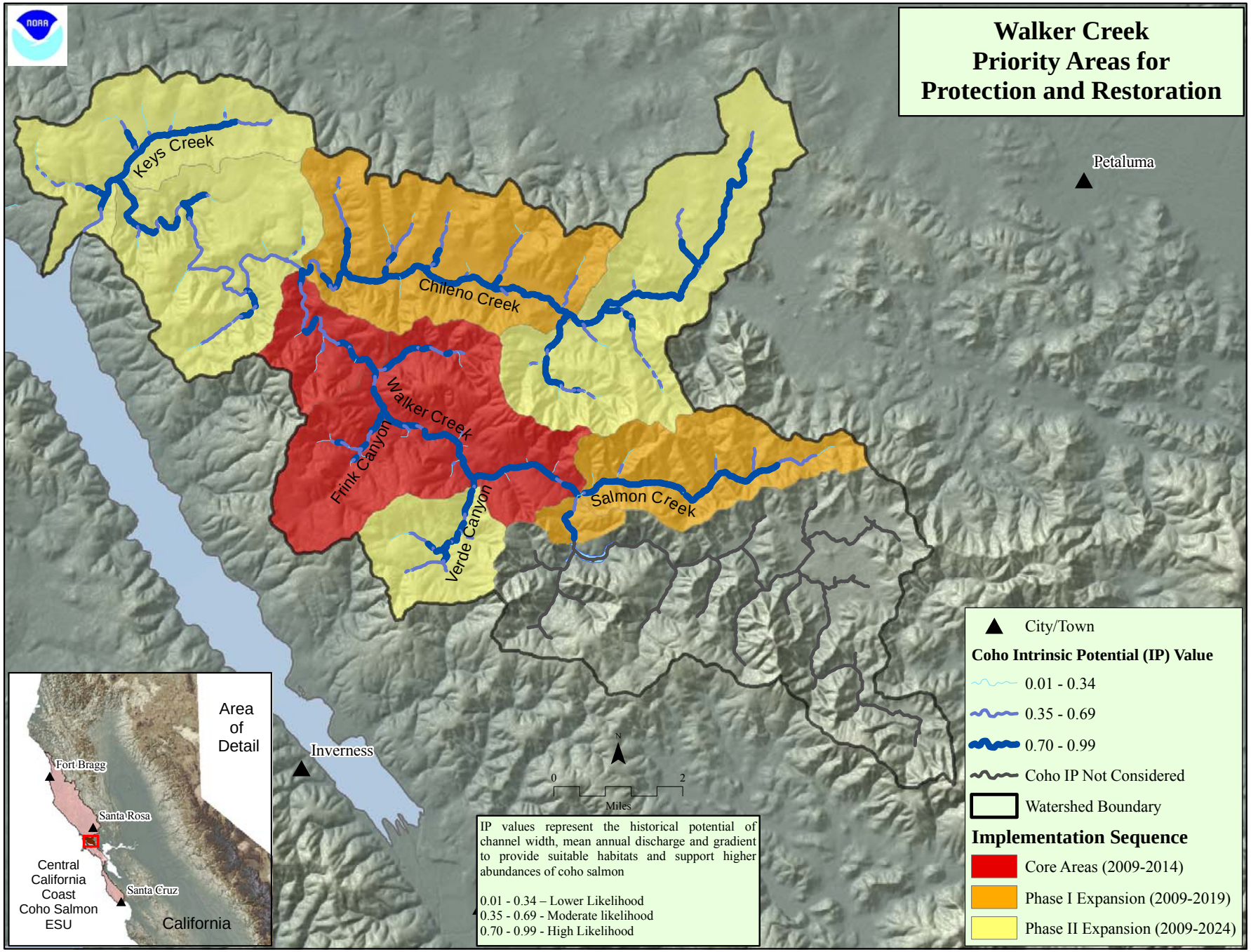
Streambank restoration on Walker Creek
Photo by Bob Coey, NMFS

Immediate Needs

√ Assess and prioritize sediment sources from road networks
√ Conduct landowner outreach to expand broodstock releases/monitoring
√ Explore passage above water diversions and dams

Recovery Partners

MMWD
Marin RCD
DFG
UCCE
Tomales Bay Watershed Council Private


Walker Creek
Priority Areas for
Protection and Restoration
Keys Creek
Chileno Creek
Walker Creek
Frink Canyon
Verde Canyon
Salmon Creek
Petaluma
Inverness
Area
of
Detail
Fort Bragg
Santa Rosa
Santa Cruz
Central
California
Coast
Coho Salmon
ESU
California
N
0
2
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
Coho IP Not Considered
Watershed Boundary
Implementation Sequence
Core Areas (2009-2014)
Phase I Expansion (2009-2019)
Phase II Expansion (2009-2024)

CCC Coho Salmon
Walker Creek
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	70%	Fair	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	500-4900 m^2	Fair	Spawning Adults	Sediment	Amount of Gravel*	<500 m^2	500-4900 m^2	4900-9400 m^2	>9400 m^2
NMFS	Best Prof. judgment	<5%	Good	Spawning Adults	Viability	Freshwater Harvest	>10% of pop.	5-10%	<5%	
Flow Panel	Decision Matrix	58	Fair	Eggs	Hydrology	Instantaneous Condition	>75 (score)	51-75	35-50	<35
Flow Panel	Decision Matrix	58	Fair	Eggs	Hydrology	Redd Scour	>75 (score)	51-75	35-50	<35
SEC	Many Sources	NA	Poor	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	83	Poor	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	Poor	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	Fair	Fair	Smolts	Estuary	Estuary				
Flow Panel	Decision Matrix	58	Good	Smolts	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	SWRCB	0.6/10 IP-km	Good	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	50-80%	Fair	Multiple Life Stages	Floodplain	Floodplain Connectivity	<50%	50-80%	>80%	not defined
NMFS	CDF CWHR	0%	Poor	Multiple Life Stages	Hydrology	Stand Age			>40 years old	
SEC	NLCDB	0.22%	Very Good	Multiple Life Stages	Hydrology	Impervious Surfaces	>12.01% of WS by area	7.01-12%	3.01-7%	0-3%
SEC	FMMP	33.38%	Poor	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	0.2 / 100 m	Poor	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	<25%	Poor	Multiple Life Stages	Riparian Veg.	Species Composition	<25%	25-50%	>50%	Historical Conditions
NMFS	CDF CWHR	0%	Poor	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	1.3 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	3 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	Poor	Poor	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

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

Walker 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	
WalC-A-1.1	Objective	Estuary	Support a coho salmon limiting factors assessment in Keys Estero and Tomales Bay (DFG 2004).	1	5	MMWD, Tomales Bay Watershed Council	4.00	4.00	4.00	4.00	4.00	20	
WalC-A-2.1	Objective	Floodplain	Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.										
WalC-A-2.1.1	Recovery Action	Floodplain	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	2	5	Marin RCD, MMWD	10.00	10.00	10.00	10.00	10.00	50	
WalC-A-2.1.2	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.										
WalC-A-2.1.2.1	Action Step	Floodplain	Support landowners and the Marin RCD in developing projects to improve channel conditions and restore natural channel geomorphology, including side channels and dense contiguous riparian vegetation (DFG 2004).	3	40	Marin County, MMWD, Tomales Bay Watershed Council						TBD	Cost cannot be determined due to unknown number of projects at various scales.
WalC-A-2.1.3	Recovery Action	Floodplain	Target habitat restoration and enhancement that will function between winter base flow and flood stage.										
WalC-A-2.1.3.1	Action Step	Floodplain	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.	1	60	Marin County, MMWD, Tomales Bay Watershed Council						TBD	Need additional information on number of projects to make cost estimate.
WalC-A-2.1.4	Recovery Action	Floodplain	Encourage willing landowners to restore historical floodplains or offchannel habitats through conservation easements, etc.										
WalC-A-2.1.4.1	Action Step	Floodplain	Set-back existing levees in strategic areas to increase flood-flow detention and promote flood-tolerant land uses.	2	40	MMWD	250	250	250	250	250	10,000	
WalC-A-3.1	Objective	Hydrology	Improve survival at all life stages by improving spatial and temporal pattern of surface flows throughout spawning, rearing, and migration areas.										
WalC-A-3.1.1	Recovery Action	Hydrology	Establish a comprehensive stream flow evaluation program to determine instream flow needs for coho salmon.	2	10	CDFG, MMWD, NMFS	10.00	10.00	10.00	10.00	10.00	100	
WalC-A-3.1.2	Recovery Action	Hydrology	Work with SWRCB and landowners to improve over summer survival of juveniles by re-establishing summer baseflows (from July 1 to October 1) in rearing reaches that are currently impacted by water use.										
WalC-A-3.1.2.1	Action Step	Hydrology	Continue to assess the release of water from Soulejule Reservoir to develop the optimum flow release for coho salmon (DFG 2004).	2	60	CDFG, MMWD, NMFS	1.67	1.67	1.67	1.67	1.67	100	
WalC-A-3.1.3	Recovery Action	Hydrology	Institutionalize programs to purchase easements on water rights to encourage the maintenance of surface flows.	2	10	CDFG, DWR, NMFS, RWQCB						TBD	
WalC-A-3.1.4	Recovery Action	Hydrology	Manage reservoirs and dam releases to maintain suitable rearing temperatures and migratory flows in downstream habitats (e.g., pulse flow programs for adult upstream migration and smolt outmigration).	2	60	CDFG, MMWD, NMFS						TBD	
WalC-A-3.1.5	Recovery Action	Hydrology	Manage riparian areas for their site potential composition and structure.	3	60	Marin County, MMWD, Tomales Bay Watershed Council						TBD	
WalC-A-3.1.6	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.										
WalC-A-3.1.6.1	Action Step	Hydrology	Monitor, identify problems, and prioritize needed changes to water diversion on current or potential coho streams that go dry in some years (DFG 2004).	2	60	MMWD, SPAWN						TBD	
WalC-A-3.1.6.2	Action Step	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.	2	30	Marin County, Marin RCD, MMWD						TBD	
WalC-A-3.1.6.3	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	1	30	Marin County, Marin RCD, MMWD						TBD	

Walker 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	
WalC-A-3.1.6.4	Action Step	Hydrology	Promote development of alternative water sources via technical assistance and/or regulatory actions.	2	30	Marin County, MMWD, RCD						TBD	
WalC-A-3.1.6.5	Action Step	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).	2	10	DWR, NMFS, SWRCB						TBD	
WalC-A-3.1.7	Recovery Action	Hydrology	Work with SWRCB and landowners to improve passage flow regimes for adult migration to spawning habitats and smolt outmigration.	2	20	CDFG, DWR, Marin RCD, MMWD, RWQCB, SWRCB						TBD	
WalC-A-3.1.8	Recovery Action	Hydrology	To improve connectivity of surface flows with groundwater reduce aggradation and overall sediment load at the watershed scale by treating roads and sources of mass wasting.	3	10	Marin RCD						TBD	
WalC-A-5.1	Objective	Passage	Evaluate the feasibility of bypassing large dams (DFG 2004) in the watershed.										
WalC-A-5.1.1	Recovery Action	Passage	Develop strategies with MMWD to evaluate passage above Soulahoulie Reservoir	3	20	MMWD, NMFS						TBD	Evaluate truck and trap operations
WalC-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.										
WalC-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.										
WalC-A-6.1.1.1	Action Step	Pool Habitat	Develop a mitigation policy that requires in-kind replacement of removed large woody debris at a 3:1 ratio.	3	10	Marin County	10.00	10.00	10.00	10.00	10.00	100	
WalC-A-6.1.2	Recovery Action	Pool Habitat	Identify historic CCC coho salmon habitats lacking in channel complexity, and promote restoration projects designed to create or restore complex habitat features that provide for localized pool scour, velocity refuge, and cover. Prioritize Core areas first followed by Phase I areas.										
WalC-A-6.1.2.1	Action Step	Pool Habitat	Install LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (DFG 2004).	1	10	Marin RCD, MMWD	100	100	100	100	100	1,000	
WalC-A-6.1.2.2	Action Step	Pool Habitat	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	2	60	Marin RCD, MMWD						TBD	
WalC-A-6.1.2.3	Action Step	Pool Habitat	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	2	20	Marin RCD, MMWD						TBD	
WalC-A-6.1.3	Recovery Action	Pool Habitat	Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (DFG 2004).	1	60	Marin RCD, MMWD						TBD	
WalC-A-6.1.4	Recovery Action	Pool Habitat	Promote bio-engineering solutions as appropriate (e.g. except where critical infrastructure is located) for bank hardening projects.	3	60	Marin County, MMWD						TBD	
WalC-A-7.1	Objective	Riparian Vegetation	Restore and enhance riparian structure and function in the Walker Creek watershed.										
WalC-A-7.1.1	Recovery Action	Riparian Vegetation	Encourage programs to purchase land/conservation easements to re-establish and enhance natural riparian communities.	2	10	Marin RCD, MMWD	50.00	50.00	50.00	50.00	50.00	500	
WalC-A-7.1.2	Recovery Action	Riparian Vegetation	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.	2	20	Marin RCD, MMWD	750	750	750	750	750	15,000	
WalC-A-7.2	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.										

Salmon 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	
SaC-CCC-6.1.2	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.										
SaC-CCC-6.1.2.1	Action Step	Pool Habitat	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	3	60	CDFG, Gold Ridge RCD						tbd	
SaC-CCC-6.1.2.2	Action Step	Pool Habitat	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	2	60	CDFG, Gold Ridge RCD						tbd	
SaC-CCC-6.1.2.3	Action Step	Pool Habitat	Continue to study the effects of LWD placement and subsequent sheltered pool formation and monitor response of summer and winter rearing juvenile use.	3	5	CDFG						tbd	
SaC-CCC-6.1.3	Recovery Action	Pool Habitat	Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (DFG 2004).	2	60	Gold Ridge RCD, Private Consultants, Private Landowners, Sonoma County						TBD	
SaC-CCC-6.1.4	Recovery Action	Pool Habitat	Install LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (DFG 2004).										
SaC-CCC-6.1.4.1	Action Step	Pool Habitat	Where feasible, design and engineer pool enhancement structures to increase the number of pools (Gold Ridge Resource Conservation District & Prunuske Chatham, Inc., 2007; DFG 2004).	3	60	CDFG, Gold Ridge RCD, NOAA RC						tbd	
SaC-CCC-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.										
SaC-CCC-7.1.1	Recovery Action	Riparian Vegetation	Increase the canopy along Salmon Creek by planting a succession of native riparian vegetation where shade canopy is not at acceptable levels. Non-anadromous reaches should also be assessed for revegetation as water temperatures throughout are affected from upstream (Gold Ridge Resource Conservation District & Prunuske Chatham, Inc., 2007; DFG 2004).										
SaC-CCC-7.1.1.1	Action Step	Riparian Vegetation	Encourage the cultivation and availability of locally indigenous riparian plants for use in restoration and bank stabilization (DFG 2004)	2	60	CDFG, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners						tbd	
SaC-CCC-7.1.2	Recovery Action	Riparian Vegetation	Support landowners and the RCD to restore riparian zones and manage livestock to increase stream protection and soil retention (Gold Ridge Resource Conservation District & Prunuske Chatham, Inc., 2007; DFG 2004).	3	20	Gold Ridge RCD, Private Consultants, Private Landowners						TBD	
SaC-CCC-7.1.3	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	Gold Ridge RCD, Private Consultants, Private Landowners	40.00	40.00	40.00	40.00	40.00	200	
SaC-CCC-7.1.4	Recovery Action	Riparian Vegetation	Promote bio-engineering solutions as appropriate (e.g. where critical infrastructure is located) for bank hardening projects.	3	20	Gold Ridge RCD, Private Consultants, Private Landowners, Sonoma County						TBD	
SaC-CCC-7.1.5	Recovery Action	Riparian Vegetation	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	2	20	CDFG, Gold Ridge RCD, NMFS, NRCS, Private Consultants, Private Landowners, USFWS						TBD	

Salmon 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	
SaC-CCC-7.1.6	Recovery Action	Riparian Vegetation	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	California Coastal Conservancy, CDFG, Sonoma County						tbd	
SaC-CCC-7.1.7	Recovery Action	Riparian Vegetation	Manage riparian areas for their site potential composition and structure.	2	30	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners, Sonoma County						TBD	
SaC-CCC-8.1	Objective	Sediment	Improve habitat conditions at multiple life stages by reducing sediment inputs to the stream at the watershed scale.										
SaC-CCC-8.1.1	Recovery Action	Sediment	Continue to implement erosion control projects that were assessed and inventoried in sediment assessment plans (DFG 2004).	3	60	Gold Ridge RCD, Private Consultants, Private Landowners, Sonoma County						TBD	
SaC-CCC-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.	3	60	Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Sonoma County						TBD	
SaC-CCC-8.1.3	Recovery Action	Sediment	Address sources from slides and gullies that deliver sediment and runoff to stream channels.	3	20	Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Sonoma County						TBD	
SaC-CCC-9.1	Objective	Viability	Re-establish a naturally reproducing run of coho salmon in appropriate subwatersheds.										
SaC-CCC-9.1.1	Recovery Action	Viability	Continue the operation of the Captive Broodstock Program in Salmon Creek.										
SaC-CCC-9.1.1.1	Action Step	Viability	Fund monitoring actions in Salmon Creek to evaluate success of adult reintroductions towards salmon recovery.	1	10	CDFG						TBD	
SaC-CCC-9.1.1.2	Action Step	Viability	Conduct outreach with landowners to expand broodstock releases within core areas, and remaining extirpated streams within the watershed.	1	2	Gold Ridge RCD						TBD	
SaC-CCC-9.1.2	Recovery Action	Viability	Minimize departure from the genetic profile that historically existed in the population.										
SaC-CCC-9.1.2.1	Action Step	Viability	Evaluate recent adult stocking efforts to guide adult spawner release sources.	2	5	NOAA SWFSC						TBD	
SaC-CCC-9.1.2.2	Action Step	Viability	Annually capture or retain (during rescue efforts) - small numbers of surplus fish from drying streams/habitats in Marin and Sonoma Counties for purposes of broodstock in Russian River, Walker and Salmon Creeks.	1	10	CDFG						tbd	
SaC-CCC-9.1.2.3	Action Step	Viability	Use surplus broodstock to repopulate remaining extirpated streams within the watershed.	1	10	CDFG, NMFS						tbd	
SaC-CCC-9.1.3	Recovery Action	Viability	Continue to rescue juvenile coho salmon with existing permittees that are under an imminent risk of stranding and mortality and relocate to suitable habitat when deemed appropriate by NMFS and CDFG	1	10	CDFG, Gold Ridge RCD, NMFS, Trout Unlimited							Existing operations
SaC-CCC-9.2	Objective	Viability	Conduct periodic, standardized spawning surveys to estimate adult abundance in the watershed. Surveys should include all three cohorts.	1	20	CDFG, Gold Ridge RCD, NMFS	200	200	200	200	200	4,000	
SaC-CCC-9.3	Objective	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.	2	20	CDFG, Gold Ridge RCD, NMFS	400	400	400	400	400	8,000	
SaC-CCC-9.4	Objective	Viability	Monitor the effectiveness and maintenance of watershed restoration projects and augment inventories as needed (DFG 2004).	2	20	CDFG, Gold Ridge RCD, NMFS	50.00	50.00	50.00	50.00	50.00	1,000	

Salmon 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	
SaC-CCC-10.1	Objective	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).	2	5	Gold Ridge RCD, Private Consultants, Private Landowners	60.00	60.00	60.00	60.00	60.00	300	
SaC-CCC-10.2	Objective	Water Quality	Improve summer rearing survival by reducing instream temperatures in potential rearing reaches. See also strategies for restoring and enhancing riparian vegetation.										
SaC-CCC-10.2.1	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).										
SaC-CCC-10.2.1.1	Action Step	Water Quality	Plant native vegetation to promote streamside shade.	3	20	Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Sonoma County						TBD	
SaC-CCC-12.1	Objective	Channel Modification	Restore or minimize impacts to watershed processes (e.g., riparian, sediment transport, hydrology and estuary function).										
SaC-CCC-12.1.1	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.										
SaC-CCC-12.1.1.1	Action Step	Channel Modification	Evaluate whether proposed stabilization projects will lead to additional instability either up- or downstream.	2	10	CalTrans, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Public, Sonoma County						TBD	Costs may vary significantly depending on level of commitment from local government and private landowners. The majority of the costs would likely include local government and consultant staff time.
SaC-CCC-12.1.1.2	Action Step	Channel Modification	Eliminate the use of gabion baskets and undersized rock within the bankfull channel.	2	10	CalTrans, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Public, Sonoma County						TBD	Costs may vary significantly depending on level of commitment from local government and private landowners. The majority of the costs would likely include local government and consultant staff time.
SaC-CCC-12.1.1.3	Action Step	Channel Modification	Where feasible, remove obsolete bank stabilization structures from the channel which contribute to channel incision and reduced habitat complexity.	2	10	CalTrans, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Public, Sonoma County						TBD	Costs may vary significantly depending on level of commitment from local government and private landowners. The majority of the costs would likely include local government and consultant staff time.
SaC-CCC-12.1.2	Recovery Action	Channel Modification	Develop a mitigation policy that requires in-kind replacement of removed large woody debris at a 3:1 ratio.	2	10	CalTrans, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Consultants, Private Landowners, Public, Sonoma County						TBD	Costs may vary significantly depending on level of commitment from local government and private landowners. The majority of the costs would likely include local government and consultant staff time.
SaC-CCC-15.1	Objective	Droughts	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.										

Salmon 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	
SaC-CCC-15.1.1	Recovery Action	Droughts	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.	2	20	, Gold Ridge RCD, Private Landowners, Sonoma County						TBD	
SaC-CCC-15.1.2	Recovery Action	Droughts	Work with DFG, County of Sonoma, State Parks, municipalities, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.	1	20	, Cities, Sonoma County, State Parks						TBD	
SaC-CCC-15.2	Objective	Droughts	Minimize water use and seek alternatives during droughts.	1	20	, Cities, Private Landowners, Sonoma County						TBD	
SaC-CCC-19.1	Objective	Livestock Farming and Ranching	Reduce the adverse effects of grazing and ranching to water quality.										
SaC-CCC-19.1.1	Recovery Action	Livestock Farming and Ranching	Support grazing practices that minimize impacts to riparian and instream habitat: livestock exclusion, rotational grazing, etc.										
SaC-CCC-19.1.1.1	Action Step	Livestock Farming and Ranching	Provide funding assistance to landowners willing to fence riparian and other sensitive areas (areas prone to erosion) to exclude cattle and sheep. Calf/cow operations should take priority for riparian fencing programs over steer operations.	2	20	Farm Bureau, Gold Ridge RCD, NRCS						TBD	
SaC-CCC-19.1.1.2	Action Step	Livestock Farming and Ranching	To minimize gully initiation, grazing should be kept at relatively low intensities on the steeper slopes in this area.	2	60	Farm Bureau, Gold Ridge RCD, Private Landowners, Sonoma County						TBD	
SaC-CCC-19.1.1.3	Action Step	Livestock Farming and Ranching	Where necessary, establish predetermined stream crossings when herding cattle between pastures.	2	20	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
SaC-CCC-19.1.2	Recovery Action	Livestock Farming and Ranching	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	2	20	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
SaC-CCC-19.2	Objective	Livestock Farming and Ranching	Locate water sources away from riparian areas.										
SaC-CCC-19.2.1	Recovery Action	Livestock Farming and Ranching	Encourage riparian restoration to regain riparian corridors damaged from livestock and other causes.	2	30	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
SaC-CCC-19.2.2	Recovery Action	Livestock Farming and Ranching	Increase the use of water storage and catchment systems that collect rainwater in the winter for use during the dry summer and fall seasons.	2	30	Farm Bureau, Gold Ridge RCD, NRCS, Private Landowners						TBD	
SaC-CCC-24.1	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.	2	20	, Private Landowners, Sonoma County						TBD	This is the only road parameter that received a high or very high threat (density of roads in riparian zone)
SaC-CCC-25.1	Objective	Storms and Flooding	Conduct outreach and education regarding how local, city, county, State and Federal planning can put in place mechanisms that provide community resiliency to storms and flooding.										
SaC-CCC-25.1.1	Recovery Action	Storms and Flooding	Agencies should develop large woody debris retention programs and move away from the practice of removing instream large woody debris under high flow “emergencies”.	1	20	Cities, FEMA, Sonoma County, Water Agencies						TBD	
SaC-CCC-25.1.2	Recovery Action	Storms and Flooding	Land use zoning should be appropriate to the site and be tolerant to anticipated conditions (e.g., tolerant to frequent flooding).	2	60	Bodega Land Trust, CalFire, Farm Bureau, FEMA, FishNet 4C, Gold Ridge RCD, NRCS, Private Landowners, RWQCB						TBD	Costs will vary significantly depending on site specific conditions and landowner willingness to have roads addressed.

Salmon 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	
SaC-CCC-25.1.3	Recovery Action	Storms and Flooding	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	2	5	CDFG, FEMA, FishNet 4C, Gold Ridge RCD, NMFS, NRCS, Sonoma County, USACE, USFWS	4.00	4.00	4.00	4.00	4.00	20	Existing documents and policies can be used for this recommendation. Costs would increase if a number of site specific conditions and criteria are developed.
SaC-CCC-25.1.4	Recovery Action	Storms and Flooding	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.	1	60	CalFire, CalTrans, FEMA, Gold Ridge RCD, RWQCB, San Mateo RCD, Sonoma County, USACE						TBD	Costs will vary significantly depending on site specific conditions and landowner willingness to have roads and other infrastructure addressed to improve hydrologic function. As a general recommendation for future development cost may vary depending on existing infrastructure and site specific conditions.
SaC-CCC-25.1.5	Recovery Action	Storms and Flooding	Work with local governments to incorporate protection of CCC coho salmon in any flood management activity (DFG 2004).	2	10	CDFG, Cities, FEMA, Gold Ridge RCD, NMFS, Sonoma County, USACE						0	Outreach and education are ongoing, and additional costs are expected to be minimal.
SaC-CCC-26.1	Objective	Water Diversion and Impoundment	Improve current laws and policies to control diversions and water use in order to maintain and restore surface flows.	1	Ongoing	CDFG, NMFS, RWQCB, SWRCB						TBD	
SaC-CCC-26.2	Objective	Water Diversion and Impoundment	Promote water conservation by the public, water agencies, agriculture, private industry, and the citizenry.										
SaC-CCC-26.2.1	Recovery Action	Water Diversion and Impoundment	Promote off-channel storage to reduce impacts of water diversion (e.g., storage tanks for rural residential users).	2	5	CDFG, Gold Ridge RCD, Private Landowners, RWQCB, Sonoma County						TBD	
SaC-CCC-26.2.2	Recovery Action	Water Diversion and Impoundment	Promote the use of reclaimed water for agricultural or other uses.	2	10	Gold Ridge RCD, Private Landowners, RWQCB, Sonoma County, Sonoma County Water Agency						TBD	
SaC-CCC-26.3	Objective	Water Diversion and Impoundment	Develop new policies and regulations and or enforce existing policies and regulations to provide suitable flow conditions for CCC coho salmon.										
SaC-CCC-26.3.1	Recovery Action	Water Diversion and Impoundment	Avoid and/or minimize the adverse effects of water diversion on CCC coho salmon.										
SaC-CCC-26.3.1.1	Action Step	Water Diversion and Impoundment	Determine and monitor 1600 program compliance related to water diversions (DFG 2004).	2	5	CDFG Law Enforcement, NMFS OLE, SWRCB						TBD	
SaC-CCC-26.3.1.2	Action Step	Water Diversion and Impoundment	Develop and implement regulations for groundwater use.	2	5	RWQCB, Sonoma County, SWRCB						TBD	