Garcia River

Garcia River

Independent Population
76.0 IP-Km of potential coho salmon habitat
Coho salmon, Chinook salmon, and steelhead present

Garcia River drains about 114 square miles of western Mendocino County, and enters the Pacific Ocean about five miles north of Point Arena. About 51 percent of the Garcia River watershed is redwood coniferous forest, about 15 percent is Douglas-fir forest, and about 18 percent of the watershed area is montane hardwood forest. Approximately 57 percent of the watershed has intermediate susceptibility to soil erosion and the remaining 43 percent has high susceptibility to erosion. The EPA determined the Garcia River as having impaired water quality, and that sedimentation was impairing salmonids and their habitat. The EPA established a TMDL for the watershed in 2002. Most of the Garcia River watershed is privately owned; less than one percent of the watershed is either state park land or federal forest. The dominant land use within the Garcia River watershed is forestry, though some lands are used for agriculture and gravel mining. Logging in the Garcia River watershed began in the late 1800s; several rounds of harvest of second growth timber have occurred; approximately 52 percent of the basin was harvested between 1987 and 1997. Within the past 10 years, about 20 percent of the Garcia River watershed has been under a timber harvest plan. Housing development within the Garcia River watershed is moderate; approximately 380 housing units are present in the watershed. There are no dams within the watershed that impede or block salmon migration, though there are at least 34 partial barriers to salmon migration caused by diversions, road crossings, and natural barriers. Impassable barriers block salmonids from less than 10 percent of the watershed.

Garcia River.
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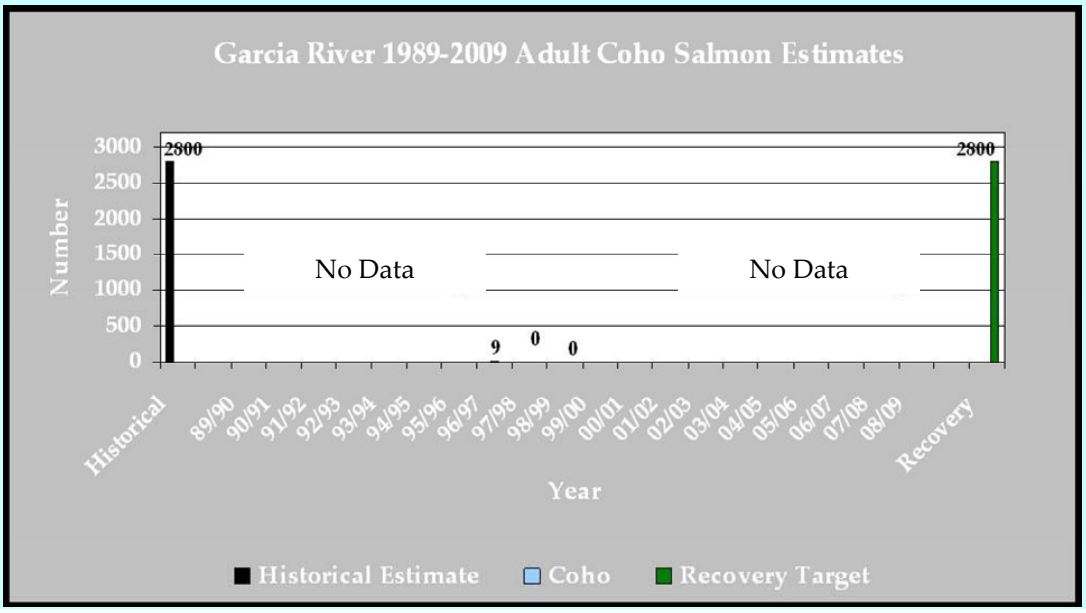
The Watershed at a Glance

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



Garcia River

Recovery Target: 2,800 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:

- Logging and Wood Harvesting
- Roads and Railroads
- Agriculture
- Droughts

Preventing the extinction of coho salmon

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

- Increase pool habitat complexity and frequency of pools
- Increase the frequency of off channel habitat
- Increase the frequency of large woody debris in streams
- Increase riparian shade to cool streams
- Reduce road density in riparian areas and across the watershed.

We need your photo here.

Garcia River
Photo © Your Name Here, AFFIL

Advancing recovery of coho

salmon in Garcia River requires these priority **recovery actions:**

- Reestablish connectivity of lower North Fork Garcia River to the main stem.
- Install or enhance existing LWD, boulders, and other features to increase stream complexity and improve pool frequency and depth. Implement projects that improve habitat complexity.
- Undertake restoration projects that upgrade or decommission high risk roads throughout the core areas.
- Maintain the following tributaries to provide coldwater input to the Garcia River mainstem: Hathaway, North Fork, Rolling Brook, Mill Creek (lower Garcia River), South Fork, Signal, Mill Creek (upper Garcia River).
- . . . in these **core areas:** North Fork Garcia River, South Fork Garcia River, Signal Creek, and Inman Creek planning watersheds.

Conservation Highlights

- The Conservation Fund (TCF) and The Nature Conservancy (TNC) purchased ~ 24,000 acres of the Garcia River watershed, and will manage the property for sustainable forestry.
- Trout Unlimited (TU), MRC, TCF, Mendocino County Fish and Wildlife Advisory Board, and TNC have undertaken various stream restoration actions.
- Established Salmonid Restoration Federation Field School

Installing LWD in Garcia River
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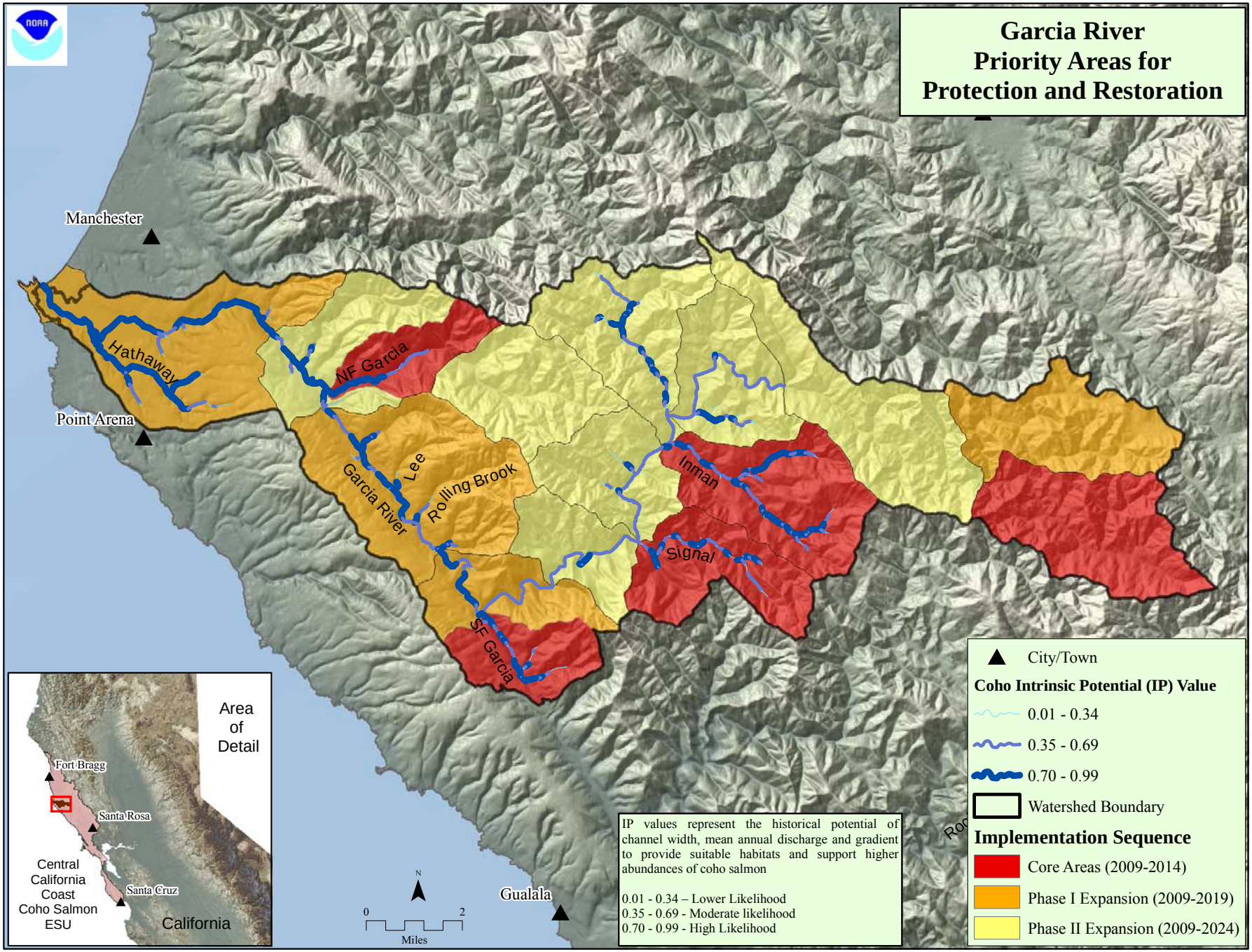
Immediate Needs

√ Continue effective collaborative restoration efforts.
√ Develop and implement life cycle and abundance studies.
√ Identify floodplain actions needed to improve habitat.
√ Finalize MRC Habitat Conservation Plan.

Recovery Partners

AmeriCorps
California Conservation Corps
Mendocino County Fish and Wildlife Advisory Board
TCF
TNC
TU
MRC
Salmonid Restoration Federation Field School
RWQCB


Garcia River
Priority Areas for
Protection and Restoration
Manchester
Point Arena
Hathaway
NF Garcia
Lee
Garcia River
Rolling Brook
Inman
Signal
SF Garcia
Gualala
Area
of
Detail
Fort Bragg
Santa Rosa
Central
California
Coast
Coho Salmon
ESU
Santa Cruz
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
Watershed Boundary
Implementation Sequence
Core Areas (2009-2014)
Phase I Expansion (2009-2019)
Phase II Expansion (2009-2024)

CCC Coho Salmon
Garcia River
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	400-3800 m^2	Fair	Spawning Adults	Sediment	Amount of Gravel*	<400 m^2	400-3800 m^2	3800-7300 m^2	>7300 m^2
NMFS	Best Prof. judgment	>10% of pop.	Poor	Spawning Adults	Viability	Freshwater Harvest	>10% of pop.	5-10%	<5%	
Flow Panel	Decision Matrix	50	Good	Eggs	Hydrology	Instantaneous Condition	>75 (score)	51-75	35-50	<35
Flow Panel	Decision Matrix	75	Fair	Eggs	Hydrology	Redd Scour	>75 (score)	51-75	35-50	<35
SEC	Many Sources	NA	Fair	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	77%	Good	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	50	Poor	Summer Rearing	Pool Habitat	Shelter Rating	<60 avg. rating	60-80	80-100	>100
SEC	CDFG HAB 8	10%	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	50	Poor	Winter Rearing	Floodplain	Complex Habitat**	<50% Connected	50-80% connected	>80% connected	
NMFS	NCWAP	Fair	Fair	Smolts	Estuary	Estuary				
Flow Panel	Decision Matrix	50	Good	Smolts	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	SWRCB	1.58/10 IP-km	Fair	Smolts	Passage	# of Diversions**	>5 / 10 IP km	1.1-5	0.01-1	0
SEC	CDFG HAB 8	50	Poor	Multiple Life Stages	Pool Habitat	Shelter Rating	<60 avg. rating	60-80	80-100	>100
NMFS	Best Prof. judgment	>80%	Good	Multiple Life Stages	Floodplain	Floodplain Connectivity	<50%	50-80%	>80%	not defined
NMFS	CDF CWHR	41%	Good	Multiple Life Stages	Hydrology	Stand Age			>40 years old	
SEC	NLCDB	0.14%	Very Good	Multiple Life Stages	Hydrology	Impervious Surfaces	>12.01% of WS by area	7.01-12%	3.01-7%	0-3%
SEC	FMMP	0.88%	Very Good	Multiple Life Stages	Land disturbance	Agriculture	>30% of WS by area	10-30%	0.1-10%	<0.1%
NMFS	CDF THP Dataset	15%	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	Many Sources	3.7/100	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	25-50%	Fair	Multiple Life Stages	Riparian Veg.	Species Composition	<25%	25-50%	>50%	Historical Conditions
NMFS	CDF CWHR	40%	Fair	Multiple Life Stages	Riparian Veg.	DBH	<39% Class 5 and 6	40-54%	55-69%	>69%
SEC	CDFG HAB 8	40%	Poor	Multiple Life Stages	Riparian Veg.	Canopy Cover	<45 % avg. over IP-km	75-85%	85-95%	>95%
NMFS	CDF THP Dataset	5.9 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	6.2 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	Good	Good	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

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

Garcia River (Navarro Point-Gualala Point) 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	
GaR-A-2.1	Objective	Floodplain	Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.										
GaR-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.										
GaR-A-2.1.1.1	Action Step	Floodplain	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	1	2	CDFG, Mendocino Redwood Company, The Nature Conservancy	5.00	5.00				10	Cost estimate based on review of existing data and validation of habitat in the field.
GaR-A-2.1.1.2	Action Step	Floodplain	Target habitat restoration and enhancement that will function between winter base flow and flood stage.	2	10	CDFG, Mendocino Redwood Company, Private Consultants, Private Landowners, The Nature Conservancy						TBD	Cost can not be determined with out additional site specific analysis.
GaR-A-2.1.2	Recovery Action	Floodplain	Promote restoration projects designed to create or restore alcove, backchannel, ephemeral tributary, or seasonal pond habitats.										
GaR-A-2.1.2.1	Action Step	Floodplain	Support programs to purchase land/conservation easements to re-establish and/or enhance natural riparian communities.	3	5	CDFG, Mendocino Redwood Company, NMFS, Private Landowners, Public, Redwood Forest Foundation	2.00	2.00	2.00	2.00	2.00	10	Cost based on additional agency staff time to promote these programs.
GaR-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.										
GaR-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.										
GaR-A-3.1.1.1	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	2	5	CDFG, NMFS, NRCS, Private Landowners, RCD, SWRCB	10.00	10.00	10.00	10.00	10.00	50	Cost based on small number of landowner participation in program during the first five years.
GaR-A-3.1.2	Recovery Action	Hydrology	Improve compliance with existing water resource regulations via monitoring and enforcement.										
GaR-A-3.1.2.1	Action Step	Hydrology	Identify and work with the SWRCB to eliminate depletion of summer base flows from unauthorized water uses.	1	60	CDFG, NMFS OLE, SWRCB						TBD	Continued enforcement will likely be required.
GaR-A-3.1.2.2	Action Step	Hydrology	Implement AB2121 to maintain instream flows for coho salmon.	1	20	SWRCB						TBD	20 year time frame was used because some improvements may be needed.
GaR-A-3.1.2.3	Action Step	Hydrology	Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.	3	3	SWRCB	3.33	3.33	3.33			10	Cost estimate for the Garcia watershed.
GaR-A-3.1.3	Recovery Action	Hydrology	Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.	2	10	CDFG, NMFS, NRCS, SWRCB	2.00	2.00	2.00	2.00	2.00	20	Cost based on minimal regulatory staff time to encourage compliance.
GaR-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).										
GaR-A-3.1.4.1	Action Step	Hydrology	Assess and map water diversions (DFG 2004).	2	5	SWRCB						0	Accounted for in other watersheds (approximately $150k over 5 years).
GaR-A-3.1.4.2	Action Step	Hydrology	Support the SWRCB in regulating groundwater.	3	5	CDFG, NMFS, RWQCB						TBD	Cost to support SWRCB for the Garcia watershed is expected to be minimal.
GaR-A-3.1.4.3	Action Step	Hydrology	Request that SWRCB review and/or modify water use based on the needs of coho salmon and authorized diverters (DFG 2004).	2	5	CDFG, NMFS, SWRCB						TBD	Cost estimate needed from SWRCB.

Garcia River (Navarro Point-Gualala Point) 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	
GaR-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).	2	20	CDFG, NOAA RC, Private Landowners, SWRCB						TBD	Cost will vary with the number of water rights holders willing to participate.
GaR-A-3.1.6	Recovery Action	Hydrology	Maintain natural flow regime to improve juvenile rearing habitats.										
GaR-A-3.1.6.1	Action Step	Hydrology	Maintain the following tributaries to provide coldwater input to the Garcia River mainstem: Hathaway, North Fork, Rolling Brook, Mill Creek (lower Garcia River), South Fork, Signal, Mill Creek (upper Garcia River) (DFG 2004).	1	60	CDFG, NMFS, Private Landowners, SWRCB, The Nature Conservancy						TBD	Additional analysis of existing and potential water diversions must be conducted to estimate cost.
GaR-A-5.1	Objective	Passage	Identify and remove existing passage barriers.										
GaR-A-5.1.1	Recovery Action	Passage	Identify high priority barriers and restore passage per NMFS' Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a).										
GaR-A-5.1.1.1	Action Step	Passage	Reestablish connectivity of lower North Fork Garcia River to the mainstem (DFG 2004).	1	10	CDFG, NRCS, Private Consultants, Private Landowners						TBD	Specific projects must be developed to determine cost.
GaR-A-5.1.1.2	Action Step	Passage	Evaluate the feasibility of relocating juvenile coho in the North Fork Garcia until geomorphic and low flow stresses are rectified (DFG 2004).	1	5	CDFG, NMFS PRD, NOAA RC, Private Consultants, Private Landowners, The Nature Conservancy	20.00	20.00	20.00	20.00	20.00	100	Cost estimate to relocate juvenile coho to suitable habitat.
GaR-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.										
GaR-A-6.1.1	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.										
GaR-A-6.1.1.1	Action Step	Pool Habitat	Maintain current LWD, boulders, and other structure-providing features to maintain current stream complexity, pool frequency, and depth (DFG 2004).	1	60	Private Landowners						0	Cost to maintain current structure is expected to be minimal.
GaR-A-6.1.2	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).										
GaR-A-6.1.2.1	Action Step	Pool Habitat	Install or enhance existing LWD, boulders, and other instream features to increase habitat complexity and improve pool frequency and depth (DFG 2004). Use information from MRC Garcia Watershed Analysis to determine stream locations with high instream LWD demand, and utilize DFG stream habitat data and The Nature Conservancy data to help determine reaches for LWD placement. Install properly sized LWD to appropriate viability table targets.	1	10	CDFG, NOAA RC, NRCS, Private Landowners, RCD	320	320	320	320	320	3,200	Cost estimate for 10 LWD loading projects at 80k in four core area subbasins.
GaR-A-6.1.2.2	Action Step	Pool Habitat	Encourage coordination of LWD placement in streams as part of logging operations and road upgrades to maximize size, quality, and efficiency of effort (DFG 2004).	2	20	CalFire, CDFG, Private Landowners						TBD	Cost will vary depending on number of projects.
GaR-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	CDFG, NOAA RC, NRCS, RCD	5.00	5.00	5.00	5.00	5.00	100	Based on a minimal expenditure to work with landowners. 5k for 20 years.
GaR-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.										

Garcia River (Navarro Point-Gualala Point) 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	
GaR-A-7.1.1	Recovery Action	Riparian Vegetation	Conserve and manage forestlands for older forest stages.										
GaR-A-7.1.1.1	Action Step	Riparian Vegetation	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.	3	2		40.00	40.00				80	Cost based on $20K in each Core area subbasin over a two year period.
GaR-A-7.1.2	Recovery Action	Riparian Vegetation	Restore and protect riparian vegetation to improve migration and summer/overwintering habitat for coho salmon (DFG 2004).										
GaR-A-7.1.2.1	Action Step	Riparian Vegetation	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004). Focus on partnerships with railroad and timber industry, as well as large private landowners.	3	20	CA Coastal Commission, California Coastal Conservancy, CDFG, Mendocino County, NMFS, NRCS, Private Landowners, RCD, Redwood Forest Foundation						TBD	Costs can not be determined without additional information on the potential projects within this basin.
GaR-A-7.1.2.2	Action Step	Riparian Vegetation	Work with landowners to plant conifers in the lower mainstem Garcia River from Eureka Hill Road Bridge to Windy Hollow road with the goal of reducing stream temperature, providing bank stability and long-term LWD recruitment (DFG 2004).	2	10	CDFG, NRCS, Private Landowners, RCD						TBD	Additional info required to estimate total cost.
GaR-A-8.1	Objective	Sediment	Improve habitat conditions at multiple life stages by reducing sediment inputs to the stream at the watershed scale.										
GaR-A-8.1.1	Recovery Action	Sediment	Re-establish natural sediment delivery processes by assessing sediment delivery sources at the sub-watershed scale and prioritizing sediment reduction activities.										
GaR-A-8.1.1.1	Action Step	Sediment	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (DFG 2004).	1									See roads section.
GaR-A-8.1.1.2	Action Step	Sediment	Complete the remaining 25% of erosion control sites identified in the South Fork Garcia River by the Trout Unlimited North Coast Coho Project.	1	5	Mendocino Redwood Company, Trout Unlimited						TBD	Need cost estimates from project proponents.
GaR-A-8.1.1.3	Action Step	Sediment	Treat high and medium priority sites that are identified in the MRC Garcia River Watershed Analysis, Garcia River Forest Integrated Resource Management Plan and other credible landowner assessments.	1	10	CDFG, NOAA RC, Private Consultants, Private Landowners, SWRCB	200	200	200	200	200	2,000	Based on $1 million estimate for just Garcia river forest sites.
GaR-A-8.1.1.4	Action Step	Sediment	Acquire funding for assessment and implementation of sediment reduction measures associated with the 2008 Jacks Fire which occurred in the North Fork Garcia River subbasin.	2	2	CalFire, NRCS, Private Landowners, RCD	100	100				200	Rough estimate for erosion control in affected area.
GaR-A-8.1.2	Recovery Action	Sediment	Reduce the density of roads and trails and their crossings across watercourses.										See Roads section.
GaR-A-9.1	Objective	Viability	Develop and implement a monitoring program to evaluate the performance of recovery efforts.										
GaR-A-9.1.1	Recovery Action	Viability	Measure or estimate the condition of key attributes across the watershed.										
GaR-A-9.1.1.1	Action Step	Viability	Use standardized watershed assessments within sub-watersheds to define limiting factors specific to those areas.	2	10	CDFG, NMFS, Private Consultants, Private Landowners	100	100	100	100	100	1,000	Estimate of $100K per year to conduct monitoring.
GaR-A-9.1.1.2	Action Step	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). Use the watershed assessment template developed in portions of the watershed in Mendocino Redwood Company ownership, and apply to the rest of the Garcia River watershed.										Monitoring costs included in "standardized watershed assessment" action step.

Garcia River (Navarro Point-Gualala Point) 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	
GaR-A-9.1.2	Recovery Action	Viability	Monitor population status for response to recovery actions.										
GaR-A-9.1.2.1	Action Step	Viability	Continue and improve upon monitoring activities to determine the population status of adult and smolt salmonids in the watershed and its tributaries.	1	10	CDFG, NMFS	100	100	100	100	100	1,000	Cost estimate for adult and smolt monitoring each year.
GaR-A-9.2	Objective	Viability	Core areas should have the highest priority for a site-based assessment; adapt the strategies for restoration and threat abatement to address site-based issues identified by the watershed assessments.	1	20	CDFG, NMFS, Private Landowners						0	Cost to prioritize expected to be minimal.
GaR-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.										
GaR-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).										See Riparian section above.
GaR-A-10.1.1.1	Action Step	Water Quality	Work with landowners to plant riparian zones of Blue Waterhole, Inman Creek, and Pardaloe Creek with the goal of reducing instream temperatures and sediment input into the Garcia River mainstem, and providing a long-term source of conifer LWD (DFG 2004).	1	10	CDFG, NOAA RC, Private Landowners						TBD	Cost will depend on the length of reaches identified for planting.
GaR-A-10.1.1.2	Action Step	Water Quality	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004).	2	60	BLM, CDFG, Conservation Fund, FishNet 4C, Mendocino County, Mendocino Redwood Company, NMFS, NRCS						TBD	Cost expected to be minimal to promote conservation measures.
GaR-A-10.1.2	Recovery Action	Water Quality	Institutionalize programs to purchase easements on water rights to encourage the maintenance of surface flows.	2	10	CDFG, Private Landowners, SWRCB						TBD	Number of water rights available will need to be determined for cost estimate.
GaR-A-15.1	Objective	Droughts	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.										
GaR-A-15.1.1	Recovery Action	Droughts	Pursue opportunities to acquire or lease water, or acquire water rights from willing sellers, for coho salmon recovery purposes. Develop incentives for water right holders to dedicate instream flows for the protection of coho salmon (DFG 2004)(Water Code § 1707).	2	20	CDFG, NMFS, Private Landowners, SWRCB						TBD	Cost will vary with the number of water rights holders willing to participate. Same recommendation in Hydrology section.
GaR-A-15.2	Objective	Droughts	Minimize water use and seek alternatives during droughts.										
GaR-A-15.2.1	Recovery Action	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	60	CalFire, CalTrans, CDFG, Mendocino County Department of Public Works, Private Landowners, RWQCB						0	Cost is expected to be minimal. Most diversions in the Garcia for dust control are for timber management actions. Most of these diversion have a 1600 agreement with the Department of Fish and Game and are likely incorporated into existing operations.
GaR-A-15.3	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.										
GaR-A-15.3.1	Recovery Action	Droughts	Identify and work with water users to minimize depletion of summer base flows from unauthorized water uses.										Costs addressed in Hydrology section.
GaR-A-15.3.1.1	Action Step	Droughts	Encourage SWRCB to bring illegal water diverters and out-of-compliance diverters into compliance with State law.			SWRCB							Costs addressed in Hydrology section.

Garcia River (Navarro Point-Gualala Point) 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	
GaR-A-15.3.2	Recovery Action	Droughts	Implement water conservation strategies that provide for drought contingencies without relying on interception of surface flows or groundwater depletion.										Costs addressed in Hydrology section.
GaR-A-20.1	Objective	Logging and Wood Harvesting	Maintain and expand California's working forestlands and forestlands held by the State, and prevent future conversion of forestlands to agriculture or other land uses.										
GaR-A-20.1.1	Recovery Action	Logging and Wood Harvesting	Areas adjacent to currently owned State parks or forestlands supporting Core, Phase I and Phase II priority areas should be considered for purchase (if feasible within the next 5 years).										
GaR-A-20.1.1.1	Action Step	Logging and Wood Harvesting	Should large tracts of forestlands within any watershed identified as a priority in this recovery plan become available for purchase, the State of California should consider purchasing the area as a Demonstration Forest or State Park.	2	60	BLM, CDFG, Redwood Forest Foundation, State Parks, The Nature Conservancy						TBD	Cost based on parcel to be purchased.
GaR-A-20.1.2	Recovery Action	Logging and Wood Harvesting	Conduct an assessment of the mechanisms driving forestland conversion and develop strategies to protect forestlands.	3	10	Board of Forestry, Mendocino County, NMFS PRD						TBD	
GaR-A-20.1.3	Recovery Action	Logging and Wood Harvesting	Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.										
GaR-A-20.1.3.1	Action Step	Logging and Wood Harvesting	Discourage Counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	1	20	Board of Forestry, CA Coastal Commission, CDFG, NMFS						minimal	Cost expected to be minimal to improve coordination with Mendocino County.
GaR-A-20.1.3.2	Action Step	Logging and Wood Harvesting	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	1	60	CA Coastal Commission, CDFG, Mendocino County, NMFS						TBD	Need to determine the number of regulatory staff to control rural development in Mendocino County.
GaR-A-20.2	Objective	Logging and Wood Harvesting	Provide for properly functioning watershed processes (e.g., cycles of wood, water and sediment) by promoting long term sustainable forestry practices that support coho salmon habitats.										
GaR-A-20.2.1	Recovery Action	Logging and Wood Harvesting	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.										
GaR-A-20.2.1.1	Action Step	Logging and Wood Harvesting	Design and implement a program of BMPs for road maintenance on private roads similar to the proposed program for public roads.	1	60	Mendocino County, Private Landowners, Public						TBD	
GaR-A-20.2.1.2	Action Step	Logging and Wood Harvesting	Minimize sediment-related effects to coho salmon habitat from road building and other soil-disturbing activities.	1	60	Board of Forestry, CalFire, California Department of Mines and Geology, CDFG, NMFS, Private Landowners						TBD	Cost will vary with logging activity in the basin.
GaR-A-20.2.1.3	Action Step	Logging and Wood Harvesting	Extend the monitoring period and upgrade THP road maintenance after harvest.	1	60	CalFire						TBD	Cost will vary with logging activity in the basin.
GaR-A-20.2.1.4	Action Step	Logging and Wood Harvesting	New THPs should identify problematic legacy roads within WLPZ's, decommission them, and revegetate the area with appropriate native species.	1	20	CalFire, Mendocino Redwood Company, NOAA RC, Private Landowners						TBD	Cost will vary with THP development near streams with legacy roads.
GaR-A-20.3	Objective	Logging and Wood Harvesting	Prevent future conversion of non-agricultural land to agriculture.										
GaR-A-20.3.1	Recovery Action	Logging and Wood Harvesting	Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.	2	60	CalFire, California Department of Mines and Geology, CDFG, NMFS						TBD	This action may require funding for additional regulatory agency staff to work with CalFire to minimize conversion projects.

Garcia River (Navarro Point-Gualala Point) 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	
GaR-A-20.3.2	Recovery Action	Logging and Wood Harvesting	Provide information to BOF regarding CCC coho salmon priorities and recommend upgrading relevant forest practices.	1	2	CDFG, NMFS						minimal	This is underway.
GaR-A-20.4	Objective	Logging and Wood Harvesting	Develop a California Forest Practice monitoring protocol to determine whether specific practices are effectively meeting intended objectives and are providing for the protection of CCC coho salmon.										
GaR-A-20.4.1	Recovery Action	Logging and Wood Harvesting	Continue the activities of the North Coast Watershed Assessment /Coastal Watershed Program.	1	20	CDFG, NMFS, Private Landowners						TBD	NCWP/Coastal Watershed Program needs to implement assessment in the Garcia River basin.
GaR-A-20.4.2	Recovery Action	Logging and Wood Harvesting	Consider the development of a Watershed Database (similar to the DFG Northern Spotted Owl database) for salmonids that provides watershed data and information in a consistent fashion to all foresters for consideration in their harvest plans.	2	20	Board of Forestry, CDFG, NMFS	5.00	5.00	5.00	5.00	5.00	100	Assumes data for the Garcia River portion of the database can be maintained for $5k per year.
GaR-A-20.4.3	Recovery Action	Logging and Wood Harvesting	Develop a framework similar to Washington State that establishes a scientific framework for monitoring the effectiveness of practices in meeting watershed process goals and a decision-making process that is adaptive to the new information.	1	10	Board of Forestry, CalFire, CDFG, Conservation Fund, Mendocino Redwood Company, NMFS, Private Landowners	25.00	25.00	25.00	25.00	25.00	250	Assumes $50k to be spent on THP effectiveness monitoring for a minimum of five years.
GaR-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.										
GaR-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.	2	10	CalTrans, CDFG, Mendocino County Department of Public Works, NRCS, Private Consultants						TBD	Cost may be minimal for education of staff working in the Garcia River.
GaR-A-24.1.2	Recovery Action	Roads and Railroads	Develop a Salmon Certification Program for road maintenance staff.	2	10	CDFG, Mendocino County, NOAA RC, NRCS, Private Landowners	5.00	5.00	5.00	5.00	5.00	50	Cost estimate for Garcia watershed only.
GaR-A-24.1.3	Recovery Action	Roads and Railroads	Conduct collaborative evaluations of priorities for treatment of CCC coho salmon passage barriers, such as the Fish Passage Forum (DFG 2004).	3	60	CalFire, FishNet 4C, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners						0	Cost expected to be minimal.
GaR-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.										
GaR-A-24.2.1	Recovery Action	Roads and Railroads	Restoration projects that upgrade or decommission high risk roads in Core areas should be considered an extremely high priority for funding (e.g., PCSRF). Where no Core areas are designated, apply this action to Phase I areas.	1	20	CDFG, NOAA RC, NRCS						0	Costs minimal to prioritize projects.
GaR-A-24.2.2	Recovery Action	Roads and Railroads	Decommission riparian road systems and/or upgrade roads (and skid trails on forestlands) that deliver sediment into adjacent watercourses (DFG 2004).	1	20	CalFire, CDFG, NOAA RC, NRCS, Private Landowners, RCD						TBD	Cost may be less than other basins due to TMDLs in place since 1997.
GaR-A-24.3	Objective	Roads and Railroads	Design new roads that are hydrologically disconnected from the stream network.										
GaR-A-24.3.1	Recovery Action	Roads and Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	1	20	CalFire, CDFG, NOAA RC, NRCS, Private Landowners, RCD						TBD	Cost may be less than other basins due to TMDLs in place since 1997.
GaR-A-24.3.1.1	Action Step	Roads and Railroads	Implement a sediment reduction program for private roads.	1	20	CalFire, CDFG, Private Landowners						TBD	Cost beyond TMDL work needs to be developed.

Garcia River (Navarro Point-Gualala Point) 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	
GaR-A-24.3.1.2	Action Step	Roads and Railroads	Develop a private road database using standardized methods. The methods should document all road features, apply erosion rates, and compile information into a GIS database.	3	5	CalFire, Mendocino County Department of Public Works, NMFS, Private Consultants, Private Landowners	10.00	10.00	10.00	10.00	10.00	50	Cost estimate for entire basin.
GaR-A-24.3.1.3	Action Step	Roads and Railroads	Design and implement a program of BMPs for road maintenance on private roads similar to the proposed program for public roads.	2	40	Mendocino County, NOAA RC, NRCS, RCD						TBD	Need to determine number of miles that would be maintained for cost estimate.
GaR-A-24.3.2	Recovery Action	Roads and Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.	1	20	CalFire, CDFG, NOAA RC, NRCS, Private Landowners, RCD						TBD	Costs are related to maintenance and enforcement of gates and other closure techniques.
GaR-A-24.3.2.1	Action Step	Roads and Railroads	Conduct annual inspections of all roads prior to winter. Correct conditions that are likely to deliver sediment to streams. Hydrologically disconnect roads.	2	5	CalFire, CalTrans, CDFG, NMFS, NRCS, Private Landowners	50.00	50.00	50.00	50.00	50.00	250	Based on approximately $50k to do inspections for a five year period.
GaR-A-24.3.3	Recovery Action	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).	1	10	CalFire, CDFG, Mendocino County Department of Public Works, NRCS, Private Landowners						TBD	Cost for BMP unknown at this time. Ten year duration to accommodate changes in BMPs.
GaR-A-24.3.4	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.	1		CalTrans, Mendocino County Department of Public Works							
GaR-A-24.3.4.1	Action Step	Roads and Railroads	Stream crossings should be identified and mapped with the intention of replacement or removal if they cannot pass the 100 year flow. Design should include fail safe measures to accommodate culvert overflow without causing massive road fill failures.	2	20	CDFG, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners, RCD						TBD	Number of culverts and specific details to upgrade are needed to estimate cost.
GaR-A-24.4	Objective	Roads and Railroads	Reduce sediment sources from road networks and other actions that deliver sediment to stream channels through improved or new laws and policy.										
GaR-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.	2	20	CalFire, CDFG, Private Landowners						TBD	Cost may be minimal since roads are in place throughout the Garcia watershed.
GaR-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.	2	10	FEMA, Mendocino County Department of Public Works, Private Landowners	50.00	50.00	50.00	50.00	50.00	500	Based on an estimate of $50k funding for the Garcia watershed emergency funding per year.
GaR-A-24.4.3	Recovery Action	Roads and Railroads	Limit winter use of unsurfaced roads and recreational trails to decrease fine sediment loads.	2	10	FEMA, Mendocino County Department of Public Works, Private Landowners	50.00	50.00	50.00	50.00	50.00	500	Based on an estimate of 50k funding for the Garcia watershed emergency funding per year.