NAVARRO RIVER

Navarro River

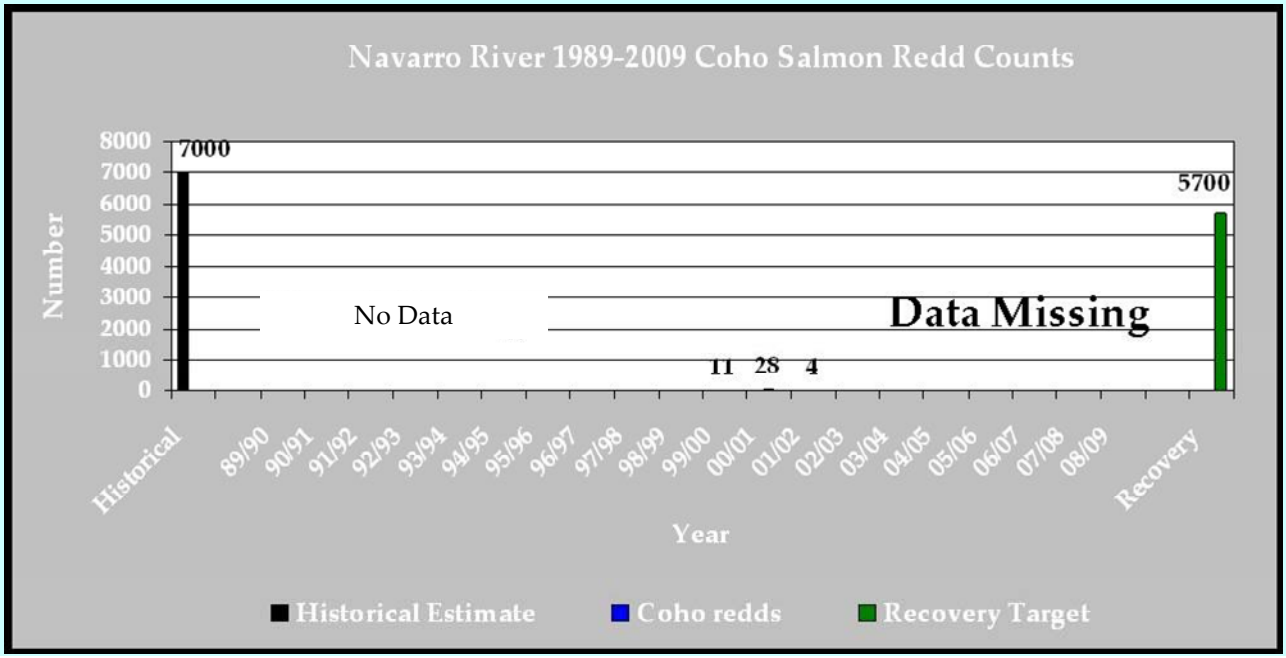
Dependent Population
17.0 Km of potential coho salmon habitat
Coho salmon, Chinook salmon, and steelhead present

Navarro River drains approximately 315 square miles of western Mendocino County. Navarro River enters the Pacific Ocean about fifteen miles south of the town of Mendocino. Approximately 41 percent of the Navarro River watershed is redwood, nine percent is Douglas-fir forest, 26 percent is montane hardwood, and 15 percent is annual grassland. The entire Navarro River watershed has moderate to high erodibility. In 2000 the EPA established a TMDL for the Navarro as water quality was impaired for sediment and temperature. About 98 percent of the watershed is in private ownership; about two percent of the watershed is state park land, state wildlife lands, or federal forest and grazing lands. Land use in the watershed is dominated by timber production, though agriculture is also prominent. Timber harvesting began in the Navarro watershed during the mid-1800s, and a second logging boom occurred from the 1930s to the early 1950s. Within the past 10 years, about 15 percent of the Navarro River watershed has been under a timber harvest plan. Housing development within the Navarro River watershed is moderately low; approximately 1280 housing units are present in the watershed. There are six dams within the watershed that impede or block salmon migration, in addition, there are numerous partial barriers to salmon migration caused by diversions, road crossings, and natural barriers. Impassable barriers block salmonids for less than ten percent of the watershed.

Navarro River estuary
Photo provided by KRIS Information System, and is used with permission

The Watershed at a Glance

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



Navarro River

Recovery Target: 5,700 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:

- Storms and Flooding
- Drought
- Roads and Railroads

Preventing the extinction of coho salmon

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

- Increase pool habitat complexity
- Increase riparian shade to cool streams
- Increase frequency of off channel habitat
- Manage stream flow to reduce redd scour
- Increase stream base flow
- Increase frequency of LWD
- Increase size of riparian trees
- Reduce road density in riparian areas and across the watershed
- Decrease sources of sediment

Photo showing poor conditions in Anderson Creek
Photo by Tom Daugherty, NMFS

Advancing recovery of coho

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

- Install large woody debris structures and other features to increase stream complexity and improve pool frequency and depth.
- Identify and implement water conservation measures. Identify and eliminate unauthorized water uses.
- Work with SWRCB and landowners to improve base stream flow. Develop and implement alternative frost protection strategies that are protective of salmonids.
- For all rural roads apply tested and approved best management practices for road maintenance and decommissioning.

. . . in these **core areas:** Flynn Creek, John Smith Creek, Lower South Branch Navarro River, and the North Fork Navarro River planning watersheds.

Conservation Highlights

- MRC has worked with TU and NMFS to improve coho salmon habitat, by replacing large culverts at John Smith Creek and conducting road upgrades.
- Mendocino County RCD and NRCS continue to work with private landowners to conduct road upgrade and sediment reduction projects throughout the watershed. Also, these agencies work with landowners to conduct stream improvement projects, such as riparian planting, and bank protection projects.

Culvert that was removed on John Smith Creek
Photo provided by KRIS Information System, and is used with permission

Immediate Needs

√ Cooperate with the Mendocino RCD and NRCS to minimize impacts of private roads and agricultural activities.

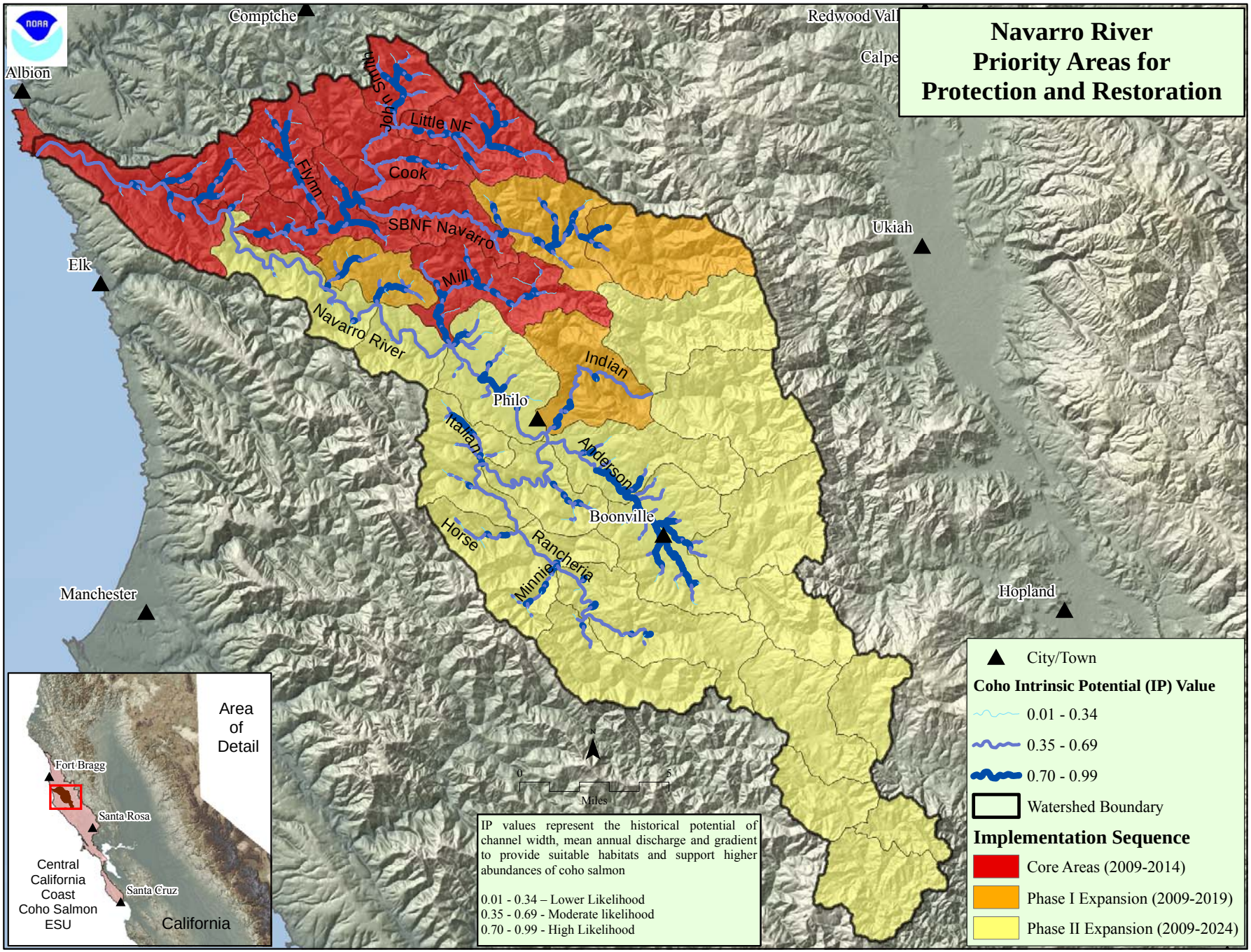
√ MRC finalize its proposed Habitat Conservation Plan and continue restoration efforts on their lands that provide current and potential habitat for coho salmon.

√ Work with water diverters along tributaries such as Floodgate Creek, Indian Creek and Mill Creek to maintain a population of coho salmon in the watershed area above the North Fork confluence.

√ Conduct an assessment of floodplain and coho salmon over-wintering potential of the Highway 128 corridor and implement actions to improve overwintering habitat impacted by the highway.

Recovery Partners

NMFS
DFG
Mendocino County RCD
NRCS
MRC
TU


Navarro River
Priority Areas for
Protection and Restoration
Comptche
Redwood Vall
Calpe
Albion
Ukiah
Elk
Manchester
Hopland
Philo
Boonville
John Smith
Little NF
Flynn
Cook
SBNF Navarro
Mill
Navarro River
Indian
Italian
Anderson
Horse
Rancheria
Minnie
Area
of
Detail
Fort Bragg
Santa Rosa
Santa Cruz
Central
California
Coast
Coho Salmon
ESU
California
0
5
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
Navarro River
CAP Viability Table Results

Analyst	Source	Result	Rating	Target	Habitat Attribute	Indicator	Poor	Fair	Good	Very Good
Flow Panel	Decision Matrix	58	Fair	Spawning Adults	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	PSMFC Database	91%	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	126,528 m^2	Very Good	Spawning Adults	Sediment	Amount of Gravel*	<900 m^2	900-7800 m^2	7800-14800 m^2	>14800 m^2
NMFS	Best Prof. judgment	5-10%	Fair	Spawning Adults	Viability	Freshwater Harvest	>10% of pop.	5-10%	<5%	
Flow Panel	Decision Matrix	67	Fair	Eggs	Hydrology	Instantaneous Condition	>75 (score)	51-75	35-50	<35
Flow Panel	Decision Matrix	76.5	Poor	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	54%	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	92	Poor	Summer Rearing	Hydrology	Baseflow	>75 (score)	51-75	35-50	<35
SEC	CDFG HAB 8	50.2	Poor	Summer Rearing	Pool Habitat	Shelter Rating	<60 avg. rating	60-80	80-100	>100
SEC	CDFG HAB 8	4%	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	53.5	Poor	Winter Rearing	Floodplain	Complex Habitat**	<50% Connected	50-80% connected	>80% connected	
NMFS	NCWAP	Fair	Fair	Smolts	Estuary	Estuary				
Flow Panel	Decision Matrix	67	Fair	Smolts	Hydrology	Passage Flows	>75 (score)	51-75	35-50	<35
SEC	SWRCB	3.1/10 IP-km	Fair	Smolts	Passage	# of Diversions**	>5 / 10 IP km	1.1-5	0.01-1	0
SEC	CDFG HAB 8	50.2	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	33%	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	1.26%	Good	Multiple Life Stages	Land disturbance	Agriculture	>30% of WS by area	10-30%	0.1-10%	<0.1%
NMFS	CDF THP Dataset	15%	Good	Multiple Life Stages	Land disturbance	Timber Harvest	>35% of WS by area	25 - 35%	10 - 25%	<10%
SEC	Best Prof. judgment	NA	Poor	Multiple Life Stages	Pool Habitat	LWD Freq. (BFW 0-10)	<4key pcs/100m	4-6/100m	6-11/100m	>11/100m
SEC	Many Sources	3.6	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	31%	Poor	Multiple Life Stages	Riparian Veg.	DBH	<39% Class 5 and 6	40-54%	55-69%	>69%
SEC	CDFG HAB 8	79%	Fair	Multiple Life Stages	Riparian Veg.	Canopy Cover	<75 % avg. over IP-km	75-85%	85-95%	>95%
NMFS	CDF THP Dataset	5.5 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	5.4 mi/sq.mi.	Poor	Multiple Life Stages	Sediment Transport	Road density 100	>1 miles/sq. mile	1-0.5	0.5-0.1	<0.1
NMFS	Many Sources	Fair	Fair	Multiple Life Stages	Water Quality	Toxicity	Acute	Sublethal or Chronic	No Acute or Chronic	No evidence of toxins or Contaminants
NMFS	Best Prof. judgment	<1 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	20-34%	Fair	Summer Rearing	Viability	Juvenile Distribution	<20% IP-km occupied	20-34%	35-50%	>50%

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

* = watershed specific numbers

** = Ratings defined by the distribution of results

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

Navarro 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	
NaR-A-2.1	Objective	Floodplain	Improve over-winter survival by increasing the frequency and functionality of off-channel habitats.										
NaR-A-2.1.1	Recovery Action	Floodplain	Target habitat restoration and enhancement that will provide functioning winter refuge habitat.										
NaR-A-2.1.1.1	Action Step	Floodplain	Delineate reaches possessing both potential winter rearing habitat and floodplain areas.	3	2	CDFG, Private Consultants, Private Landowners	12.50	12.50				25	Cost based on use of existing data and to validate in field.
NaR-A-2.1.1.2	Action Step	Floodplain	Evaluate Highway 128 and associated crossings with focus on the segment from the North Fork Navarro Bridge to Barton Gulch. Many crossing may need to be modified to provide access to historical floodplain habitats.	1	1	CalTrans, CDFG, NOAA RC	10.00					10	Cost to evaluate existing passage database and plan restoration of culvert crossings on Hwy128.
NaR-A-2.1.1.3	Action Step	Floodplain	Create flood refuge habitat, such as hydrologically connected floodplains with riparian forest, or removal barriers or levees that inhibit access to winter habitat.	2	20	CalTrans, CDFG, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners, RCD						TBD	Reaches for this action need to be identified and cost estimates developed. Stream segments in Anderson Valley have most potential for this action.
NaR-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.										
NaR-A-3.1.1	Recovery Action	Hydrology	Monitor, identify problems, and prioritize need for changes to water diversion on current or potential coho streams (DFG 2004).										
NaR-A-3.1.1.1	Action Step	Hydrology	Assess and map water diversions (DFG 2004). Focus initial efforts in Core and Phase I watersheds. Expand efforts to Phase II watersheds upon completion of Core and Phase I evaluation.	2	2	Private Consultants, Private Landowners, SWRCB	15.00	15.00				30	Estimate based on landowner cooperation to assess diversion sites.
NaR-A-3.1.1.2	Action Step	Hydrology	Support SWRCB in regulating the use of streamside wells and groundwater.	2	5	CDFG, FishNet 4C, NOAA RC, Private Landowners, RCD, SWRCB	40.00	40.00	40.00	40.00	40.00	200	Additional regulatory staff to support improved regulation of groundwater.
NaR-A-3.1.1.3	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	SWRCB						TBD	Need additional info from SWRCB to develop cost estimate for this action.
NaR-A-3.1.1.4	Action Step	Hydrology	Require streamflow gauging devices to determine the level of impairment to natural flow. Focus initial efforts on Mill Creek, Flynn Creek, and North Fork Navarro.	3	10	Private Landowners, SWRCB, USGS	40.00	40.00	40.00	40.00	40.00	400	Need information from USGS to develop more precise cost estimate. Estimate provided is based on two gauges at 20k per year for 10 years.
NaR-A-3.1.2	Recovery Action	Hydrology	Improve compliance with existing water resource regulations via monitoring and enforcement.										
NaR-A-3.1.2.1	Action Step	Hydrology	Identify and eliminate depletion of summer base flows from unauthorized water uses. Focus efforts along Mill Creek, and other tributaries along the mainstem Navarro River above the North Fork. Tributaries such as Floodgate Creek and Perry Gulch and other small tributaries need water use evaluated.	1	5	CDFG, CDFG Law Enforcement, NMFS OLE, SWRCB	40.00	40.00	40.00	40.00	40.00	200	Estimated cost for additional regulatory staff to conduct work.
NaR-A-3.1.2.2	Action Step	Hydrology	Upgrade the existing water rights information system so that water allocations can be readily quantified by watershed.	3	60	CDFG, NMFS, SWRCB						TBD	Need additional analysis to determine costs of upgrading and maintaining system.
NaR-A-3.1.3	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.										
NaR-A-3.1.3.1	Action Step	Hydrology	Work with SWRCB and landowners to re-establish natural flow regimes to improve adult migration to spawning habitats and smolt outmigration.	2	10	CDFG, NMFS HCD, Private Consultants, Private Landowners, SWRCB						TBD	Additional information needed to determine cost of providing appropriate bypass flows.

Navarro 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	
NaR-A-3.1.3.2	Action Step	Hydrology	Work with SWRCB and landowners to improve and protect over summer survival of juveniles by re-establishing summer baseflows (from July 1 to October 1) in rearing reaches that are currently or have potential to be impacted by water use.	1	20	CDFG, FishNet 4C, NOAA RC, Private Landowners, RCD, SWRCB						TBD	Costs for acquisition of water rights and developing alternatives will need to be developed. Cost of water is reported to be 500 dollars or more per acre foot (Sunding and Zwane 2004).
NaR-A-3.1.3.3	Action Step	Hydrology	Work with SWRCB and landowners to restore and maintain the natural hydrograph between March 1 and May 15 to minimize impacts to coho fry due to stranding by implementing alternative frost protection strategies.	1	5	Farm Bureau, NMFS HCD, NMFS OLE, Private Landowners, SWRCB						TBD	5 year period to get methods and actions in place to minimize stranding. Costs may be high in a few areas of Anderson Valley that maintain coho populations.
NaR-A-3.1.4	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.										
NaR-A-3.1.4.1	Action Step	Hydrology	Promote off-channel storage to reduce impacts of water diversion (e.g. storage tanks for rural residential users).	2	5	CDFG, Mendocino County, NMFS, NOAA RC, Private Consultants, Private Landowners, SWRCB	20.00	20.00	20.00	20.00	20.00	100	Cost based on initial startup of program and some implementation (water tanks etc.). Cost of purchasing tanks and infrastructure beyond 5 years will likely require additional funding.
NaR-A-3.1.4.2	Action Step	Hydrology	Promote passive diversion devices designed to allow diversion of water only when minimum streamflow requirements are met or exceeded (DFG 2004).	1	20	CDFG, Mendocino County, NMFS, NOAA RC, NRCS, RCD, SWRCB						TBD	Cost will depend on specifics of project implementation.
NaR-A-3.1.4.3	Action Step	Hydrology	Evaluate requests for on-stream dams above coho migratory reaches for effects on the natural hydrograph and the supply of spawning gravel for recruitment downstream (DFG 2004).	2	10	CDFG, NMFS HCD, NOAA RC, NRCS, Private Consultants, Private Landowners	25.00	25.00	25.00	25.00	25.00	250	Assumes 5 evaluations per year at 5k for 10 years.
NaR-A-3.1.4.4	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).	1	10	CDFG, NMFS, Private Landowners, SWRCB						TBD	Number of water rights holders willing to participate is unknown at this time. Cost 500 dollars or more per acre foot.
NaR-A-3.1.5	Recovery Action	Hydrology	Implement Best Management Practices (BMP's) for agriculture land use within Mendocino County (DFG 2004).										
NaR-A-3.1.5.1	Action Step	Hydrology	Develop BMP's (such as off-channel storage) for landowners conducting water diversion actions.	1	20	NMFS HCD, NRCS, Private Landowners, SWRCB						TBD	Total cost for basin will need additional analysis. Cost per landowner is estimated to be 10-50k.
NaR-A-3.1.5.2	Action Step	Hydrology	Encourage compliance with the most recent update of NMFS' Water Diversion Guidelines.	2	10	CDFG, NMFS, Private Landowners, SWRCB	2.00	2.00	2.00	2.00	2.00	20	Cost based on minimal regulatory staff time to work with landowners on compliance.
NaR-A-5.1	Objective	Passage	Identify and remove existing passage barriers.										
NaR-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).										
NaR-A-5.1.1.1	Action Step	Passage	Restore passage in high priority areas of the Navarro watershed as identified by the Mendocino RCD, MRC, the County of Mendocino, Caltrans (HWY 128), and existing fish passage databases.	1	10	CalTrans, CDFG, NOAA RC, Private Landowners						TBD	Review of existing passage database must be conducted to develop cost estimate. Projects along HWY 128 are likely to be very costly but key to improved lower tributary production.
NaR-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.										
NaR-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.	1	10	CDFG, NOAA RC, Private Landowners, RWQCB, SWRCB						TBD	Number of water rights holders willing to participate is unknown at this time. Cost could approach 500 dollars per acre foot.

Navarro 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	
NaR-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). Maintain large debris accumulations along Highway 128 on the North Fork Navarro.	1	60	CalTrans, CDFG, NMFS PRD, State Parks						TBD	Minimal cost to allow wood to accumulate. Cost of providing alternative route via Flynn Creek road.
NaR-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.										
NaR-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). Focus on tributaries of Flynn Creek, North Fork Navarro, South Branch Navarro, and Mill Creek.	1	10	CDFG, NOAA RC, NRCS, Private Landowners	100	100	100	100	100	1,000	Based on an estimate of 50 miles in the nest 10 years at 20k for Core and Phase 1 areas. 20k per mile based on Sundig and Zwane (2004).
NaR-A-6.1.2.2	Action Step	Pool Habitat	Target habitat restoration and enhancement that will provide functioning winter refuge habitat at flows between winter base flow and flood stage.	1	20	Private Landowners						TBD	Cost is part of estimate for LWD enhancement above.
NaR-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	60	CDFG, NOAA RC, NRCS, Private Landowners, RCD, Trout Unlimited						TBD	Minimum cost for LWD per mile 20k.
NaR-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.										
NaR-A-7.1.1	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).										
NaR-A-7.1.1.1	Action Step	Riparian Vegetation	Focus on existing areas of Arundo located in the upper reaches of Rancheria Creek to stop infestation of downstream areas.	2	2	CDFG, NOAA RC, NRCS, Private Landowners, RCD	25.00	25.00				50	Cost based on estimate of 5 projects at 10k per project.
NaR-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).										
NaR-A-7.1.2.1	Action Step	Riparian Vegetation	Fence riparian areas from grazing (using fencing standards that allow other wildlife to access the stream). Focus efforts along tributaries in Anderson Valley reach of the mainstem Navarro River.	2	10	CDFG, NOAA RC, NRCS, Private Landowners, RCD	90.00	90.00	90.00	90.00	90.00	900	Based on cost of 30k per acre and a minimum of 5 miles 50 feet wide fenced.
NaR-A-7.1.2.2	Action Step	Riparian Vegetation	Promote streamside conservation measures, including conservation easements, setbacks, and riparian buffers (DFG 2004). Work cooperatively with land trusts, and Mendocino RCD to establish conservation easements, setbacks, and riparian buffers on industrial timberland, agricultural, and rangeland within Core and Phase 1 subbasins.	3	20	CA Coastal Commission, California Coastal Conservancy, CDFG, NOAA RC, NRCS, Private Landowners, State Parks						TBD	Costs can not be determined without additional information on the potential projects within this basin.
NaR-A-7.1.2.3	Action Step	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	60	CalFire, Mendocino County, Mendocino Redwood Company, NRCS, Private Landowners, RCD						TBD	Some cost to landowners due to increased protection zones.
NaR-A-7.1.3	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	40	CDFG, FishNet 4C, Mendocino County, NMFS, NOAA RC, Private Landowners, SWRCB, USACE, USEPA, USFWS						0	Cost will be minimal to promote planting riparian vegetation.
NaR-A-8.1	Objective	Sediment	Improve habitat conditions at multiple life stages by reducing sediment inputs to the stream at the watershed scale.										

Navarro 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	
NaR-A-8.1.1	Recovery Action	Sediment	Address sources from slides and gullies that deliver sediment and runoff to stream channels.										
NaR-A-8.1.1.1	Action Step	Sediment	Address high and medium priority sediment delivery sites as identified by the Mendocino RCD, Mendocino Redwoods Company, or other credible assessments.	1	20	CDFG, Mendocino Redwood Company, NOAA RC, NRCS, Private Landowners, RCD						TBD	More information is needed for large projects such as large slides and landings.
NaR-A-8.1.1.2	Action Step	Sediment	Acquire emergency funding for sediment reduction measures associated with the Navarro Fire that occurred in the Flynn Creek subbasin in 2008.	1	2	CalFire, CDFG, NOAA RC, Private Landowners, RCD, RWQCB						TBD	Need to conduct restoration during 2009 or 2010 to minimize sediment delivery to Flynn creek and its tributaries.
NaR-A-9.1	Objective	Viability	Develop and implement a monitoring program to evaluate the performance of recovery efforts.										
NaR-A-9.1.1	Recovery Action	Viability	Measure or estimate the condition of key habitat attributes across the watershed. Prioritize Core tributaries first, followed by Phase I and Phase II areas as appropriate.	2	60	CDFG, Mendocino Redwood Company, NMFS, Private Landowners						TBD	Frequency and survey method will determine costs.
NaR-A-9.1.2	Recovery Action	Viability	Monitor population status for response to recovery actions.										
NaR-A-9.1.2.1	Action Step	Viability	Conduct monitoring activities to determine the population status of adult and smolt salmonids in Core and Phase 1 areas.	2	60	CDFG, Mendocino Redwood Company, NMFS						TBD	Type and effort of future population monitoring is not known.
NaR-A-9.1.2.2	Action Step	Viability	Evaluate feasibility of installing a lifecycle station in an appropriate location within the watershed.	3	2	CDFG, Mendocino Redwood Company, NOAA SWFSC, Private Landowners						0	Minimal cost to determine feasibility of a lifecycle station.
NaR-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.										
NaR-A-10.1.1	Recovery Action	Water Quality	Determine site-specific recommendations for improving riparian habitat to remedy high stream temperatures and implement accordingly (DFG 2004).	2	2	CDFG, NMFS, NRCS, Private Consultants, RCD	10.00	10.00				20	Cost is only to determine site specific recommendations using existing data.
NaR-A-10.1.1.1	Action Step	Water Quality	Plant native vegetation to promote streamside shade.	1	20	CDFG, NOAA RC, NRCS, Private Landowners, RCD						TBD	Specific areas for planting need to be identified for cost estimate to be estimated.
NaR-A-11.1	Objective	Agricultural Practices	Improve education and awareness of agencies, landowners and the public regarding salmonid protection and habitat requirements.										
NaR-A-11.1.1	Recovery Action	Agricultural Practices	Work within the agricultural community to educate landowners and enhance practices that provide for functional watershed processes.	3	3	Farm Bureau, NRCS, RCD	20.00	20.00	20.00			60	Additional staff time for RCDs and NRCS to conduct education programs for landowners.
NaR-A-11.1.2	Recovery Action	Agricultural Practices	Provide technical and staff support to counties to encourage general plan updates that include measures to protect coho salmon (DFG 2004).										
NaR-A-11.1.2.1	Action Step	Agricultural Practices	Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.	2	10	Board of Forestry, CDFG, Mendocino County, NMFS, Private Landowners, SWRCB	10.00	10.00	10.00	10.00	10.00	100	Additional staff time to improve regulations.
NaR-A-11.2	Objective	Agricultural Practices	Minimize future agricultural development and promote agricultural practices on existing activities that protect and restore habitats for CCC coho salmon.										

Navarro 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	
NaR-A-11.2.1	Recovery Action	Agricultural Practices	Encourage landowners to implement restoration projects as part of their ongoing operations in stream reaches where large woody debris is lacking.	3	20	CDFG, FishNet 4C, Mendocino County, NMFS PRD, NOAA RC, NRCS, Private Consultants, RCD						0	Cost is expected to minimal for agency staff to encourage restoration projects.
NaR-A-11.2.2	Recovery Action	Agricultural Practices	Promote off-channel storage to reduce impacts of water diversion during the spring and summer (e.g. diversion during winter high flow).	1	10	CDFG, NMFS HCD, Private Landowners, SWRCB						TBD	Cost of implementing is unknown at this time.
NaR-A-11.2.3	Recovery Action	Agricultural Practices	Implement the NRCS/RCD coordinated permit program for fishery restoration practices.	2	40	CDFG, Farm Bureau, NMFS HCD, Private Landowners						TBD	Cost of implementing BMPs to agriculture producers is not known at this time. The cost BMPs for reducing sediment production, riparian protection, and water use will need to be determined.
NaR-A-11.2.3.1	Action Step	Agricultural Practices	Develop a Road Sediment Reduction Plan for agricultural lands that prioritizes problem sites and outlines implementation and a timeline of necessary actions.	2	2	Private Consultants, Private Landowners	25.00	25.00				50	Cost estimate for current activities in the Anderson Valley.
NaR-A-11.2.3.2	Action Step	Agricultural Practices	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	3	5	Board of Forestry, CDFG, Farm Bureau, NMFS, Private Landowners	20.00	20.00	20.00	20.00	20.00	100	Additional staff time to improve regulations.
NaR-A-11.2.3.3	Action Step	Agricultural Practices	Work with landowners to assess the effectiveness of erosion control measures throughout the winter period.	3	2	Farm Bureau, NMFS, Private Consultants, Private Landowners	10.00	10.00				20	Cost based on consultant working with landowners to carry out effectiveness monitoring.
NaR-A-11.2.4	Recovery Action	Agricultural Practices	Maintain and enhance existing natural vegetation types within the Navarro watershed.										
NaR-A-11.2.4.1	Action Step	Agricultural Practices	The State and Mendocino County should impose a moratorium on conversion of open space, rangeland, or TPZ to vineyards or other agricultural uses that impact salmonids until a grading ordinance and land conversion ordinance are in place.	1	60	Farm Bureau, Private Consultants, Private Landowners						TBD	Cost to minimize or halt future agricultural development can not be determined at this time.
NaR-A-15.1	Objective	Droughts	Work with land owners or public agencies to acquire water that would be utilized to minimize effects of droughts.										
NaR-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).	3	40	CDFG, NMFS, SWRCB						TBD	Cost is unknown. The main benefit of this action is to improve flow conditions in stream reaches where the majority of home owners and agricultural use occurs.
NaR-A-15.2	Objective	Droughts	Minimize water use and seek alternatives during droughts.										
NaR-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	CDFG, NOAA RC, NRCS, Private Landowners, RCD						0	Cost is expected to be minimal. Most diversions in Navarro River watershed 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.
NaR-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.										
NaR-A-15.3.1	Recovery Action	Droughts	Identify and work with water users to minimize depletion of summer base flows from unauthorized water uses.										
NaR-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.	2	20	NOAA RC, Private Landowners, USACE						0	Minimal cost to implement.
NaR-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.										

Navarro 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	
NaR-A-15.3.2.1	Action Step	Droughts	Critical flow values should include minimum bypass flow requirements to support upstream adult migration during winter months and juvenile rearing in the summer and fall months.	2	60	CDFG, NMFS, NMFS OLE, Private Landowners, SWRCB						TBD	Cost of providing bypass flow can not be estimated without further analysis.
NaR-A-15.3.2.2	Action Step	Droughts	If predicted flows are below a level considered critical to maintain viable rearing habitat for salmonids, measures to reduce water consumption should be initiated by municipal water suppliers and other users in the watershed through conservation programs.	2	60	Mendocino County, NOAA RC, Private Landowners, Public, SWRCB						TBD	Additional analysis needed to estimate total cost.
NaR-A-15.3.3	Recovery Action	Droughts	Establish an emergency drought operations center (EDOC), (e.g., Washington Department of Fish and Wildlife, 2001), comprised of the SWRCB, DFG, NMFS, and others to develop emergency rules for augmenting water supplies and mitigating the effects of drought on fish.										
NaR-A-15.3.3.1	Action Step	Droughts	Work with DFG, County of Mendocino, MRC, municipalities, and knowledgeable biologists to develop emergency rules and adopt implementation agreements.	3	5	CDFG, Mendocino County, NMFS, Private Landowners, Public, SWRCB	6.00	6.00	6.00	6.00	6.00	30	Cost based on estimate for additional staff time to develop rules.
NaR-A-15.3.3.2	Action Step	Droughts	Increase enforcement patrols by DFG and NMFS OLE in sensitive spawning and rearing areas.	2	20	CDFG, NMFS OLE	30.00	30.00	30.00	30.00	30.00	600	Based on 4 additional staff estimated for 3 drought years in a 20 year period.
NaR-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.	3	60	California Coastal Conservancy, Private Landowners, State Parks						TBD	Cost would be millions for purchase and operation of additional land held by the State or other entity.
NaR-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).										
NaR-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 Federal Government, State of California, or other entities should consider purchasing the area as a conservation area.	3		BLM, CDFG, Redwood Forest Foundation						TBD	Will vary with specific tract.
NaR-A-20.1.1.2	Action Step	Logging and Wood Harvesting	Increase size of Navarro River Redwoods State Park if opportunities arise. At the minimum purchase or develop conservation easement on lower tributaries and associated riparian areas, including important coho salmon tributaries such as Flynn Creek.	1	20	Mendocino Redwood Company, Private Landowners, State Parks						TBD	Cost will vary with size of parcel purchased or placed in a conservation easement.
NaR-A-20.1.2	Recovery Action	Logging and Wood Harvesting	Coordinate with the agencies that authorize conversions to minimize conversions in key watersheds and discourage forestland conversions.										
NaR-A-20.1.2.1	Action Step	Logging and Wood Harvesting	Discourage Counties from rezoning forestlands to rural residential or other land uses (e.g., vineyards).	1	20	CDFG, Mendocino County, NMFS PRD, RWQCB, State Parks						TBD	Some increase in cost to regulatory agencies.
NaR-A-20.1.2.2	Action Step	Logging and Wood Harvesting	Discourage home building or other incompatible land use in areas identified as timber production zones (TPZ).	1	60	CalFire, Mendocino County, NMFS, Private Landowners						TBD	Additional regulatory agency cost. Undetermined at this time.
NaR-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.										
NaR-A-20.2.1	Recovery Action	Logging and Wood Harvesting	Address sources from logging areas that deliver sediment and runoff to stream channels.										
NaR-A-20.2.1.1	Action Step	Logging and Wood Harvesting	Work with the California Board of Forestry to design and implement a program of BMPs for logging areas that meets the approval of NMFS and DFG.	1	3	CalFire, NMFS, NMFS OLE, Private Landowners, RWQCB						TBD	Cost of additional BMPs to timber operators can not be determined at this time.

Navarro 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	
NaR-A-20.2.1.2	Action Step	Logging and Wood Harvesting	Encourage all permanent and year-round access roads beyond the THP parcel be surfaced after harvest completion with base rock and road gravel, asphalt, or chipseal, as appropriate.	1	60	CalFire, CDFG, NMFS, Private Landowners, RWQCB						TBD	See roads and sediment actions.
NaR-A-20.2.1.3	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	40	CalFire, CDFG, NRCS, Private Landowners						TBD	Cost will be estimated in sediment reduction actions and roads actions.
NaR-A-20.2.1.4	Action Step	Logging and Wood Harvesting	Map unstable soils and use that information to guide land use decisions, road design, THPs, and other activities that can promote erosion.	2	60	CalFire, CDFG, Private Consultants, Private Landowners, RWQCB						0	These action occur now in CA THP process, therefore cost is expected to be minimal.
NaR-A-20.2.1.5	Action Step	Logging and Wood Harvesting	Encourage tree retention on the axis of headwall swales. Any deviations should be reviewed and receive written approval by a licensed engineering geologist.	3	60	Private Landowners						TBD	Additional cost of retaining trees is not know at this time. Landowners need to estimate timber volumes that would be lost.
NaR-A-20.2.2	Recovery Action	Logging and Wood Harvesting	Conserve and manage forestlands for older forest stages.										
NaR-A-20.2.2.1	Action Step	Logging and Wood Harvesting	Explore acquisition or conservation easements from willing land-owners.	3	2	Private Consultants, Private Landowners	15.00	15.00				30	Cost based on private consultant to contact landowners and determine interest in conservation easements.
NaR-A-20.2.2.2	Action Step	Logging and Wood Harvesting	Allow trees in riparian areas to age, die, and recruit into the stream naturally.	2	60	Board of Forestry, CalFire, Mendocino County, Mendocino Redwood Company, Private Landowners						TBD	Need additional info to determine cost for landowners to implement riparian management.
NaR-A-20.3	Objective	Logging and Wood Harvesting	The priorities in this recovery plan should serve as a guide for independent Forest Certification.	3	60	California Coastal Conservancy, Private Landowners, State Parks						TBD	Cost would be millions for purchase and operation of additional land held by the State or other entity.
NaR-A-20.3.1	Recovery Action	Logging and Wood Harvesting	Investigate opportunities to programmatically permit the forest certification program to authorize incidental take for landowners through Section 10(a)(1)(B).	3	5	CalFire, CDFG, NMFS PRD, Private Consultants, Private Landowners						TBD	Need further analysis to costs to develop take permit.
NaR-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.										
NaR-A-20.4.1	Recovery Action	Logging and Wood Harvesting	Assign NMFS staff to conduct THP reviews of the highest priority areas using revised "Guidelines for NMFS Staff when Reviewing Timber Operations: Avoiding Take and Harm of Salmon and Steelhead" (NMFS 2004).	2	10	CalFire, NMFS	25.00	25.00	25.00	25.00	25.00	250	Based on 25k of NMFS staff time for the Navarro watershed per year..
NaR-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.	3	3	CalFire, Private Consultants, Private Landowners	16.67	16.67	16.67			50	Cost is rough estimate for database development.
NaR-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.	3	20	CalFire, CDFG, NMFS, Private Consultants, Private Landowners, RWQCB						TBD	Additional analysis need to develop cost estimate monitoring practices.
NaR-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.										
NaR-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.	3	60	CalFire, CDFG, Mendocino County, Private Landowners						TBD	Cost of additional staff time is unknown at this time, could be considerable.

Navarro River (Navarro Point-Gualala Point) Threats and Associated Recovery Actions

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							FY1	FY2	FY3	FY4	FY5	Entire Duration	
NaR-A-24.1.2	Recovery Action	Roads and Railroads	Develop a Salmon Certification Program for road maintenance staff.	2	5	CDFG, FishNet 4C, Mendocino County, Mendocino Redwood Company, NOAA RC, Private Consultants, Private Landowners	10.00	10.00	10.00	10.00	10.00	50	Cost based on annual training for certification of entities in Navarro watershed.
NaR-A-24.1.3	Recovery Action	Roads and Railroads	Expand the NRCS/RCD coordinated permit program to a statewide programmatic ESA consultation that allows funding and technical expertise to small land owners and rural residential property owners.	2	20	CDFG, NMFS PRD, NOAA RC, NRCS, Private Landowners, RCD, USACE						TBD	Cost associated with additional staff time and consulting to expand program at this time unknown.
NaR-A-24.1.4	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, CalTrans, CDFG, FishNet 4C, NMFS, NRCS, Private Landowners						0	Cost expected to be minimal.
NaR-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.										
NaR-A-24.2.1	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).										
NaR-A-24.2.1.1	Action Step	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, Mendocino County, Mendocino Redwood Company, NOAA RC, Private Landowners						TBD	estimates for roads not yet been upgraded are not available.
NaR-A-24.2.2	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.	1	10	Mendocino County, Mendocino Redwood Company, Private Landowners	50.00	50.00	50.00	50.00	50.00	500	A cost estimate to avoid sensitive areas over the next ten years.
NaR-A-24.3	Objective	Roads and Railroads	Assess and implement actions that hydrologically disconnect roads or reduce sediment sources in Core CCC coho salmon areas within five years, Phase I within 10 years, and Phase II areas within 15 years (from 2010).										
NaR-A-24.3.1	Recovery Action	Roads and Railroads	Develop a Road Sediment Reduction Plan that prioritizes sites and outlines implementation and a timeline of necessary actions.	2	3	Mendocino Redwood Company, NRCS, Private Consultants, Private Landowners, RCD	33.33	33.33	33.33			100	Estimate based on using existing data from various sources to develop road plan for the watershed.
NaR-A-24.3.1.1	Action Step	Roads and Railroads	Develop a road database using standardized methods. The methods should document all roads features, apply erosion rates, and compile information into a GIS database.	3	5	NRCS, Private Landowners, Public, RCD	10.00	10.00	10.00	10.00	10.00	50	Rough estimate to develop database for Navarro watershed.
NaR-A-24.3.2	Recovery Action	Roads and Railroads	Address sediment and runoff sources from road networks and other actions that deliver sediment and runoff to stream channels.	3	60	CalFire, CDFG, Mendocino County, Private Landowners						TBD	Cost of additional staff time is unknown at this time, could be considerable.
NaR-A-24.3.2.1	Action Step	Roads and Railroads	For all rural (unpaved) and seasonal dirt roads apply best management practices for road construction maintenance management and decommissioning (e.g. Hagans & Weaver 1994 Sommarstrom 2002 Oregon Department of Transportation 1999).	1	10	CDFG, Mendocino County Department of Public Works, Mendocino Redwood Company, NOAA RC, NRCS, Private Landowners, Public, RCD	312	312	312	312	312	3,120	Estimate for treating 200 miles of dirt roads over ten years at 15.6k per mile.
NaR-A-24.3.3	Recovery Action	Roads and Railroads	Limit winter use of unsurfaced roads and recreational trails by unauthorized and impacting uses to decrease fine sediment loads.										

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NaR-A-24.3.3.1	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.	1	5	CDFG, NOAA RC, Private Landowners, RCD	50.00	50.00	50.00	50.00	50.00	250	Based on 50K estimate for highest priority work that needs to be done prior to each winter.
NaR-A-24.3.4	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	20	Mendocino County, Mendocino Redwood Company, Private Landowners						TBD	Cost not available for conducting improved practices.
NaR-A-24.4	Objective	Roads and Railroads	Improver salmonid passage conditions at road crossings.										
NaR-A-24.4.1	Recovery Action	Roads and Railroads	Use NMFS Guidelines for Salmonid Passage at Stream Crossings (NMFS 2001a) and appropriate barrier databases when developing new or retrofitting existing road crossings.	2	10	CalTrans, Mendocino County Department of Public Works, NOAA RC, NRCS, Private Landowners	30.00	30.00	30.00	30.00	30.00	300	Based on estimate for 3 projects per year and each would have an additional 10k in cost.
NaR-A-24.4.2	Recovery Action	Roads and Railroads	Continue to refine, update, and maintain the California Fish Passage Assessment Database of barriers to fish passage.	2	10	California Coastal Conservancy, CDFG, Pacific States Marine Fisheries Commission, USFWS	5.00	5.00	5.00	5.00	5.00	50	Cost estimate for maintaining database for the Navarro watershed for 10 years.
NaR-A-25.1	Objective	Storms and Flooding	Support economic incentives to reduce the impacts of storms and flooding from current and future planned urban infrastructure.										
NaR-A-25.1.1	Recovery Action	Storms and Flooding	Where existing infrastructure exists within historical floodplains or offchannel habitats in any historical coho watersheds, and restoration is found feasible, encourage willing landowners to restore these areas through conservation easements, etc.	3	40	CDFG, NMFS, Private Landowners						TBD	Potential sites need to be identified and cost estimate developed.
NaR-A-25.2	Objective	Storms and Flooding	Develop policies in urban planning that reduce the impacts of storms and flooding on watersheds occupied by CCC Coho.	1	40	CalFire, California Department of Mines and Geology, CalTrans, CDFG, Mendocino Redwood Company, NRCS, Private Landowners, Public, RCD, RWQCB						TBD	Can be very costly, need to determine number of high risk sites and develop cost estimate.
NaR-A-25.2.1	Recovery Action	Storms and Flooding	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.	3	20	CDFG, Mendocino County, NMFS, RWQCB						TBD	Additional analysis needed to determine cost of modifying regulations at various levels.
NaR-A-25.2.1.1	Action Step	Storms and Flooding	Protect high-risk shallow-seeded landslide areas and surfaces prone to erosion from being mobilized by intense storm events.	2	60	Board of Forestry, CalFire, CDFG, Mendocino County, Private Landowners						TBD	Cost of protecting high risk areas is unknown at this time.
NaR-A-25.2.2	Recovery Action	Storms and Flooding	New development in all historic CCC coho salmon watersheds should meet a zero net increase in storm-water runoff, changes in duration, or magnitude of peak flow.	3	60	Mendocino County						TBD	Cost dependent on number of projects.
NaR-A-25.2.3	Recovery Action	Storms and Flooding	Develop Bank Stabilization and Floodplain Guidelines for use by private and public entities.	3	2	CDFG, NMFS, NRCS, Private Consultants	25.00	25.00				50	A rough estimate for an agency or consultant using existing information to develop guidelines.