Appendix B

Proposed Basin Plan Amendment

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Proposed Basin Plan Amendment:
Napa River Sediment Reduction and Habitat Enhancement Plan
~~June 30, 2006~~

The goals of the Napa River Sediment Reduction and Habitat Enhancement Plan (Plan) are to:

- Conserve the steelhead trout population
- Establish a self-sustaining Chinook salmon population
- Enhance the overall health of the native fish community
- Enhance the aesthetic and recreational values of the river and its tributaries

To achieve these goals, specific actions are needed to:

- Attain and maintain suitable gravel quality and diverse streambed topography in freshwater reaches of Napa River and its tributaries
- Protect and/or enhance base flows in tributaries and the mainstem of the Napa River
- Reduce the number and significance of human-made structures in channels that block or impede fish passage
- Maintain and/or decrease summer water temperatures in tributaries to the Napa River

The following sections establish:

1. A sediment total maximum daily load (TMDL) defining the allowable amount of sediment that can be discharged into the Napa River, expressed as a percentage of the natural background sediment delivery rate to channels
2. An implementation plan to achieve the TMDL and related habitat enhancement goals

Problem Statement

Steelhead and salmon populations in the Napa River and its tributaries have declined substantially since the late 1940s. Results of recent analyses of fisheries and sediment sources indicate that:

1. **Spawning and juvenile rearing habitat for salmon and steelhead are adversely affected by high concentrations of fine sediment (primarily sand) deposited in the bed of the Napa River and its tributaries.**

   Successful reproduction by salmon and steelhead depends on adequate flow through streambed gravels (permeability) in order for eggs to hatch and larvae to grow. As the concentration of fine sediment (primarily sand) in the streambed increases, permeability decreases, which in turn increases egg and larval mortality, and ultimately causes a decrease in the number of young fish that emerge from the streambed. Similarly, as the concentration of sand in the streambed increases, the frequency and extent of streambed scour is intensified, further increasing mortality between spawning and emergence by washing eggs and/or larvae out of the bed during common high flow events.

Even small increases in the concentration of fine sediment in the streambed may degrade the quality of rearing habitat for juvenile steelhead and salmon. Young steelhead need open spaces between clusters of large cobbles and boulders in order to escape high flows and predation during the winter. Similarly, as the concentration of fine sediment in the streambed increases, growth and survival of juvenile steelhead and salmon decreases as a consequence of lower biomass of aquatic insect prey species, and increasing activity level, aggressive behavior, and attacks between juvenile salmon and steelhead as they compete for food.

2. **Channel incision has greatly reduced the quantity and quality of spawning and rearing habitat for Chinook salmon in Napa River watershed. Habitat losses as a result of incision exert a significant negative influence on freshwater growth and survival of juvenile salmon, and therefore, on the number of Chinook salmon that ultimately return to spawn.**

   Channel incision, the progressive lowering over time of streambed elevation as a result of net erosion, has lowered the streambed of the mainstem of the Napa River by more than two meters since the start of the current episode of incision, which began sometime after 1965. As a result, habitat is being degraded. The channel has become isolated from its flood plain and there has been a large reduction in the size and frequency of riffles, gravel bars, side channels, and sloughs. These habitats provide essential spawning and juvenile rearing habitat for Chinook salmon. Human activities that have contributed to channel incision in the River, including (but not necessarily limited to) levee building, development projects that have increased peak runoff during storms, construction of large tributary dams, straightening of some mainstem channel reaches, filling of side channels, historical gravel mining, dredging to reduce flood risk, and intensive removal of large woody debris.

3. **Low flows and stressful water temperatures during the dry season, and fish migration barriers exert a significant negative influence on the number (and fitness) of juvenile steelhead that migrate to the ocean from the watershed, and as such, on the number of adults that successfully return to spawn.**

   Drifting aquatic insects produced in riffles often are the primary source of food for juvenile steelhead. Low or no flow over riffles during the dry season greatly reduces this food source. An association between low and/or negative growth rates in juvenile steelhead and poor baseflow persistence was documented in the summer and fall of 2001 in Napa River watershed. Summer water temperatures in tributaries also are often stressful to juvenile steelhead, likely contributing to poor growth rates that were documented. If low growth rates in summer are not mitigated by high rates of growth during other times of the year, significant reductions in survival rates during all subsequent life stages may result.

Poor access to and from potential spawning and rearing habitat due to man-made structures built in channels (e.g., dams, road crossings, weirs, etc.) and human water uses have reduced the size of the steelhead run in the Napa River watershed. For example, approximately 30 percent of the land area in Napa River watershed drains into over 400 reservoirs constructed on stream channels.

Due to excess erosion and sedimentation in the Napa River Watershed, the narrative water quality objectives for sediment and settleable material are not being met and cold freshwater habitat, wildlife habitat, fish spawning, recreation, and preservation of rare and endangered species beneficial uses are impaired. In addition, channel incision has reduced the quantity of gravel bars, riffles, side channels, and sloughs, which threatens Chinook salmon and other fish and aquatic wildlife species. Channel incision is a controllable water quality factor that is contributing to a violation of the narrative water quality objective for population and community ecology.

Numeric Targets

Meeting the numeric targets listed in Table 1 will allow water quality in the Napa River and its tributaries to achieve the Basin Plan's narrative water quality objectives for sediment, settleable material, and population and community ecology.

Table 1. TMDL sediment targets for the Napa River and its Tributaries

Spawning gravel permeability	Median value ≥ 7000 cm/hr[a]
Streambed scour	Mean depth of scour ≤ 15 cm[b]

[a] Target applies to all potential spawning sites for steelhead and salmon in the Napa River and its tributaries, excluding those upstream of municipal water supply reservoirs.

[b] Target applies to the response of the streambed to peak flows less than the ~~annual (one-year) flood~~ bankfull event at all potential spawning sites for salmon in gravel-bedded reaches of: 1) mainstem Napa River; and 2) alluvial reaches of tributaries where streambed slope is between 0.001 and 0.02. Potential spawning sites can be identified based on any of the following:1) dominant substrate size in the streambed surface layer is between 8 and 128 mm; 2) minimum surface area of gravel deposit is 0.2 square meters in tributaries and 1.0 square meter in mainstem Napa River; ~~and~~ or 3) located within mainstem Napa River at a riffle head, pool tail, and/or pool margin or in tributary reaches where streambed slope < 0.03, or in tributary reaches where streambed slope > 0.03 in pool tails, backwater pools, and/or in gravel deposits associated with flow obstructions (e.g., woody debris, boulders, banks, etc.).

Sources

Field inventories conducted throughout the watershed ~~between 1994 and 2004~~ provide credible estimates of the rates and sizes of sediment delivered to Napa River watershed channels ~~during the decade~~ between 1994 and 2004. Based on this work, and application of channel and reservoir mapping, the Water Board concludes that:

1. More than half of fine sediment delivered to Napa River during the 1994–2004 period is associated with land use activities including roads, human-caused channel incision, vineyards, intensive historical livestock grazing, and urban stormwater runoff.

2. In addition to its prominence in the sediment budget, channel incision is the primary agent for isolation of the channel from its flood plain and a reduction in the quantity and frequency of spawning and rearing habitat for salmon and steelhead in Napa River and the lower reaches of its tributaries.

3. Channel sediment loads vary greatly depending upon nature of underlying bedrock or sediment deposits, land use activities, and the location of dams.

4. Thirty percent of the watershed drains into reservoirs constructed on tributary channels. These reservoirs capture all of the gravel and sand, and most of the finer sediment input to upstream channels. Nonetheless, anthropogenic activities, downstream of dams, are contributing enough sediment such that the fine sediment load is substantially elevated in the Napa River downstream of the reservoirs.

Mean annual sediment delivery rate to channels is estimated to have been ~~271,000~~ 272,000 metric tons per year during the period from 1994 to 2004, which when considered in relation to the land area draining into the Napa River at Soda Creek (e.g., 584 km^2), equals ~~464~~ 466 metric tons per km^2 ~~land area~~ per year (Table 2). The natural background rate of sediment delivery during this period, absent dams and human-caused erosion is estimated to have been ~~253~~ 252 metric tons per km^2 per year, which is calculated from Table 2 as follows:

48,000 metric tons/year–*sediment deposited in tributary reservoirs*
7,000 metric tons/year–*sediment discharged through dams on tributaries*
92,000 metric tons/year–*input to channels downstream of reservoirs*
147,000 metric tons/year

147,000 metric tons/584 km^2–*land area draining to Napa R. at Soda Creek*
=252 metric tons/km^2/year

Therefore total sediment load in the Napa River at Soda Creek is estimated to have been ~~183~~ 185 percent of natural background (e.g., ~~464/253 = 183~~ 466/252 = 185%) during 1994-2004. ~~Table 1~~ Table 2 breaks down the sediment sources to the Napa River, with annual average rate calculated at Soda Creek over the 10-year study period.

Table 2. Mean Annual Sediment Delivery to Napa River at Soda Creek (1994-2004)

Source	Estimated Mean Annual Delivery Rate (metric tons/yr)
Land areas upstream of dams ~~(e.g.,~~ fine sediment discharged from reservoirs)	
▪ Natural Processes	7,000
▪ Human Actions	11,000
Land areas downstream of dams	
▪ Natural Processes:	92,000
▪ Human actions:	
o Channel incision and associated bank erosion	~~37,300~~ 37,000
o Road-related sediment delivery (all processes)	~~55,400~~ 55,000
o Surface erosion associated with vineyards and/or livestock grazing	~~36,700~~ 37,000
o Gullies and shallow landslides associated with vineyards, and/or intensive historical grazing	~~29,600~~ 30,000
o Urban Stormwater Runoff and Wastewater Discharges	~~4,000~~ 2,500
TOTAL	~~271,000~~ 272,000
Notes: Drainage area for Napa River at Soda Creek = 584 km^2. Estimates above do not include sediment deposited and retained in tributary reservoirs, which includes all gravel and sand, and most of the finer sediment input to channels located upstream of the reservoirs. Approximately 104,000 metric tons per year of sediment are deposited in tributary reservoirs, 48,000 metric tons per year of which is derived from natural processes, Above estimates are rounded to the nearest thousandth	

Total Maximum Daily Load and Allocations

The Napa River sediment TMDL is established at 185,000 metric tons per year, which is approximately 125 percent of natural background load (based on sediment load estimates from the 1994-2004 period) calculated at Soda Creek. Natural background load depends upon natural processes, and varies significantly. Therefore, the TMDL and allocations are expressed both in terms of sediment mass and percent of natural background. The percentage based TMDL, 125% of natural background, applies throughout the watershed. In order to achieve the TMDL, controllable sediment delivery resulting from human actions needs to be reduced by approximately 50 percent from current proportion of the total load (Table ~~3~~ 3a and 3b). TMDL attainment will be evaluated at the confluence of Napa River with Soda Creek, which approximates the downstream boundary of freshwater habitat for salmon and steelhead. Attainment of the TMDL will be evaluated over a 5-to-10-year averaging period.

Because dams trap almost all upstream sediment inputs to channels, natural sediment input to channels downstream of dams equals only 62 percent of the total natural background load (e.g. amount that would have been input to Napa River absent dams and human caused erosion). Almost 50 percent of the TMDL can be allocated to human-caused sources~~, and t~~ The TMDL equal to 125 percent of natural background load~~,~~ can be achieved if human-related sources are reduced to the level of the allocations shown in Tables ~~3~~ 3a and 3b).

Table 3a. Load Allocations

Source category	Load during 1994-2004		Estimated reductions needed (percentage)	Load allocations	
	Metric tons/year	Percentage of Natural Background		Metric tons/year	Percentage of Natural Background
Land areas upstream of dams					
▪ Natural processes	7,000	4.8	0	7,000	4.8
▪ Human actions	11,000	7.5	51	5,000	3.6
Land areas downstream of dams					
▪ Natural processes	92,000	63	0	92,000	63
▪ Human actions:					
o Channel incision and associated bank erosion	37,000	25	51	18,000	12
o Roads	55,000	38	51	27,000	18
o Surface erosion associated with vineyards and grazing	37,000	25	51	18,000	12
o Gullies and shallow landslides associated with vineyards, and/or intensive historical grazing	30,000	20	51	15,000	10
TOTAL	269,000			182,000	123
Note: Above estimates for loads, percent reductions, and allocations are rounded to two significant figures					

Table 3b. Wasteload Allocations for Urban Runoff and Wastewater Discharges

Point Source Category	Current Load		Reductions needed (percentage)	Wasteload Allocations	
	Metric tons/year	Percentage of Natural Background		Metric tons/year	Percent of Natural Background
Construction Stormwater- NPDES Permit No. CAS000002	500	0.3	0	500	0.3
Municipal Stormwater NPDES Permit No. CAS000004	800	0.5	0	800	0.5
Industrial Stormwater NPDES Permit No. CAS000001	500	0.3	0	500	0.3
Caltrans Stormwater- NPDES Permit No. CAS000003	600	0.4	0	600	0.4
Wastewater Treatment Plant Discharges[a]					
City of St. Helena NPDES Permit No. CA0038016	30	<0.1	0	30	<0.1
Town of Yountville/CA Veteran's Home NPDES Permit No. CA0038121	30	<0.1	0	30	<0.1
City of Calistoga NPDES Permit No. CA0037966	40	<0.1	0	40	<0.1
TOTAL	**2500**	**2**		**2500**	**2**

a. For wastewater treatment plant discharges, compliance with existing permit effluent limit of 30 mg/L of TSS is consistent with these wasteload allocations

Note: Above estimates for loads, percent reductions, and allocations are rounded to two significant figures

Table 3. Total Maximum Daily Load and Load and Wasteload Allocations

Source category	Load during 1994-2004 (percentage of natural load)	Estimated reductions needed (percentage)	Load allocations (percentage of natural load)
Land areas upstream of dams			
• Natural processes	5	0	5
• Human actions	8	50	4
Land areas downstream of dams			
• Natural processes	62	0	62
• Human actions:			
o Channel incision and associated bank erosion	26	50	13
o Roads	36	50	18
o Surface erosion associated with vineyards and grazing	24	50	12
o Gullies and shallow landslides associated with vineyards, and/or intensive historical grazing	20	50	10
			Wasteload allocation (Percentage of natural load)
o Urban stormwater runoff	2	50	1
TMDL			125

IMPLEMENTATION PLAN

The Implementation actions described below are to achieve TMDL targets and allocations and habitat enhancement goals. In addition, actions specified in this plan are expected to enhance steelhead run size and facilitate establishment of a self-sustaining Chinook salmon run.

Regulatory Tools

The only point sources of sediment identified in Tables 2 and 3b are those associated with urban stormwater runoff (e.g., municipal stormwater, runoff from State highways, and industrial and construction discharges) and wastewater treatment plants, which are regulated by NPDES permits. Table 4.0 shows implementation required of these sources.

The state's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires regulation of nonpoint source discharges using the Water Board's administrative permitting authorities, including waste discharge requirements (WDRs), waiver of WDRs, Basin Plan Discharge Prohibitions, or some combination of these. Consistent with this policy, Tables 4.1 – 4.4 ~~Implementation Measures for Nonpoint Sources~~ specifies actions and performance standards by nonpoint source category, as needed to achieve TMDL sediment targets and allocations in Napa River watershed. The Water Board will consider adopting conditions for waiving WDRs that apply to the nonpoint sources (vineyards, grazing, roads, etc.) listed in Tables 4.1 – 4.4.

Table 4.0 TMDL Implementation measures for Sediment Discharges Associated with Urban Stormwater Runoff and Wastewater Discharges

Source Category	Actions	Implementing Parties
Urban Stormwater Runoff and wastewater discharges	Comply with applicable NPDES permits	Napa County, City of Napa, Town of Yountville, City of St. Helena, City of Calistoga, City of American Canyon, State of California, Department of Transportation, California Veterans' Home, owners or operators of industrial facilities and construction projects > 1 acre

Problems associated with channel incision, related rapid bank erosion, and loss of essential habitat features, reflect and integrate multiple historical and ongoing disturbances, some of which are local and direct, and others that are indirect and distal. Effectively addressing these issues will require cooperative and coordinated actions by multiple landowners, working with public agencies, over significant distances along the river. The most effective means of controlling channel incision and reducing related fine sediment delivery to the river is a channel restoration program that re-establishes width-to-depth ratios and sinuosity values conducive to formation of alternate bars and a modest flood plain. The Water Board will work with stakeholders along Napa River, through local stewardship groups, to implement such channel restoration/habitat enhancement projects. Tables 5.1 to 5.4 (~~Implementation~~ Recommended Measures to Protect or Enhance Habitat), specify actions to address adverse impacts of channel incision on salmon habitat quantity and quality, and to accomplish habitat enhancement goals for flow, temperature, and fish passage for steelhead and salmon.

Individual landowners or coalitions may work with "third parties" to develop and implement sediment pollutant control programs. With regard to achievement of actions to protect or enhance baseflow, fish passage, habitat complexity, and stream temperature, as specified in Tables 5.1 through 5.4 the Water Board will initially rely on cooperative programs. Reliance on this approach is dependent on regular and substantive progress ~~in achieving the performance milestones for sediment reduction and habitat enhancement specified in Table 6~~. Alternatively,

the Water Board has the discretion to use WDRs and/or waste discharge prohibitions (for sediment) as primary regulatory tools for control of sediment discharges. Similarly, the Water Board may consider adopting specific water quality objectives for flow or other habitat attributes, or using alternative authorities to achieve habitat, fish passage, temperature, and flow enhancement objectives.

Table 4.1 Required and Trackable TMDL Implementation Measures for Sediment Discharges Associated with Vineyards[1]

Land Use Category	Sources and Performance Standards	Actions	Implementing Parties	Completion Dates
Vineyards	**Surface Erosion associated with vineyards**: Comply with conservation regulations (County Code, Chapter 18.108); **and** **Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period[2]; **and** **Gullies and/or shallow landslides:** Accelerate natural recovery and minimize human-caused increases in sediment delivery from unstable areas; **or** Implement farm plan certified under Napa Green Certification Program	Submit a Report of Waste Discharge[3] (RoWD) to the Water Board that provides, at a minimum, the following: a description of the vineyard; identification of site-specific erosion control measures needed to achieve performance standard(s) specified in this table; and a schedule for implementation of identified ~~management~~ erosion control measures ~~as needed to achieve performance milestones listed below in Table 6.~~	Vineyard owner and/or operator	October 2012
		Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs.	Vineyard owner and/or operator	As specified in applicable WDRs or waiver of WDRs
		Report progress on implementation of ~~measures to reduce fine sediment discharge, and enhance stream habitat conditions~~ site specific erosion control measures.[4]	Vineyard owner and/or operator	As specified in applicable WDRs or waiver of WDRs

[1] Does not apply to parcels upstream of municipal reservoirs, where measures required per Napa County Code (Chapter 18.108), are sufficient to achieve sediment load allocations, and/or parcels classified by Napa County as "rural residential" (2% of unincorporated area in Napa County), where Water Board will rely on education and outreach and participation in voluntary programs.
[2] To achieve 50% reduction in road-related erosion, which we estimate averaged 500 yd^3 per mile between 1994 and 2004.
[3] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[4] Reports may be submitted individually or jointly through a recognized third party.

Table 4.2 Required ~~and Trackable~~ TMDL Implementation Measures for Sediment Discharges Associated with Grazing[1]

Land Use Category	Source(s) and Performance Standard(s)	Actions	Implementing Parties	Completion Dates
Grazing	**Surface erosion associated with livestock grazing**: Attain or exceed minimal residual dry matter values consistent with University of California Division of Agriculture and Natural Resources guidelines **and** **Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period[2] **and** **Gullies and/or shallow landslides**: Accelerate natural recovery and minimize human-caused increases in sediment delivery from unstable areas	~~1.~~ Submit a Report of Waste Discharge[3] to the Water Board that provides, at a minimum, the following: description of the ~~ranch~~ property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified ~~management~~ erosion control measures.	~~Ranch~~ Landowner and/or ~~lessee~~ ranch operator	October 2012
		Comply with applicable waste discharge requirements (WDRs) or waiver of WDRs.	~~Ranch~~ Landowner and/or ~~lessee~~ ranch operator	As specified in applicable WDRs or waiver of WDRs
		Report progress on implementation of ~~measures to reduce fine sediment discharge, and enhance stream habitat conditions~~ site specific erosion control measures.[4]	~~Ranch~~ Landowner and/or ~~lessee~~ ranch operator	As specified in applicable WDRs or waiver of WDRs

[1] Does not apply to parcels upstream of municipal reservoirs, where measures required per Napa County Code (Chapter 18.108), are sufficient to achieve sediment load allocations, and/or parcels classified by Napa County as "rural residential" (2% of unincorporated area in Napa County), where Water Board will rely on education and outreach and participation in voluntary programs.
[2] To achieve 50% reduction in road-related erosion, which we estimate averaged 500 yd^3 per mile between 1994 and 2004.
[3] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[4] These reports may be prepared individually or jointly or through a recognized third party.

Table 4.3 Required ~~and Trackable~~ TMDL Implementation Measures for Sediment Discharges Associated with Rural Lands[1, 4]

Land Use Category	Sources and Performance Standards	Actions	Implementing Parties	Completion Dates
Rural Lands	**Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period[2]; **and** **Gullies and/or shallow landslides**: Accelerate natural recovery, and minimize human caused increases in sediment delivery from unstable areas.	Submit a Report of Waste Discharge[3] to the Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified ~~management~~ erosion control measures.	Landowners ~~and/or designated managers~~	October 2012
		Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs.	Landowners ~~and/or designated managers~~	As specified in applicable WDRs or waiver of WDRs
		Report progress on implementation of ~~measures to reduce fine sediment discharge, and enhance stream habitat conditions~~ site specific erosion control measures.[5]	Landowners ~~and/or designated managers~~	As specified in applicable WDRs or waiver of WDRs

[1] Does not apply to parcels upstream of municipal reservoirs, where measures required per Napa County Code (Chapter 18.108), are sufficient to achieve sediment load allocations, and/or parcels classified by Napa County as "rural residential" (2% of unincorporated area in Napa County), where Water Board will rely on education and outreach and participation in voluntary programs.
[2] To achieve 50% reduction in road-related erosion, which we estimate averaged 500 yd^3 per mile between 1994 and 2004.
[3] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board
[4] Rural lands, per Napa County definition include: non-farmed and non-grazing portions of parcels >10-ac that contain one or more residences, and/or a winery; vacant residential parcels >10-acres; and/or portions of 10-acre or larger parcels with secondary vineyard, orchard, and/or grazing
[5] These reports may be prepared individually or jointly or through a recognized third party.

Table 4.4 Required ~~and Trackable~~ TMDL Implementation Measures for Sediment Discharges associated with Parks and Open Space, and/or Municipal Public Works[1]

Landowner Type	Sources and Performance Standards	Actions	Implementing Parties	Completion Dates
Parks and Open Space and Public Works	**Roads**: Road-related sediment delivery to channels ≤ 500 cubic yards per mile per 20-year period[2]; **and** **Gullies and/or shallow landslides**: Accelerate natural recovery, and minimize human caused increases in sediment delivery from unstable areas.	~~1.~~ Submit a Report of Waste Discharge[3] to Water Board that provides, at a minimum, the following: description of the property; identification of site-specific erosion control measures to achieve performance standard(s) specified in this table; and a schedule for implementation of identified ~~management~~ erosion control measures. ~~2.~~ Adopt and implement best management practices for maintenance of roads to reduce road-related erosion and protect stream-riparian habitat conditions.	Napa County ~~Municipal~~ Stormwater Management Program State of California, Department of Parks and Recreation State of California, Department of Transportation	October 2012
		Comply with applicable Waste Discharge Requirements (WDRs) or waiver of WDRs.	Landowners ~~and/or designated managers~~	As specified in applicable WDRs or waiver of WDRs, and/or the SWMP
		Report progress on implementation of ~~measures to reduce fine sediment discharge, and enhance stream habitat conditions~~ site specific erosion control measures.[4]	Landowners ~~and/or designated managers~~	As specified in applicable WDRs or waiver of WDRs, and/or SWMP

[1] Does not apply to parcels upstream of municipal reservoirs, where measures required per Napa County Code (Chapter 18.108), are sufficient to achieve sediment load allocations, and/or parcels classified by Napa County as "rural residential" (2% of unincorporated area in Napa County), where Water Board will rely on education and outreach and participation in voluntary programs.
[2] To achieve 50% reduction in road-related erosion, which we estimate averaged 500 yd^3 per mile between 1994 and 2004.
[3] Or compliance with applicable conditional waivers of WDRs that may be adopted by the Water Board.
[4] These reports may be prepared individually or jointly or through a recognized third party.

Table 5.1 Recommended Actions to Reduce Sediment Load and Enhance Habitat Complexity in Napa River and its Tributaries

STRESSOR	***MANAGEMENT OBJECTIVE(S)***	**Actions**	**Implementing Parties**	Completion Dates and Notes
Habitat degradation as a result of mainstem Napa River and lower reaches of its larger tributaries incising.	Reduce rates of sediment delivery (associated with incision and accelerated bank erosion) to channels, by 50 percent Enhance channel habitat as needed to support self-sustaining run of Chinook salmon and enhance the overall health of the native fish community.	1.1 Develop and implement plans to enhance stream-riparian habitat conditions, and reduce fine sediment supply in mainstem Napa River and lower tributary reaches	Landowners and/or designated agents, and reach-based stewardships	Comply with conditions of Clean Water Act Section 401 certifications (implementation of Rutherford Project completed by fall 2015, other projects by 2025)
Habitat degradation as a result of reduction in large woody debris in stream channels.	Enhance quality of rearing habitat for juvenile salmonids	1.2 Develop and implement performance standards for protection of ecologically significant large woody debris in stream channels.	Napa County ~~Municipal~~ Stormwater Management Program and State Department of Parks and Recreation	Fall 2008

Table 5.2 Recommended actions to protect or enhance baseflow

Stressor	Management Objective	Action(s)	Implementing Parties	Schedule/Notes
Low flows during dry season	Maintain suitable conditions for juvenile rearing, and smolt migration to Napa River estuary	2.1. Establish guidelines to maintain in-stream flow to protect salmonids	State Water Board (Division of Water Rights)	By January 1, 2008
		2.2. ~~Adopt~~ Local, state, and federal agencies to participate in a cooperative partnership to develop a plan for joint resolution of water supply reliability and fisheries conservation concerns	Local municipalities working with Water Board, State Water Board (Division of Water Rights), National Oceanic and Atmospheric Administration Fisheries Service (NOAA), and California Department Fish and Game (DFG)	Adopt plan by fall 2010.
		~~2.3. Adopt reservoir bypass flows as needed to protect salmonids downstream of municipal water supply reservoirs~~	~~State Water Board (Division of Water Rights)~~	~~Conduct in-stream flow analysis; schedule based on consultation with NOAA, DFG, and Water Board~~
		~~2.4.~~ 2.3. Install and maintain dial-up water-level gage programs and implement public education program in 10 key tributaries for steelhead	Local public agencies	Accomplish~~ed~~ by Spring of 2010
		~~2.5.~~ 2.4.Develop water-level guidelines to support juvenile salmonid rearing and migration	Local public agencies	Adopt g~~G~~uidelines ~~adopted~~ by spring of 2010
		~~2.6.~~ 2.5. Conduct water rights compliance survey to protect fish and water rights	~~County of Napa~~ State Water Board(Division of Water Rights)	Schedule per consultation with NOAA, DFG, and Water Board

Table 5.3 Recommended Actions TO Restore to Fish Passage

Stressor	Management Objective(s)	Action(s)	Implementing Parties	Schedule/Notes
Structures in channels that block or impede fish migration (note: flow-related barriers are addressed above)	No significant structural impediments to salmonid migration in mainstem or in 10 key tributaries for steelhead (including but not limited to the following): Dry, Milliken, Redwood, Sulphur, and York Designation of remaining tributaries will be determined in consultation with Napa County RCD, CDFG, NOAA Fisheries, and USEPA	3.1. Enhance conditions for adult and juvenile salmon and juvenile steelhead passage at Zinfandel Lane	Local public agencies and landowners	Project completed by fall of 2010
		3.2. Restore passage for adult and juvenile steelhead to-and-from York Creek upstream of Upper Dam	City of St. Helena	Schedule to be determined based on consultation with National Oceanic and Atmospheric Administration Fisheries Service (NOAA), and California Department Fish and Game (DFG)
		3.3. Identify and develop a plan to remedy all significant structural impediments to salmonid migration in ten key steelhead tributaries (including York)	Local public agencies and landowners	Complete comprehensive fish passage surveys in 10 key tributaries by Fall 2010. Schedule for barrier remediation to be determined based on consultation with NOAA and DFG.

Table 5.4 Recommended Actions to Protect and/or Enhance Stream Temperature

Stressor	Management Objective(s)	Action(s)	Implementing Parties	Schedule/Notes
Stressful summer water temperatures in tributaries	Protect and/or enhance baseflow	4.1. As described ~~earlier~~ in Table 5.2	As ~~described~~ indicated in Table 5.2	As described in Table 5.2
	Enhance amount of ecologically significant large woody debris in channels	4.2. As described ~~earlier~~ in Table 5.1	As ~~described~~ indicated in Table 5.1	As described in Table 5.1
	Enhance potential shade along riparian corridors	4.3.~~ Via Napa Green Certification Program, voluntarily establish riparian buffers, and~~ Implement management actions to accelerate recovery of native riparian tree species	~~Vineyard owners and managers in partnership with Napa County Resource Conservation District and the California Land Stewardship Institute~~ As indicated in Tables 4.1 to 4.4.	As described in ~~Table 4.1, Trackable TMDL Implementation Measures for Sediment Discharges from Vineyards~~ Tables 4.1 to 4.4.

Table 6. Performance Milestones and Decision Points

Milestones	Date
Water Board Decisions: adopt waste discharge requirements or waiver(s) of waste discharge requirements, as applicable, for source categories presented in Tables 4.1 through 4.4.	Fall 2010
Performance Milestones • Performance standards for protection of ecologically important large woody debris implemented as part of Countywide Stormwater Program. • Grazing surface erosion management practices implemented at all commercial livestock ranches • Baseflow monitoring program and guidelines implemented • Tributary fish passage surveys completed • Water supply reliability and fisheries conservation plan adopted by municipalities • Zinfandel Lane fish passage project implemented	Fall 2010
Water Board Decisions: renew/revise/rescind waiver(s); adaptive update TMDL and Implementation Plan.	Fall 2013
Performance Milestones • 25% reduction in sediment delivery from roads • 15% reduction in sediment delivery from land use related gullies and slides • Rutherford (or similar) channel enhancement project fully implemented	Fall 2015
Water Board Decisions: renew/revise/rescind waiver(s); adaptive update of TMDL and Implementation Plan.	Fall 2016 & Fall 2019
Performance Milestones • 50% reduction in sediment delivery from roads • 30% reduction in sediment delivery from land use related gullies and slides • All hillside vineyards have approved/implemented erosion control plans per Napa County Conservation Regulations	Fall 2020
Water Board Decisions: renew/revise/rescind waiver(s); adaptive update of Plan.	Fall 2022
Performance Milestones • 50% reduction in sediment delivery from land use related gullies and slides	Fall 2025

Notes: Milestones and/or decision points may be revised per adaptive updates to this plan.

Agricultural Water Quality Control Program Costs

Implementation measures for grazing lands and vineyards constitute an agricultural water quality control program and therefore, consistent with California Water Code requirements (Section 13141), the cost of this program is estimated herein. This cost estimate includes the cost of implementing all actions to reduce sediment discharges and enhance habitat complexity as specified in the implementation plan, and is based on costs associated with technical assistance and evaluation, project design, and implementation of actions needed to achieve the TMDL. In estimating costs, the Water Board has assumed that owners of agricultural businesses (e.g., grape growers and ranchers), within the unincorporated area, own 75 percent of total land area on hillside parcels, and 95 percent of the land along Napa River and lower reaches of its tributaries. Based on these assumptions, we estimate total cost for program implementation for agricultural sources could be $1.9-to-3.4 million per year throughout the 20-year implementation period. More than two-thirds of these potential costs are associated with reducing sediment discharges and enhancing habitat conditions (to address channel incision) in Napa River. Considering potential benefits to the public in terms of ecosystem functions, aesthetics, recreation, and water quality~~.~~, it is anticipated that at least 75 percent of the cost of these actions will be paid for with public funds ~~and~~. Therefore, the total cost to agricultural businesses associated with efforts to reduce sediment supply and enhance habitat in Napa River is $800,000 to $1.7 million per year.

Evaluation and Monitoring

Three types of monitoring are specified to assess progress toward achievement of numeric targets and load allocations for sediment:

1) Implementation monitoring to document that required sediment control and habitat enhancement actions are implemented
2) Upslope effectiveness monitoring to evaluate effectiveness of sediment control actions in reducing rates of sediment delivery to channels
3) In-channel effectiveness monitoring (e.g., spawning gravel permeability and redd scour) to evaluate channel response to management actions and natural processes

Implementation monitoring will be conducted by landowners or designated agents. The purpose of this type of monitoring is to document that sediment control and/or habitat enhancement actions specified herein actually occur.

The Water Board will conduct upslope effectiveness monitoring to evaluate sediment delivery to channels from landuse activities and natural processes., ~~which will involve regular updates of the sediment source analysis (e.g., estimation of rates of sediment delivery to channels), at a frequency that tracks with the projected schedule for evaluation of the performance milestones listed in Table 6~~. The first update will occur on or before the fall of 2017, when sediment delivery associated with land use activities should be reduced by 25 percent or more. A subsequent update may occur, assuming the numeric targets for sediment are not already achieved, on or before the fall of 2022, when sediment supply associated with land use activities should be reduced by 37 percent or more.

In-channel effectiveness monitoring should be conducted by local government agencies with scientific expertise and demonstrated capability in working effectively with private property owners (to gain permissions for access), as needed to develop a representative sample of stream habitat conditions, in relation to sediment supply and transport within the watershed. In addition, the Water Board will conduct in-channel effectiveness monitoring as part of the Surface Water Ambient Monitoring Program. In-channel effectiveness monitoring needs to include measurements of redd scour and spawning gravel permeability to evaluate attainment of water quality objectives for sediment, settleable material, and population and community ecology. To establish a high level of statistical confidence in estimated values, spawning gravel permeability will need to be measured at 150 or more potential spawning sites located in ten-or-more tributaries, and 50 or more potential spawning sites in the mainstem of the Napa River. Redd scour will need to be measured in the mainstem Napa River at approximately 30 or more potential spawning sites, with 4 or more scour measurements per spawning site. Desired frequency for measurement of permeability and redd scour is once every two to three years. At a minimum, repeat surveys will be conducted once every five years.

In addition to the above described monitoring program to evaluate attainment of numeric targets for sediment, the Water Board will monitor turbidity and residual pool volume. Monitoring will be conducted in a subset of the channel reaches where spawning gravel permeability and/or redd scour are measured. Stream temperature and baseflow persistence will be monitored as part of the Surface Water Ambient Monitoring Program.

Adaptive Implementation

In concert with the monitoring program, described above, the Napa River Sediment Reduction and Habitat Enhancement Plan and TMDL will be regularly updated. Results of in-progress or anticipated studies that enhance understanding of the population status of steelhead trout and Chinook salmon in Napa River watershed, and/or factors controlling those populations, may also trigger changes to the plan and TMDL. At a minimum, data in response to the following questions will be considered to guide research and monitoring efforts and focus each subsequent update of the TMDL.

Key Questions to be considered in the course of Adaptive Implementation:

1. What is the population status of steelhead and salmon in the watershed?

An improved understanding of the current status of steelhead and salmon populations in the Napa River watershed is essential for guiding adaptive updates to the management actions recognized in this plan.

Two types of monitoring data may be needed to evaluate the current population status of steelhead in the Napa River watershed: 1) "smolt" production and sizes, and 2) adult spawning run-size. Smolt refers to the life stage when juvenile salmon and trout migrate from freshwater to the ocean. Estimates of smolt production and sizes, and inter-annual variation in these parameters, can provide a strong basis for evaluating population status of ocean migrating

species of trout and salmon, and influence of freshwater rearing habitat conditions on number of adults that successfully return to spawn. At least five years of monitoring (trapping) of ocean migrating smolts are needed to evaluate current steelhead population status. In addition to smolt trapping, three or more years of monitoring data are needed to estimate the number of adult steelhead returning to spawn. This information, when combined with estimates of smolt production and sizes, would provide a basis for assessing the influences of ocean and freshwater habitat on steelhead run-size, for validating smolt production estimates and predictions regarding ocean survival, and ultimately for evaluating the status of the steelhead population in the watershed.

A similar monitoring program is needed to evaluate the current population status of Chinook salmon in Napa River watershed. Such a program might include the following elements: 1) adult spawning run-size and genetic structure; 2) smolt production; and 3) egg survival from spawning to emergence (emergence trapping). During the past two years, the Napa County Resource Conservation District has conducted surveys to estimate the number of adult salmon returning to spawn. These surveys should continue for at least three more years, both to estimate the number of spawners and inter-annual variations, and to collect fin clips, as needed to evaluate origins of the spawning adults (e.g., returning adults or strays from hatcheries or other streams). The hypothesis that Chinook salmon experience very high rates of mortality during all freshwater life stages in the Napa River watershed, could be confirmed or rejected through direct monitoring of egg survival to emergence (emergence trapping), fry survival and growth, and smolt trapping.

2. ***What are expected benefits of various actions to enhance habitat for steelhead and salmon?***
For steelhead, the results of in-progress studies of juvenile growth and survival will enhance understanding of the significance of dry season base flow and temperature as potential limiters on steelhead run-size. Other information needed to refine understanding of primary constraints on steelhead population size includes the following: a) comprehensive fish passage evaluations in all key tributaries that provide potential habitat for steelhead; b) dry season water-level monitoring in the same tributaries conducted over two-or-more consecutive years; and c) field surveys to evaluate winter rearing habitat quantity and quality. Given the above sources of information, it may be possible to accurately predict relative increases (high, medium, low) in smolt production associated with various management actions (e.g., baseflow enhancement, fish passage enhancement, reduction in fine sediment supply, etc.) in various locations throughout the watershed.

Key information sources needed to refine understanding of primary controls on Chinook salmon population size include egg survival-to-emergence and controls (e.g., redd scour, gravel permeability), fry survival and growth, and number and sizes of juvenile salmon migrating to the ocean. To this end, pre-and-post project monitoring associated with the proposed Rutherford channel enhancement project may provide an opportunity to determine the amount and types of habitat enhancement actions needed to support a self-sustaining run of Chinook salmon, and to enhance the overall health of the native fish community within the watershed.

Key parameters that might be monitored to evaluate fisheries' response to channel enhancement could include: a) changes in quantity, quality, and frequency of key habitat types (e.g., riffles, pools, side channels, gravel bars); b) spawning gravel permeability and scour; c) base flow persistence and temperature; and d) relative abundance of native and introduced fish species.