



**IMPLEMENTING SEDIMENT AND PATHOGEN TMDLS IN THE NORTH BAY:  
NAPA RIVER WATERSHED**

**U.S. EPA GRANT # EM-00T34101  
FINAL REPORT**



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## **I. EXECUTIVE SUMMARY**

The Napa County Resource Conservation District (NCRCD) was funded as one of four partners in the North Bay, coordinated by the North Bay Watershed Association, to implement TMDLs in the north San Francisco Bay through a grant from the U.S. EPA's San Francisco Bay Water Quality Improvement Fund and administered by the San Francisco Estuary Partnership and Marin Municipal Water District. The geographic focus area for NCRCD's portion of the project was the Napa River watershed which has adopted TMDLs for sediment and pathogens.

The overall goal of the project in the Napa River watershed was to increase local understanding of and actions to implement TMDLs in the watershed. Specific objectives were to increase awareness related to the impacts of erosion from unpaved roads on water quality, provide technical assistance to landowners to help them reduce sediment from roads, implement a road-related sediment reduction project, implement three additional pollution reduction projects, assist vineyard landowners and managers in understanding and preparing for upcoming water quality regulations, and carry out a pilot watershed monitoring program tied to TMDL-specific targets.

NCRCD held a variety of technical and outreach workshops targeted at stakeholders who will be essential to TMDL program implementation in the Napa River watershed including: engineers, vineyard managers, heavy equipment operators, resource agencies in the region, Water Board directors, agricultural industry representatives, and a variety of interested stakeholders in the San Francisco Bay region through the State of the Estuary (SOE) Conference held in 2013. An estimated 30 – 50 people attended each of the workshops and approximately 150 people attended the SOE conference session focusing on TMDL implementation.

NCRCD targeted specific technical road assessment and improvement planning services to landowners in the upper Redwood Creek watershed, a local tributary watershed that supports threatened steelhead, has relatively high habitat value, and a high erosion risk. Several landowners requested the assessment and planning service and ultimately NCRCD staff assessed over 30 miles of road in the watershed and prepared site-specific plans for each participating landowner. NCRCD also provided limited technical assistance to the Regional Park and Open Space District and the Land Trust of Napa County in other sub-watersheds of the Napa River. The Land Trust, Open Space District and at least one land manager in the Redwood Creek watershed immediately began implementing the sediment reduction recommendations, thus reducing the risk of sediment delivery from these properties and building the capacity of these land managers to apply common management techniques at other properties that they manage throughout the Napa River watershed.

To implement and demonstrate road erosion reduction improvements, NCRCD worked with a private landowner in the Heath Canyon watershed, a local tributary located north-west of the

City of St. Helena. The project consisted of shaping and grading 4.71 miles of road surfaces to avoid concentrated storm flows and to disperse runoff (“stormproofing”) and treating 47 site specific locations to reduce the risk of episodic erosion and failure, including stream crossings, ditch relief culverts, and critical road surface sites. The project significantly reduces the risk of over 6,000 cubic yards of fine sediment being delivered to local waterways over the next decade. The landowner was very satisfied with the work performed and has allowed and encouraged NCRCD to utilize his property as a demonstration site for NCRCD-sponsored workshops. Three additional projects to reduce pollution transport to local waterways included 1) removal of small fish barrier and associated fine sediment accumulation in the Murphy Creek watershed, 2) “stormproofing” of approximately 0.75 miles of road in the Redwood Creek watershed, and 3) implementation of recommended maintenance on a sediment basin that was near capacity.

To help prepare vineyard managers for a pending regulatory program to be carried out by the Water Board, NCRCD worked with Sonoma RCD (SRCD) to develop a vineyard water quality plan template that is expected to meet planning requirements of the pending regulatory program. Subsequently, NCRCD and SRCD worked with Mendocino RCD and Gold Ridge RCD to expand the vineyard water quality farm plan template to additional landuses, to cover resource issues beyond water quality compliance, and to expand services beyond conservation planning. The result of the collaboration is the LandSmart® program ([www.landsmart.org](http://www.landsmart.org)). Developing the LandSmart® Program required far more funding resources than were available through this project, however, this project provided some support for NCRCD to work with other RCDs in the region and Water Board staff to improve the vineyard water quality plan template.

Once the vineyard water quality plan template and the mechanism to help vineyard managers complete the template was complete, this project funded NCRCD to carry out a LandSmart® farm planning workshop series. The series was well attended with 30 participants enrolling over 1,400 acres of vineyard property. The status of farm plan completion is somewhat hindered by a delay in adoption of the Water Board regulatory program for vineyards. However, LandSmart® participants are working on their plans and we expect that many of them will request that their plans be “verified” or “certified” after the Water Board releases and/or adopts its regulatory program. NCRCDs promise to vineyard managers, beyond the term of this project, is to make any necessary modifications to the vineyard water quality farm plan template so that requirements of the Water Board will be met. Partially as a result of this project, the LandSmart® program and multiple RCDs are now well situated to assist vineyard and other land managers meet and exceed water quality requirements in Napa, Sonoma and Mendocino counties.

Lastly, through this project and building upon previous work to develop a statistically robust monitoring plan for streambed scour and gravel permeability, the two primary targets

identified in the Napa River TMDL, NCRCD carried out two years of pilot monitoring and developed specific and informed protocol that can be implemented into the future. In sum, NCRCD effectively met the project goal and multiple objectives of this project in the Napa River watershed. A broad spectrum of stakeholders are more aware of actions that need to be taken to reduce erosion from unpaved roads, several projects were implemented to actually reduce sediment discharges to local waterways, the capacity of our community to implement TMDLs and monitor progress, now and into the future, was improved, and collaborative efforts in the North Bay were improved.

<b>Project Achievement Summary – By the Numbers</b>	
Miles of private unpaved road assessed	36
Miles of unpaved road treated / storm-proofed	4.751
Critical sediment delivery sites treated	47
Fish barriers removed	1
Linear feet of steelhead habitat made available	633
Heavy equipment operators trained to work on unpaved roads	40
Attendees of LandSmart® workshop series	30
Acres enrolled in LandSmart® Vineyard Conservation Planning Program	1,400
Presentations given regarding Project and Napa River TMDL progress	10

## **II. INTRODUCTION AND PROJECT DESCRIPTION**

### **A) WATERSHED OVERVIEW**

The Napa River watershed is located in western Napa County and is approximately 426 square miles, which is roughly half the size of the County. The watershed is bordered by Mt. St. Helena in the north, the Mayacamas Mountains in the west, Howell Mountain, Atlas Peak and Mt. George in the east, and the Napa-Sonoma Marsh in the south. The Napa River runs through the center of the watershed on the valley floor and drains numerous tributaries along its 55-mile run from the headwaters of Mt. St. Helena to the San Pablo Bay. The Napa Valley has a Mediterranean climate characterized by warm, dry summers and cold, moist winters. The majority of annual precipitation occurs as rain that falls during the winter and early spring. The highest rainfall occurs in the western side of the watershed where average annual precipitation is 35-40 inches as compared to 20-25 inches in the eastern portion. Precipitation also decreases from north to south in the watershed with average annual precipitation of 38 inches in Calistoga and 25 inches at Napa State Hospital in the City of Napa. The Napa River and its tributaries wind their way through many types of landscapes: forested mountain slopes, vineyards, open pasture and grassland, urban areas, industrial lands, and marshes. The Napa River watershed is home to most of the residents and developed areas in Napa County and it is estimated that 95% or more of the population of Napa County live in the Napa River watershed.

The Napa Valley has been managed and manipulated by people for hundreds of years. Native peoples actively managed the landscape to support their communities and had a well-established land management and communication network in the region prior to arrival of European contact. However, in the post-European contact timeframe, land management intensified significantly and since the mid-1900's rapid population and expansion of agriculture in the watershed has led to urban development, extensive road networks, construction of water reservoirs, and expanded water use.

Similar to other watersheds in the region, the altered landscape increased the compaction of soils and the extent of impervious surfaces, such as roads and rooftops, significantly increasing runoff volumes and rates as well as erosion and transport of fine sediments to local waterways. These alterations also contributed to confinement and channelization of streams that would normally migrate across alluvial fans in the depositional setting of the Napa Valley. The increased runoff leads to increased peak discharge to the Napa River, increased sediment inputs from incision and bank erosion, and possible decreased water infiltration and recharge in the valley. The relatively rapid changes to the Napa Valley have created environmental challenges, including the decline of local fisheries and the listing of the Napa River as impaired by sedimentation under the Clean Water Act.

#### **B) NAPA RIVER IMPAIRMENTS AND PROJECT BACKGROUND**

In 1990, the San Francisco Bay Regional Water Quality Control Board (Water Board) listed the Napa River as impaired by sedimentation based on visual evidence of widespread erosion and concerns regarding potential adverse impacts to threatened and endangered fish (i.e., steelhead and Chinook salmon) and cold-water habitat. Subsequently, in the early 2000's, the Water Board completed several studies in the Napa River watershed to better understand sedimentation, erosional sources, and other factors that may limit steelhead and salmon populations and associated habitat. Based upon this and other research, the Water Board prepared the Napa River Watershed Sediment Total Maximum Daily Load (TMDL) and Habitat Enhancement Plan (Sediment TMDL) and adopted a Basin Plan Amendment in 2009 consistent with the Sediment TMDL. The primary sources of sediment in the Napa River watershed were determined to be: roads, erosion of the bed and banks of the Napa River and lower tributary reaches, vineyards, and intensive historical grazing. Pollution reduction targets and required actions for each of these sources is detailed in the Sediment TMDL and Basin Plan Amendment.

The Napa River is also listed by the Water Board as impaired by pathogens, which, in excess, create a health risk to recreational users of the Napa River in certain locations. Sources of pathogens were identified by the Water Board to be septic systems, sanitary sewer systems, municipal runoff, grazing lands, confined animal facilities, municipal wastewater treatment facilities. Similar to the Sediment TMDL, specific reduction targets

and required actions were identified by the Water Board for each pathogen source identified and a Pathogens TMDL and associated Basin Plan Amendment were adopted.

As a participant in a technical advisory committee and the watershed council for the North Bay Watershed Association (NBWA), and with recognition of similar water quality impairments and project needs across the North Bay, NCRCD partnered through NBWA with other North Bay entities to apply for grant funds to implement TMDL actions in Napa, Sonoma, and Marin counties. Project partners including NBWA, Marin County, Sonoma Ecology Center, and Sonoma RCD (formerly Southern Sonoma RCD) were successful in a Bay Area-wide grant request submitted by San Francisco Estuary Partnership (SFEP) to U.S. EPA for San Francisco Bay Water Quality Improvement Program funds. The North Bay project partners entered into contract for a project entitled “Implementing TMDLs in the North Bay” (Project) with Marin Municipal Water District (MMWD) as the administrative lead and SFEP as the contract manager.

NCRCD’s role in the Project is to carry out TMDL implementation actions in the Napa River watershed and to coordinate and share information with the other North Bay partners. Required actions identified in the Sediment and Pathogens TMDL and specific monitoring targets in the Sediment TMDL heavily influenced the initial scope of work for NCRCD. Subsequent amendments to the scope of work eliminated a task associated with the pathogens TMDL and replaced it with a task identified as a priority by the Water Board, farm water quality planning for vineyards, which address a variety of potential water quality concerns.

## **C) TASK INFORMATION**

### ***Project Management and Reporting (Task 2.1)***

NCRCD provided project coordination in the Napa River watershed, produced timely reports, invoices, and deliverables, and coordinated project implementation and amendments with NBWA, MMWD, SFEP and EPA.

### ***Develop Monitoring Protocols, including QAPP (Task 2.2)***

NCRCD prepared two Quality Assurance Project Plans as part of this Project. “Rural Road Erosion Reduction in the Heath Canyon Watershed” was approved in April 2011 to document project implementation and sediment reduction best management practices that were implemented in the Heath Canyon watershed as part of this project. “The Napa River Sediment Total Maximum Daily Load (TMDL) Monitoring Program” was approved in August 2012 establishing protocol for streambed scour and permeability monitoring in the Napa River watershed that was conducted as part of this project.

### ***Permitting (Task 2.3)***

Environmental review and permitting for implementation of the road erosion reduction project that was implemented in the Heath Canyon watershed with partial funding from this project was completed in 2011 by the California Department of Fish and Wildlife Fisheries Restoration Grant Program with input from NCRCD. Additional permitting assistance for subsequent road erosion reduction projects that were identified as a result of this project was provided to project participants.

### ***Implement Sediment TMDL in the Napa River Watershed (Task 2.4)***

Outreach: NCRCD staff presented "low impact road" workshops to the Napa Sustainable Winegrowing Group and the Napa Engineers Association to discuss the impacts of unpaved roads and various practices to reduce the risk of erosion. In addition, NCRCD held two trainings specifically for heavy-equipment operators that work on unpaved roads. 23 individuals, including operators and one Regional Water Board staff person, attended the heavy-equipment operator trainings and feedback was excellent. Subsequent similar trainings, with alternative sources of funding, have been held as a result of the positive feedback. The intended outcome of such trainings is to increase the capacity of local equipment operators to implement long-lasting road improvements that reduce erosion and sediment delivery. NCRCD also worked with Marin Municipal Water District staff to host a 1/2-day rural road training for Regional Water Board staff and other public agency personnel in the region. The workshop was held in May 2014 with participants from Napa, Sonoma and Marin Counties. It was well received and provided an opportunity for the various organizations to meet in the field and improve the collective understanding of road systems and management practices to reduce risk of erosion.

Technical Assistance: NCRCD staff provided technical assistance to several private and public landowners in priority tributaries to discuss the impact of erosion from unpaved roads and assessment best management practices that could be implemented to reduce erosion risk. Ultimately, over 36 miles of unpaved road were assessed with funding from this project. Several participating landowners implemented recommended practices immediately and with their own funding. Other landowners partnered with NCRCD on an additional grant proposal that was successful and will be implementing practices over the next two years.

Sediment Reduction: A road erosion reduction project was implemented in the Heath Canyon sub-watershed with partial funding from this project. As a result, 4.751 miles of road in the Heath/Sulphur Creek watershed were storm-proofed, 47 critical sediment delivery sites were treated to reduce sediment delivery to waterways (35 stream crossings, 9 ditch relief culverts, and 3 road surface discharge points). The estimated long term sediment savings as a result of treating the roads is 1,440 cubic yards of sediment for the

47 sites and an estimated 4,605 cubic yards per decade for the treated road, ditch and cutbank surfaces.

***Develop and Implement LandSmart® for Vineyards in the Napa River Watershed (Task 2.5 as modified effective May 1, 2014)***

LandSmart® Program Development: NCRCD worked with Sonoma RCD, Natural Resources Conservation Service (NRCS), Water Board, and vineyard managers to complete a LandSmart® Conservation Plan template for vineyard water quality. A companion resource manual and general program structure was also developed. Elements of the vineyard farm plan template include: property description, map summary, managing agrichemicals, managing erosion in the vineyard, managing waterways, managing roads and crossings, water management, photo monitoring, implementation tracking.

LandSmart® Vineyard Workshops and Conservation Plans: NCRCD staff assisted Sonoma RCD with implementation of a LandSmart® workshop series in Sonoma Valley in July and August, 2014. A LandSmart® workshop series includes three workshops to assist participating growers in completing a farm water quality plan for their vineyard property. Two in-class sessions are held and one field class is held. Technical assistance is provided during the workshops and after the workshops as needed to complete farm plans. NCRCD held a LandSmart® workshop series in the Napa River watershed in February and March, 2015. 30 individuals registered for the workshop series (20 vineyard managers and 10 partner/interested organizations). Over 1,400 acres were enrolled in LandSmart® through this first workshop series and many managers expressed interest in completing plans for multiple properties. In anticipation of a regulatory program currently being developed by the Water Board, there is increased interest LandSmart® and we have started a waiting list for future workshops.

Project Implementation: NCRCD staff worked with a property owner to acquire access and permission to remove a fish passage barrier on Murphy Creek in the Napa River watershed (Tulucay tributary). In September 2012, in a collaborative effort between RCD and Napa County Flood Control and Water Conservation District, the fish passage barrier was removed. Approximately 633 linear feet of high quality habitat was made available to steelhead and approximately 5 cubic yards of fine sediment were removed from the system. In August and September 2013, RCD staff provided oversight for three stormwater runoff management practices being conducted by participating landowners. Approximately 0.75 miles of road, a sediment basin, and a drop inlet structure were maintained, consistent with RCD recommendations and best management practices, to reduce delivery of fine sediments to local waterways. NCRCD staff continues to work with this particular land manager and his staff is now proficient at implementing road shaping practices to reduce erosion. This land manager will effectively take what he and his staff have learned and apply the practices to other properties in the watershed. In addition, NCRCD assisted

this landowner in acquiring a CDFW 1600 permit to replace an undersized culvert on the property. The property was utilized for the field portion of the LandSmart workshop series that was held in Napa in 2015.

***Local and Regional Capacity Building (Task 2.6):***

NCRCDC participated and presented at several meetings of local and regional stakeholders regarding this project and regarding TMDLs and their implementation in the Napa River watershed. These included 6 project related meetings with NBWA Board or Committees, 2 project related meetings with the Watershed Information Center and Conservancy Board of Napa County (now named Watershed Information and Conservation Council), a TMDL implementation presentation at the State of the Estuary Conference in 2013, a TMDL implementation presentation and tour for Water Board Directors (held in the Napa Valley in 2014), and a variety of coordination and collaboration meetings with staff from Water Board, EPA, SFEP, and other project partners regarding TMDL specific topics and general project implementation.

***Project Evaluation / Watershed Monitoring (Task 2.7)***

NCRCDC conducted streambed scour and permeability monitoring in the Napa River and its tributaries according to the adopted QAPP. This project contributed to two years of monitoring and the results are being incorporated into another EPA funded project in the Napa River watershed: TMDL Implementation Tracking and Accounting System (ITAS).

**D) PROJECT EXECUTION AND METHODS**

The bulk of this project was carried out under the broad interconnected (and non-linear) categories of:

- Outreach and Technical Assistance,
- Regional Capacity Building,
- Pollution Reduction and Project Implementation, and
- Watershed Monitoring for TMDL Targets.

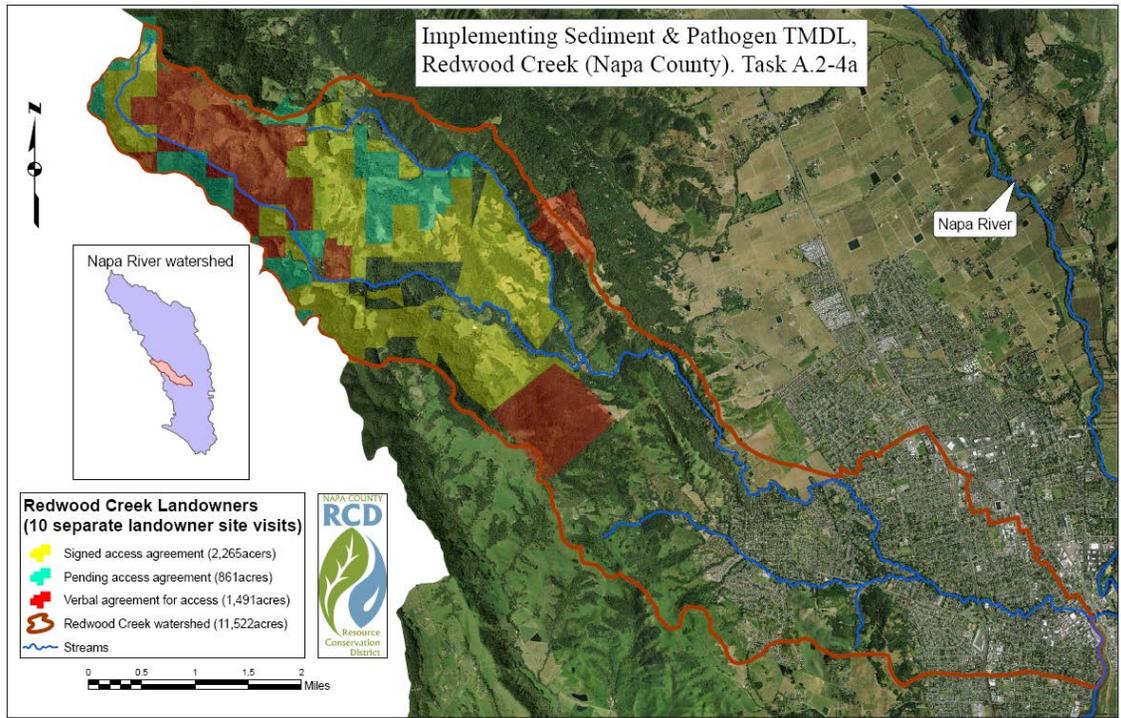
Necessary actions, such as project administration, use of existing watershed assessments and priorities to focus our efforts, quality assurance project plans, environmental review, and permitting were conducted and they supported the broader categories of actions that were used to carry out the project and promote TMDL implementation in the Napa River watershed. This section of the report will focus on the broader categories as our methodology for project execution in recognition that the process of execution was not linear and that we were working simultaneously on many of these.

**Outreach and Technical Assistance**

Outreach and technical assistance that NCRCD provided under this project primarily focused on offering specific technical assistance to provide assessments and plans to reduce sediment erosion from unpaved roads.

Our methodology for selecting a targeted area to focus our outreach and technical assistance to reduce sediment erosion from unpaved roads was based upon a pre-existing analysis that merged a watershed-wide erosion hazard index with known anadromous fish locations and watersheds with relatively high quality fish habitat. As a result, we selected to target our outreach and technical assistance under this project to landowners in the Redwood Creek watershed, a watershed on the west side of the valley with relatively high risk for erosion (based primarily on precipitation, slope, and soil type) that supports threatened steelhead with relatively high-quality habitat. Once selected, we focused our outreach and technical assistance efforts related to road assessment and planning to the upper Redwood Creek watershed and ultimately were very successful in recruiting interested landowners gaining written and verbal access to over 3,750 acres (approximately 75% of the upper watershed). Figure 1 shows the distribution of property access that was obtained in the Redwood Creek watershed.

Figure 1: Property Access for Road Assessment and Planning in the Redwood Creek Watershed



Road assessments were largely completed between January and September, 2013. Assessments were conducted and recommended practices were made following California Department of Fish and Wildlife protocol. A summary of assessment and recommendation data is presented in Table 1 and Table 2, respectively.

Table 1: Summary of Road Erosion Assessment Results for Redwood Creek Watershed

Summary results	Total
Total miles of road assessed	30.8
Miles of road connected to the stream system	12.3
Number of sites identified	84 (44 stream crossings, 36 road surface runoff locations, 2 landslides, 1 gully, 1 bank erosion)
Volume of episodic erosion <sup>1</sup>	1,578yd <sup>3</sup>
Volume of chronic erosion <sup>2</sup>	24,082yd <sup>3</sup>
Total future erosion volume	25,660yd <sup>3</sup>
<sup>1</sup> <u>Episodic erosion</u> occurs when soils fail in response to storm events or other triggers. The erosion may occur once, or in pulses over an indeterminate time period. Stream crossing washouts, road-related landslides, and gullying are examples of episodic erosional features.	
<sup>2</sup> <u>Chronic erosion</u> is sediment production from road surfaces and cutbanks during storm events that produce runoff. This is erosional process is termed chronic because it occurs annually. Chronic erosion is calculated by taking the connected road length and multiplying that by a global width and surface lowering rate. Unpaved road surfaces assume a 25' wide road prism and cutbank contribution area, and 0.4' of road/cutbank surface lowering over two decades. Paved road surfaces assume an 8' average cutbank and ditch contribution area, and 0.4' surface lowering rate over two decades.	

Table 2: Summary of practices recommended to treat erosion sites and road surfaces that are directly connected to Redwood Creek stream system.

Recommended Road Treatments	Quantity
Construct rolling dip to drain road surface	249
Construct waterbar	257
Construct a critical dip	14
Replace culvert at stream crossing	20
Replace culvert at pond outlet	1
Install single post trash rack above culvert inlet.	26
Clean drop inlet or install level spreader to dissipate outlet flows	3

Additional, less formal technical assistance was also provided to Napa County Regional Park and Open Space District (Open Space District) under this project. At the request of the Open Space District, NCRCD staff conducted 'rapid assessments' of approximately 3.2 miles of a trail-use road in the Garnett Creek watershed, east of the City of Calistoga. The assessment was requested to help the Open Space District identify high-priority erosion sites. NCRCD staff identified 12 stream crossings diverting flow down the road surface and causing chronic erosion as well as gullying of the hillside below. NCRCD staff advised the Open Space District on possible improvements and subsequently assisted them in selecting sites for some treatments.

Some of the recommendations made during this project were implemented immediately and are discussed below. Other recommendations were not implemented during the timeframe of this project but are included for implementation in a pending project that will be implemented in the next three years.

### ***Regional and Local Capacity Building***

Regional and local capacity building included a wide variety of activities from informal input regarding TMDL implementation to formal development of an interagency structure to implement a regional conservation program, LandSmart®, in Napa Sonoma, and Mendocino Counties.

Over the course of the project, technical trainings/presentations were provided to heavy equipment operators, Napa Engineers Association, Napa Sustainable Winegrowing Group, and a regional inter-agency group of staff interested in erosion from unpaved roads. More general and informational presentations and tours were given at the State of the Estuary Conference in 2013 and at a tour of Water Board directors that was held in the Napa Valley in early 2014. Project update presentations and partner meetings were held throughout the course of the project with NBWA, WICC, and project partners. TMDL program input was provided as requested to Water Board staff and a variety of stakeholder groups in the Napa River watershed. Materials and presentations from these efforts were provided with bi-annual reports as required. Results from these capacity building efforts are anticipated to lead to improved project implementation, a better regional understanding of TMDL implementation actions and implications, and improved communication among a variety of agency staff and stakeholders that are engaged in TMDL implementation.

One of the most significant outcomes of the capacity building task was development of the LandSmart® program in Sonoma, Napa, and Mendocino counties. The LandSmart® program is developed to address a number of conservation priorities, including farm plan development and project implementation to meet the anticipated needs of developing TMDL and clean water regulatory programs. Capacity building from this project resulted in a memorandum of understanding (MOU) regarding LandSmart® implementation between four RCDs and a formal agreement on implementation of LandSmart® in Napa County between NCRCD and the local Natural Resources Conservation Service (NRCS). The formalized MOU between the RCDs ensures consistent program implementation and sharing of information across the region and provides for program efficiencies (e.g., sharing of staff, website, program development, program marketing, etc.). While only a small portion of Project funds were used to support this effort, the results will be long lasting and positive.

### ***Pollution Reduction and Project Implementation***

The major pollution reduction project that was implemented with partial funds from this Project was planned and permitted prior to Project initiation. It included major upgrades and storm-proofing of 4.71 miles of unpaved road in the Heath Canyon watershed. Additional project implementation included improvements along roads in the Redwood Creek watershed that were assessed as part of this Project and removal of a fish passage barrier and associated fine-sediment build up.

#### Heath Canyon Road Improvements

Sulphur Creek is an approximately 9.5 mi<sup>2</sup> tributary watershed to the Napa River located in Napa County on the western side of the Napa Valley in the Mayacamas Mountain Range. Sulphur Creek contains approximately 24 miles of blue-line streams and tributaries. The watershed contains the 2.9 mi<sup>2</sup> Heath Creek sub-basin that drains through the town of Saint Helena. The watershed supports threatened anadromous steelhead and has been identified as a priority watershed for implementation of sediment reduction projects that will result in improved water quality for the fisheries population.

NCRCD along with Pacific Watershed Associates Inc. (PWA) completed project design and layout, and supervised heavy equipment operations, to implement road related erosion control and erosion prevention treatments in the Heath Creek watershed as part of a more comprehensive project that treated similar road erosion sites throughout the Sulphur Creek and Carneros Creek watersheds. The work plan addressed treatment sites previously assessed in 2002 as having high or high-moderate treatment immediacies, as well as all lengths of hydrologically connected road.

A detailed report summarizing the work completed in the Heath Canyon watershed in 2011 with funds from this Project and the California Department of Fish and Wildlife (formerly California Department of Fish and Game) is included as appendix to this report and was submitted in April, 2012. All erosion control and erosion prevention treatments implemented for this project followed guidelines described in the *Handbook for Forest and Ranch Roads* (Weaver and Hagans, 1994), as well as CDFG's *Salmonid Stream Habitat Restoration Manual*, Parts IX and X (Taylor and Love, 2003; Weaver et al., 2006). Implementation results and Typical Drawings of treatment procedures are provided in the detailed report.

Sediment reduction treatments for Heath Creek occurred along approximately 4.71 miles of road with work being completed between July-September 2011. A total of 47 sites were treated, including 35 stream crossings, 9 ditch relief culverts, and 3 road surface discharge points (Table 3). The goal of the project was to implement well-established erosion control

and prevention techniques in order to minimize the impact of road related sediment to anadromous fish-bearing tributaries of the Napa River.

Table 3. Number of sites and lengths of road treated to reduce sediment delivery (Heath Creek)

Site type	Sites treated (#)	Hydrologically connected road segments treated <sup>a</sup> (mi)
<b>Sulphur Creek watershed (Heath Creek)</b>		
Stream crossings	35	2.56
Ditch relief culvert	9	0.98
Road surface discharge point	3	0.33
Locations treated for road drainage only <sup>b</sup>	-	0.84
<b>Total for the entire project</b>	<b>47</b>	<b>4.71</b>

<sup>a</sup>Hydrologically connected road segments refer to lengths of road adjacent to the treatment sites that are funneling sediment to the sites and into the stream system.

<sup>b</sup>Includes 11 stable stream crossings.

NCRCD estimates that treating the 47 sites and 4.71 mi of road in the watershed will substantially diminish the delivery of coarse and fine sediment to the stream system, including approximately 1,440 yd<sup>3</sup> of sediment projected to originate from episodic erosion at individual sites and approximately 4,605 yd<sup>3</sup> of fine sediment estimated to originate from the chronic erosion of road, ditch, and cutbank surfaces during the next decade alone (Table 4).

Table 4. Estimated sediment savings for treated sites and hydrologically connected road reaches (Heath Creek).

Sediment sources	Estimated sediment savings (yd <sup>3</sup> )	Percent of total
<b>Sulphur Creek watershed (Heath Creek)</b>		
Episodic sediment delivery from road related erosion sites (indeterminate time period)		
Stream crossings	1,160	81%
Ditch relief culvert	250	17%
Road surface discharge point	30	2%
<i>Subtotal</i>	1,440	100%
Chronic sediment delivery from road surface erosion (estimated for a 10 yr period) <sup>a</sup>		
<i>Subtotal</i>	4,605	
<b>Total sediment savings</b>	<b>6,045</b>	

<sup>a</sup>Sediment delivery for rocked and native surface roads is calculated for a 10 yr period. It assumes a combined width of 25 ft for the road, ditch, and cutbank contributing area, and 0.2 ft lowering of road and retreat of cutbank surfaces per decade based on field analyses.

#### Redwood Creek Road Improvements

Based upon the assessments described above, NCRCD worked with a single land manager to stormproof 0.75 miles of road by installing 19 recommended rolling dips, resulting in an estimated sediment savings of 1,447 cubic yards. NCRCD provided training to and construction oversight of the crews installing the rolling dips. The crews are now trained and the land manager continues, as time and budget permit, to install additional rolling dips that result in additional sediment savings. NCRCD also worked with the land manager to apply for a 1600 permit from the California Department of Fish and Wildlife to remove five existing culverts and replace them with upgraded and properly sized culverts with trash racks. The permit was issued and the land manager anticipates that the improvements will be made in the next year.

The image below shows land manager crews installing a rolling dip.



### Fish Barrier Removal

Historically, short concrete weirs were often built in creeks to impound water and create pools for water diversion and recreation. Though they are no longer in use for their original purpose, these structures often remain in place and present major obstacles to fish passage, change the process of sediment storage and movement, and may influence localized flooding.

Murphy Creek is a tributary to Tulucay Creek, which flows into the Napa River. Murphy Creek maintains perennial flows, and because of this, it supports favorable steelhead trout spawning areas throughout much of its length. In September of 2007, during a Murphy Creek stream inventory conducted by NCRCD, two weirs in Murphy Creek were identified as barriers to fish passage. These barriers were located approximately 1-mile upstream of the confluence of Tulucay and Murphy Creeks. The weirs were categorized to be severe (possibly complete) barriers to both adult and juvenile steelhead due to excessive height and insufficient jump pool depth.

In July and August, 2012 with funding from this Project, NCRCD staff worked with the property owner to gain access and to get approval for removal of the weirs. In mid-

September 2012, NCRC and the Napa County Flood Control and Water Conservation District partnered with the property owner and removed the two concrete weirs with funding provided by the Flood Control District. Removal of these weirs re-opened 633 feet of high quality stream habitat for steelhead spawning and rearing. In addition, approximately 5 cubic yards of fine sediment was removed from the stream.

Project images are provided below.



***Before:*** September, 2012. Two weirs on Murphy Creek in the Napa River watershed. These weirs were acting as a fish passage barrier, altering the natural movement of sediment, and potentially influencing localized flooding.



*After: September, 2012. Post removal of the two weirs on Murphy Creek in the Napa River watershed. Approximately 633 linear feet of high quality habitat was made available to threatened steelhead for spawning and rearing and approximately 5 cubic yards of fine sediment was removed from the stream.*

### ***Watershed Monitoring for TMDL Targets***

A Quality Assurance Project Plan (QAPP) was prepared for streambed scour and gravel permeability monitoring in the Napa River watershed consistent with the targets identified in the Sediment TMDL. The QAPP was prepared with funds from another project and utilized in this project to direct a pilot monitoring effort. Results from the pilot monitoring effort yielded data related to streambed scour and permeability, but perhaps more importantly it yielded feasible protocols to guide these monitoring activities into the future. The protocols are included as an appendix to this final report. A summary of the methods used and results from the pilot program are summarized below.

### **Streambed Scour Monitoring**

In fall 2012, 40 scour chains were installed in four mainstem Napa River study reaches and left in place through the 2012/13 winter season. The chains were constructed of a 1-meter length of heavy steel chain with 1-inch (2.5cm) links attached to a duckbill anchoring system at the bottom to hold them in place. A tag and fluorescent cord were attached to the free end of the chain. The chains were driven into the streambed using a driving rod and sledge hammer. The exact location and exposed length of chain were noted and documented with photographs and GPS coordinates.

The first effort to retrieve scour chains occurred in January 2013, at which time only 17 of the original 40 scour chains were able to be found, due primarily to the poor visibility encountered under high streamflow conditions. This initial monitoring period included the flow of record for water year 2013: 9,690 cfs near St. Helena and 13,100 cfs near Napa. The recovered chains were measured and reset following their initial retrieval. Subsequent efforts to retrieve scour chains at all sites under lower flow conditions, and aided by use of a metal detector, occurred in May 2013. A total of 20 of the original 40 scour chains, or 50%, were located during the second retrieval period, five of which were chains not found during the initial retrieval effort. The exposed length of each scour chain retrieved was recorded for comparison with the exposed length when installed, for calculation of the amount of scour or deposition that occurred while the chain was in place.

In January 2014, a total of 30 chains were set, including four from the pilot study and an additional 26 new chains. NCRCD was able to retrieve 15 of the 30 chains, or 50%, in June 2015. Results of both scour chain studies are presented in Table 5. These studies were conducted to test and refine the field methodology and the results are not intended to gauge compliance with the Napa River sediment TMDL.

Table 5. Scour chain monitoring results.

Monitoring Reach	Reach Average Scour (cm)			
	Monitoring Period 1 <sup>1</sup>	Monitoring Period 2 <sup>2</sup>	Monitoring Period 3 <sup>3</sup>	Monitoring Period 4 <sup>4</sup>
Napa River near Calistoga	8	2	7	2
Napa River near St. Helena	1	0	0	2
Napa River – Rutherford North	5	1	0	8
Napa River – Rutherford South	9*	5*	not measured	not measured

<sup>1</sup> 11/27/2014 – 1/10/2013, Max flow of 9,690 cfs (~5yr return interval) at USGS streamgage at Pope St., St. Helena

<sup>2</sup> 1/11/2013 – 5/21/2013, No significant flow events

<sup>3</sup> 2/20/2014 – 2/4/2015, Max flow of 7,670 cfs (2-5 yr return interval) at USGS streamgage at Pope St., St. Helena

<sup>4</sup> 2/5/2015 – 7/31/2015, Max flow of 1,500 cfs (~0.5 yr return interval) at USGS streamgage at Pope St., St. Helena

\* Only 1 of 10 chains was recovered at this site, therefore this value represents a single measurement and not an average.

There were two main challenges encountered during scour chain monitoring:

1. Successful retrieval of the chains following the high-flow season
2. Accurate measurement of chain lengths to quantify bed scour and deposition

Extensive effort was put into re-locating and attempting to excavate lost chains using a variety of methods (e.g. metal detector, hand digging, etc.), yet, ultimately, only half of the original scour chains were found in both sampling years. In an effort to address this challenge, NCRCD developed several strategies to improve chain recovery during future studies – these include making detailed site sketches of each monitoring site, recording distances from both bank pins to triangulate the exact original location of each chain, installing tall bank pins that are less likely to be dislodged or lost during high flows, and attaching rare-earth magnets to each chain to improve the signal provided to a magnetometer during search efforts. The NCRCD produced a detailed field protocol with all of these recommendations for use in future studies.

Scour chains proved difficult to measure precisely, due primarily to their relatively large link size (2.5 cm in these studies) and tendency to become encrusted with corrosion and sediment. To address this challenge, NCRCD experimented with attaching a small plastic cable-tie to the last link in the chain on the streambed surface to mark the original installation depth. Once this link was known, the field crew could clean off the chain to that point and compare the original measurement to the field observation. This technique worked well, although it was determined that the margin of error for these measurements appeared to be approximately one chain link, which in the case of these study was +/- 2.5 cm. The scour protocol developed for future monitoring also prescribes using a graduated rod and board to more accurately measure deposition depth on top of each chain.



*Streambed scour monitoring in the Napa River.*

### Gravel Permeability Monitoring

Each of the study reaches contained five sampling sites established as cross-sections with installed survey pins on the right and left banks. The purpose of the cross-sections was to provide a means to re-locate sites for future monitoring. Four artificial redds were manually constructed at each site to simulate spawning activity prior to measuring permeability. The permeability standpipe was driven into each artificial redd until the perforations were between 10-20cm below the bed surface.

Permeability, or input flow, was measured using a permeometer consisting of a portable vacuum pump powered by a 12 volt rechargeable battery to siphon water out of the standpipe to maintain the water level inside the standpipe exactly one inch lower than the surrounding water. The recharge rate of the water level in the standpipe through the perforations under a standard one-inch pressure head was determined by measuring the volume of water siphoned out of the standpipe over a measured time interval. Water temperature was also recorded at each site. At each standpipe drive location, five or six replicate draws of the permeometer were taken for a total of 407 mainstem and 402 tributary measurements in the 2012/13 water year, and 82 mainstem and 204 measurements in the 2014/15 water year.

The recharge rate (units of volume per time) measured in the field was converted into permeability (units of length per time) using an empirically derived rating table and adjusted with a correction factor that accounts for temperature-related changes in water viscosity that can affect permeability results. The median permeability value for the five replicate measurements at each artificial redd was calculated and used as the representative redd permeability value. Reach median permeability values were then derived from the representative redd values (Table 6).

It is worth noting that permeability values collected during the 2014/15 sampling year were significantly higher (i.e. better) than results from the same locations in 2012/13. This was likely caused by a subtle change in the field technique during the 2014/15 season that appeared to skew the results heavily. Specifically, the permeability method described in the Napa River Sediment TMDL Monitoring Plan provides a range of driving depths (10-20 cm) when installing the standpipe in the streambed. During the 2014/15 sampling round, field crews consistently used the shallower end (~10cm deep) of this range. Given the apparent difference this caused in the results, it appears that the method is highly sensitive to driving depth. Therefore, establishing a standard driving depth and using it consistently in all future monitoring efforts is the only way to ensure comparability amongst sampling years and examine trends over time.

As with scour, these studies were conducted to test and refine the field methodology and the results are not intended to gauge compliance with the Napa River sediment TMDL.

Table 6. Gravel permeability monitoring results

Monitoring Reach	Reach Median Permeability (cm/hr)	
	2012/13	2014/15
Napa River near Calistoga	2,960	-
Napa River near St. Helena	1,388	6,459
Napa River – Rutherford North	2,455	-
Napa River – Rutherford South	8,538	-
York Creek	6,394	17,610
Sulphur Creek	7,970	24,151
Ritchey Creek	11,936	-
Carneros Creek	2,162	-



*Gravel Permeability monitoring in Napa River (left) and Sulphur Creek (right).*

### III. PROJECT EVALUATION

#### A) OUTPUTS AND OUTCOMES

Task Description	Outputs / Deliverables	Outcomes
2.1. Project Administration	<ul style="list-style-type: none"> <li>• Monthly reports and invoices to MMWD</li> <li>• Bi-annual reporting to SFEP</li> <li>• Project progress tours with SFEP</li> <li>• Final project reporting</li> </ul>	<ul style="list-style-type: none"> <li>• NBWA, SFEP, and EPA kept informed about project progress</li> <li>• SFEP able to effectively administer project and communicate project progress and needs to EPA</li> </ul>
2.2. Develop Monitoring Protocols, including QAPP	<ul style="list-style-type: none"> <li>• QAPP developed for Heath Canyon Road project.</li> <li>• QAPP developed for streambed scour and gravel permeability monitoring pilot program.</li> <li>• Monitoring protocol prepared for streambed scour and gravel permeability</li> </ul>	<ul style="list-style-type: none"> <li>• Implementation of Heath Canyon Road project was photodocumented in a consistent manner.</li> <li>• Pilot streambed scour and gravel permeability monitoring was conducted consistently. Opportunities for improvement were documented and resulted in a more informed protocol for both monitoring efforts.</li> <li>• Monitoring protocol provides consistent and feasible method to carry out monitoring into the future.</li> </ul>
2.3. Permitting	<ul style="list-style-type: none"> <li>• CDFW Regional General Permit and Environmental Review were provided for Heath Canyon Road project.</li> <li>• 1600 permit for road improvements that resulted from technical assistance provided under this project were issued.</li> </ul>	<ul style="list-style-type: none"> <li>• Heath Canyon Road project was permitted to proceed and be implemented.</li> <li>• Road erosion reduction projects in Redwood Creek watershed are permitted to proceed in the future (beyond the timeframe of this project).</li> </ul>
2.4. Implement Sediment TMDL in Napa River Watershed		
Educational and Technical Workshops	<ul style="list-style-type: none"> <li>• 2 classroom style technical workshops were held with practitioners (engineers, vineyard managers)</li> <li>• 3 field workshops were held with practitioners (1 regional interagency workshop and 2 heavy equipment operator trainings)</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers and vineyard managers become familiar with the impact of unpaved roads to water quality, methods by which roads can be assessed, and common management practices to “stormproof” roads (e.g., minimize erosion risk and potential).</li> <li>• Heavy equipment operators became familiar with the impact of unpaved roads to water quality and learned practical skills to use when working on roads to implement best management practices. They also became aware of typical drawings for common practices and where those (and other) reference materials could be found on the NCRCD website.</li> </ul>

<p>Technical Assistance to Landowners / Managers</p>	<ul style="list-style-type: none"> <li>• Targeted outreach to landowners in Redwood Creek Watershed and resulting map of interested parties</li> <li>• Over 30 miles of road assessed and recommendations provided to landowners / managers in the Redwood Creek watershed</li> <li>• A small amount of mileage assessed and recommendations made in other watersheds where land managers expressed interest in implementing projects independent of grant funds.</li> </ul>	<ul style="list-style-type: none"> <li>• Land manager in Redwood Creek watershed implemented recommendations related to road surface erosion and worked with NCRCD to get a permit to address stream crossing recommendations. Over 1,400 yd<sup>3</sup> of estimated “sediment savings.”</li> <li>• Additional landowners in Redwood Creek are interested in partnering to implement recommendations and may be provided an opportunity to do so with a grant that NCRCD recently received.</li> <li>• Land Trust of Napa County and Napa County Regional Parks and Open Space District implemented small road surface improvement projects (e.g., rolling dip installations).</li> </ul>
<p>Reduce Sediment and Stormwater Runoff</p>	<ul style="list-style-type: none"> <li>• 4.71 miles of unpaved road “stormproofed” in the Heath Canyon watershed (i.e., surface treatments for chronic erosion sources)</li> <li>• 35 streamcrossing treatments</li> <li>• 9 ditch relief culvert treatments</li> <li>• 3 road surface discharge point treatments</li> </ul>	<ul style="list-style-type: none"> <li>• Potential sediment transport to waterways decreased by 6,045 yd<sup>3</sup>.</li> <li>• Establishment of a good demonstration site for field workshops.</li> <li>• Road drivability and safety improved.</li> </ul>
<p>2.5. Develop and Implement LandSmart® for Vineyards in the Napa River Watershed</p>		
<p>Develop LandSmart® Farm Water Quality Plan Template, Resource Binder, and Workshop Series</p>	<ul style="list-style-type: none"> <li>• Review conditional waiver of waste discharge for vineyards in Napa River and Sonoma Creek watersheds.</li> <li>• Draft major LandSmart® Farm Water Quality Plan elements with Sonoma RCD.</li> <li>• Discussions with Sonoma RCD and Water Board staff familiar with the vineyard regulatory program being worked on by Water Board (subsequent to them abandoning the waiver of waste discharge program.</li> <li>• Complete final draft of LandSmart® Water Quality Plan Template for vineyards.</li> <li>• Meet with vineyard industry organizations to talk about template and program structure and potential use for regulatory compliance.</li> <li>• Finalize LandSmart® Farm Plan template and program, make the</li> </ul>	<ul style="list-style-type: none"> <li>• LandSmart® template anticipated to meet regulatory requirements of Water Board.</li> <li>• Water Board familiar with elements of the farm plan and supportive of template and program.</li> <li>• “Optional” LandSmart® elements available to encourage conservation beyond water quality regulations.</li> <li>• Template and Resource Binder widely available on-line for all potential users (landsmart.org).</li> <li>• Napa industry stakeholder groups (Farm Bureau, Grapegrowers, Winegrowers, and Vintners) interested in utilizing and supporting LandSmart® program, particularly once Water Board regulations are adopted.</li> <li>• A program to assist growers and Water Board with TMDL compliance/implementation is ready, has been piloted, and is</li> </ul>

	<p>template available to growers in a variety of ways.</p> <ul style="list-style-type: none"> <li>• Revise final draft of LandSmart® Template and add “optional” elements.</li> </ul>	<p>broadly available (open source) once Water Board adopts final regulations.</p>
<p>Hold LandSmart® Farm Plan Workshop Series and Assist with Completion of Farm Plans</p>	<ul style="list-style-type: none"> <li>• NCRCD assisted Sonoma RCD with the first LandSmart Workshop Series in July and August, 2014 <ul style="list-style-type: none"> <li>— Two classroom presentations and one field day.</li> <li>— Powerpoint presentations</li> <li>— Maps and resources</li> </ul> </li> <li>• NCRCD held a LandSmart® Workshop Series in February and March, 2015 (similar to above with slight modifications to presentations based on lessons-learned) <ul style="list-style-type: none"> <li>— 20 vineyard managers (properties) enrolled, representing over 1,400 acres.</li> <li>— 10 interested organizations attended</li> </ul> </li> <li>• NCRCD offered technical assistance to complete plans</li> </ul>	<ul style="list-style-type: none"> <li>• Workshops in Sonoma and Napa were well received and growers indicated that they found the workshops helpful.</li> <li>• Growers in Napa started working on their farm plans and many have indicated that they intend to use the template from multiple properties.</li> <li>• Discussion with some participating growers and industry groups leads us to believe that they would like to wait to complete the plans until they know regulatory requirements.</li> <li>• NCRCD will make some minor changes to the workshop series based upon experience and feedback.</li> <li>• LandSmart® is now being contemplated as a pathway to “Napa Green” Certification (currently only one program path exists).</li> </ul>
<p>Reduce Stormwater Runoff and Pollutants from Agricultural Vineyard Land.</p>	<ul style="list-style-type: none"> <li>• NCRCD provided construction training and oversight to land manager and crews installing 19 rolling dips on unpaved road on vineyard property in the Redwood Creek watershed.</li> <li>• A sediment basin was maintained to restore capacity and ensure proper function.</li> <li>• Partnership was built with Napa County Flood Control and Water Conservation District to partner on small-scale restoration projects.</li> <li>• An in-channel structure and the sediment that had accumulated behind it was removed from a local tributary.</li> </ul>	<ul style="list-style-type: none"> <li>• 0.75 miles of unpaved road were stormproofed and potential sediment deliver to Redwood Creek was reduced by 1,447 yd<sup>3</sup>.</li> <li>• Likelihood of failure of a sediment basin that had reached capacity was significantly reduced.</li> <li>• 5 yd<sup>3</sup> of fine sediment that had built up behind an instream structure was removed from a tributary creek.</li> <li>• 633 feet of high quality fish habitat was made available to threatened steelhead.</li> <li>• Successful partnership with Napa County Flood Control and Water Conservation District is yielding additional opportunities to effectively and efficiently work together to implement small-scale restoration projects.</li> </ul>
<p>Local and Regional Capacity Building</p>	<ul style="list-style-type: none"> <li>• Meetings between Sonoma RCD, Gold Ridge RCD, Mendocino RCD and NCRCD to build capacity offer a regional conservation program, LandSmart® (includes several</li> </ul>	<ul style="list-style-type: none"> <li>• MOU developed for long-term relationship between RCDs allowing for joint and consistent program implementation, shared website, staff sharing, collaborative grant</li> </ul>

	<p>program elements, not just planning).</p> <ul style="list-style-type: none"> <li>Over 10 meetings where project specific and TMDL implementation information was shared with elected officials (WICC and NBWA meetings, State of the Estuary Conference, Water Board tour).</li> </ul>	<p>writing, and effective and efficient conservation program delivery.</p> <ul style="list-style-type: none"> <li>Improved understanding about status of TMDL implementation in the Napa River – status of implementation efforts and status of vineyard regulatory program.</li> </ul>
Watershed Monitoring / Project Evaluation	<ul style="list-style-type: none"> <li>Two years of pilot monitoring program for streambed scour and gravel permeability implemented</li> <li>Data from monitoring collected and analyzed</li> <li>Monitoring protocol for streambed scour and gravel permeability refined</li> </ul>	<ul style="list-style-type: none"> <li>Better understanding about the benefits and drawbacks of monitoring streambed scour and permeability (NCRCD, Water Board and consulting scientists).</li> <li>An improved monitoring protocol for TMDL targets that can more feasibly be implemented into the future.</li> <li>Incorporation of TMDL targets into a TMDL Information Tracking and Accounting System (ITAS).</li> </ul>

## B) LESSONS LEARNED AND PROJECT IMPLICATIONS

### *Outreach and Technical Assistance*

- The heavy-equipment operator trainings (and resources available on-line) were very well received. The trainings were attended by public and private heavy equipment operators that work on paved and unpaved roads and there is a general sense that operators who go through the training will be better equipped to implement conservation-minded practices during the course of their work. The positive impact of working directly with equipment operators was confirmed when we worked directly with crews working on private property and saw their skills and understanding develop over the course of implementation and be translated to other crew members by the crew lead. Water Board staff who attended the equipment operator training found it valuable, encouraged us to seek funding to do more of these workshops, and requested that we conduct a similar workshop for Water Board staff and other public agencies working in the North Bay.
- The inter-agency road workshop was well received and again, Water Board staff requested that we seek additional funds so that annual inter-agency workshops could be held.
- Outreach and technical assistance to landowners related to Water Board regulations for vineyards to implement the sediment TMDL was difficult due to a series of Water Board delays. Delays made it difficult to communicate clearly with landowners, managers, and industry groups. The uncertainty surrounding “final” regulation requirements was a constant struggle when trying to explain the relationship between LandSmart® and compliance with pending regulations. Lack of

an adopted regulation and clarity that LandSmart® will provide compliance may have deterred some participating landowners from having their plans completed and “verified” or “certified” during the timeframe of this project.

### ***Regional Capacity Building***

- Presentations to elected officials about activities happening around the North Bay related to TMDL was helpful and it provided project practitioners and elected officials an opportunity to meet one another and share ideas, questions, and concerns.
- Developing a joint conservation program that can be implemented by multiple RCDs across a region is difficult work that requires trust, open communication, patience, technical knowledge, and dedication to resource conservation. The effort is worthwhile and has the potential to result in stronger RCDs across the State of California that could be available to help State and Federal resource agencies implement programs consistent with their missions.
- It is important to have supportive, knowledgeable, and empowered State and Federal staff as partners to developing conservation programs that will meet local, State and Federal needs. We were very lucky to have these types of partners during the course of the project.
- There is a lot of TMDL implementation action happening in the Napa River watershed and it’s important for local lines of communication to remain open so that efforts can support one another.

### ***Pollution Reduction and Project Implementation***

- It is extremely helpful to have project planning and permitting complete at the onset of a project that requires implementation. Design, permitting, and environmental review can be time consuming. We felt fortunate to be in a position to begin project implementation within months of receiving the project contract.
- Developing a QAPP to monitor project implementation is challenging. The QAPP templates that are required seem to be geared toward water quality monitoring rather than project implementation monitoring.
- It was rewarding to work with and implement projects with land managers who oversee operations of several properties because through the process they often began to talk about applying what they learned to their other properties, therefore expanding benefit without necessarily expanding the project budget.
- We found it helpful to work with landowners to implement road shaping projects while simultaneously helping them to get permits for more complex road sites. This balance of short-term implementation with longer-term planning seemed to satisfy a desire to “do something positive now” while working toward and budgeting for a longer-term goal.

- Obtaining, or partnering with an agency that has, “multi-agency” authorization to implement a given suite of identified practices is a very effective way to implement beneficial practices in a cost-effective and timely manner. In our case we worked with the Napa County Flood Control and Water Conservation District under their Stream Maintenance Program and are interested in obtaining our own authorizations to implement standard road erosion reduction practices.

### ***Watershed Monitoring for TMDL Targets***

- It is expensive to develop a monitoring program and prepare a QAPP to the satisfaction of regulatory agencies for the purpose of monitoring TMDL targets. We were fortunate to have funds from another project to complete that task and fortunate to have funds from this project to carry out pilot monitoring program implementation to test and modify the monitoring program and protocol.
- Implementation of the pilot program over several years was essential to test and improve monitoring methods to be more effective in the Napa River watershed.
- Monitoring streambed scour under the conditions called for in the TMDL (e.g., at or below specific flow levels) is difficult to do because flow conditions are so variable and often will not be within the range identified in the TMDL.
- Monitoring of this type is expensive and there is no consistent, long-term funding to ensure that it is carried out to inform whether the targets are being met.

### **C) FUTURE AND ADDITIONAL RELATED WORK**

Providing technical and educational programming in the Napa River watershed to improve water quality, wildlife habitat, and natural resources in general is core to the mission of NCRCD. This project was informed and supported by several other projects and will result in several additional projects and efforts. Below are some of the additional projects that NCRCD is involved with that relate to the goal of this project and that will be worked on over the next few years.

- NCRCD is nearing the end of a project implemented in conjunction with Pacific Watershed Associates to assess and develop plans for 80 miles of unpaved road in three tributary watersheds in the north-west portion of the Napa River watershed.
- NCRCD is providing construction oversight and technical assistance to the Land Trust of Napa County as they implement practices that we recommended on some of their properties and begin to assess the condition of roads and trails on other Land Trust owned properties.
- NCRCD will be providing construction oversight for a road erosion reduction project in Wing Canyon watershed.
- NCRCD has received a number of grants that will allow us to implement LandSmart® Conservation Planning and LandSmart® On-the-Ground, including: 1)

implement road storm-proofing practices with landowners for whom we have already prepared erosion reduction plans, 2) assist vineyard managers with developing farm water quality plans, 3) provide on-request assistance to land managers related to road assessment and planning (including land managers who may already have a farm plan but need help verifying and interpreting the road section of their plan), 4) work with other regional partners to develop farm plan templates for additional landuses (e.g., forestry and orchards), and 5) coordinate and carry out heavy equipment operator trainings and multi-agency workshops related to unpaved roads.

- NCRCD is working with Napa County and consultant 2<sup>nd</sup> Nature to complete protocol for monitoring road condition and stream habitat condition (RoadRAM and StreamRAM).

#### **IV. CONCLUSIONS**

This multi-faceted project provided needed assistance to expand TMDL implementation in the Napa River watershed and establish a more robust framework for future implementation. Critical to future success of these outreach, planning, implementation, and monitoring efforts will be ongoing engagement with watershed partners, natural resource and regulatory agencies, and local landowners. Understanding agency and local landowner goals will be paramount to implementing and achieving sediment load reduction milestones and community involvement in the long term.

#### **V. APPENDICES/DELIVERABLES**

Select items are provided as appendices. These items and several other project deliverables can be found on basecamp.

- QAPP for Heath Canyon Road Improvement Project
- Heath Canyon Road Improvement Report
- QAPP for Streambed Scour and Gravel Permeability Monitoring
- Napa TMDL Pilot Monitoring Technical Memo 9.30.13
- Scour Chain Protocol
- Select PowerPoint Presentations
  - Project Update to NBWA 4.5.13
  - LandSmart® Overview 9.25.14 (WICC)
  - Low Impact Roads (multi-agency workshop)
  - Implementing the Napa River Sediment TMDL (for SOE 10.29.13)
  - Watershed- and Wallet-Friendly Roads Workshop Flyer 3.4.14 (Heavy Equipment Operator Training)
- LandSmart Vineyard Water Quality Planning Workshop Flyer
- LandSmart Overview Map (showing LandSmart® participant properties)