MARIN COASTAL WATERSHEDS PERMIT COORDINATION PROGRAM ANNUAL REPORT 2016-2017



JULY 2017

MARIN RESOURCE



P.O. Box 1146, Point Reyes Station, CA 94956

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# Marin Coastal Watersheds Permit Coordination Program

# **Annual Report Executive Summary**

The Marin Resource Conservation District (Marin RCD) recognizes that on-farm natural resource conservation and restoration activities can improve ranch lands, increase agricultural productivity, and protect the environment by enhancing water quality and wildlife habitat throughout western Marin County. The Marin Coastal Watersheds Permit Coordination Program (PCP) was created to incentivize and facilitate the implementation of high quality restoration projects to reduce non-point source pollutant loading into watersheds and to increase wildlife habitat. Over the past thirteen years, the number of private landowners volunteering to partner with Marin RCD to implement restoration projects has increased, and the organization partly attributes this to the PCP, which reduces the implementation timeframe and cost of environmental review fees. Every year, Marin RCD approves eligible projects into the program for implementation and then compiles a report that summarizes those projects and any performance information requested by regulatory agency permits.

# **Program Highlights for 2016**

Marin RCD over the past 13 years has helped implement 229 management practices on 56 ranches. The 2016 PCP included seventeen projects: Point Reyes National Seashore (PRNS) installed two projects, and Marin RCD implemented eight along with six other projects approved into prior PCP program years.

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Performance Measures & Notable Achievements for 2016-2017	Count	Unit
Projects Completed	16	Count
Management Practices Completed	22	Count
Stream Protected	9,357	Linear Feet
Streambank Restored	3,501	Linear Feet
Livestock Fence Installed	7,900	Linear Feet
Heavy Use Area	7,200	Square Feet
Animal Walkway	2	Count
Spring & Water Developments Installed	10	Count
Native Trees & Shrubs Installed	867	Count
Species Planted	63	Count
Sediment Load Reduction	>144	Tons Per Year

Table 1. Summary of work accomplished through May 2016 - April 2017

#### **Program Background**

The PCP is based on a model of coordinated, multi-agency regulatory review that ensures the integrity of agency mandates, but makes permitting more accessible to landowners, particularly farmers and ranchers, than the traditional process. The Marin RCD's goal in establishing the PCP was to increase landowner willingness to participate in stewardship projects by providing a streamlined and expedited programmatic compliance with the California Environmental Quality Act (CEQA). Marin RCD established the PCP in 2004 and was able to achieve a streamlined CEQA review process for restoration projects. The streamlined CEQA process is limited to 17 conservation practices (Table 2, also known as management practices, MP) derived from the United States Department of Agriculture's Natural Resources Conservation Service (USDA NRCS). In order for projects to be processed through the PCP, the dimensions of the MPs must fall within the size limitations and geographic scope of the PCP. The types of MPs incorporated in the PCP are designed to control soil erosion, restore riparian habitat, protect and improve water quality, provide education and outreach, conserve rangeland, cropland, and forest, and support the agricultural economy and heritage in western Marin County.

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County) within the Marin Coastal Watersheds Permit Coordination Program.
Table 2. A list of the 17 conservation practices (USDA NRCS practices tailored to Marin

Marin Coastal Watersneds Permit Coordination Program's Conservation Practices					
1. Access Road	7. Grassed Waterways	13. Stream Channel Stabilization			
2. Animal Trails & Walkways	8. Lined Waterways	14. Stream Habitat Improvements			
3. Critical Area Plantings	9. Pipelines	15. Structure for Water Control			
4. Filter Strips	10. Sediment Basins	16. Underground Outlets			
5. Fish Passage	11. Spring Developments	17. Water & Sediment Control Basins			
6. Grade stabilization	12. Streambank Protection				



Through the program, projects on private lands go through expedited CEQA review under the condition that landowners implement their project under the supervision and sponsorship of Marin RCD, PRNS or the USDA NRCS. Each year, Marin RCD reviews the proposed construction projects to determine if the projects meet the environmental protection limitations of the PCP. Projects that fit within the limitations are vetted through the PCP process, while projects that are beyond the scope of the PCP are then taken through the traditional CEQA review process. Incorporated into the PCP process is securing approval from local, state, and federal agencies with jurisdiction over one or more of the PCP's 17 conservation practices. Table 3 names the agencies and types of permits that may issue permits under the permit coordination program. Some permits require reports; this annual report serves to fulfill requirements of individual permits and the PCP:

"Under the PCP, the Marin RCD, USDA NRCS, and/or PRNS will provide written notification of the status of all projects to permitting and funding agencies in the form of an annual post-construction report is due January 31<sup>1</sup> of each year after project completion for the required duration of monitoring. As stated in the PCP report, a list of participating landowners and description of each project objective, area affected, natural biological enhancements, monitoring protocols conducted, and cut/fill volumes and slope of work will be provided. It will discuss conservation benefits, quantify gains in wetlands and riparian areas, and provide photo documentation of before and current site conditions. Photodocumentation will occur from photo points before construction and annually thereafter throughout the term of the monitoring program and will include both close-up and longrange shots." – Marin Coastal Watersheds Permit Coordination Program

The annual report summarizes overall program accomplishments (Appendix A: List of all PCP projects since 2013) and then includes Project Profiles, individual project reports for projects implemented in 2016-2017, as well as, past projects with permit reporting updates (Appendix B). Marin RCD writes Project Profiles for projects implemented inhouse, while Point Blue Conservation Science's Students and Teachers Restoring a Watershed writes reports for projects they install for Marin RCD. In addition, PRNS writes as-built reports for projects implemented by the Seashore.

Over the past thirteen years, the Marin RCD has met the PCP goal and strengthened its relationships with Marin ranchers, the USDA NRCS, PRNS, and state and federal regulators; these partners worked together to implement voluntary actions to improve water quality and wildlife habitat throughout western Marin County. The Marin RCD,

<sup>&</sup>lt;sup>1</sup> Marin RCD has changed this due date to June 30 in order to incorporate project elements occuring in the winter months such as plant installations and monitoring conducted.

USDA NRCS, PRNS, and landowners recognize that because agriculture is the area's predominant land use; on-farm conservation activities can lead to significant ecological improvements.

Table 3. Representative sample of the regulatory agency and associated permits that can be issued on or more of the 17 conservation practices.

Regulatory Agency	Regulatory Permit or Approval Issued
CA Department of Fish and Game	CA Fish & Game Code §1602 Lake and Streambed
	Alteration or Routine Maintenance Agreement
	CA Endangered Species Act Incidental Take Permit or
	Consistency Determination
North Coast or San Francisco Bay Regional	Waste Discharge Requirements or Clean Water Act §401
Water Quality Control Board	Certification
U.S. Army Corps of Engineers	Clean Water Act §404 Nationwide Permits.
County of Marin	Determination of Consistency with Local Coastal Plan
	Grading Permit, and Creek Permit
California Coastal Commission	Coastal Development Permit
U.S. Fish and Wildlife Service	Endangered Species Act §7
	Consultation/ Incidental Take Statement.
NOAA Fisheries	ESA §7 Consultation/ Incidental Take Permit
CA Department of Transportation	Road Encroachment Permit
Gulf of Farallones National Marine Sanctuary	Sanctuary Permit



### 2016 PCP Program

The 2016 PCP provided streamlined CEQA coverage for 17 projects: twelve of which were Marin RCD projects and five were PRNS projects (Appendix A). Projects approved into the PCP were assigned a numerical code name (year and project number) for the PCP list. Point Reyes National Seashore (PRNS) installed two and aims to implement the other three in 2017, while Marin RCD implemented eight 2016 PCP projects along with six others from previous PCP program rounds. 2016 PCP projects not implemented in 2016 are scheduled for implementation in 2017, and were delayed by landowner request for various reasons.

The success and benefits of the program are determined through monitoring conducted by Marin RCD and program partners: Point Blue Conservation Science's Students and Teachers Restoring a Watershed Program, and Marin Agricultural Land Trust. The success of the PCP was captured through two methods: 1) Performance Measures and Notable Achievements (Table 1) identified in each grant that captures programmatic success by identifying the program goals and outcomes; and 2) the Riparian Zone Monitoring Plan<sup>2</sup> that provides a suite of protocols that Marin RCD uses to measure performance of individual ranch projects. The success of the entire program is based on the cumulative impact of the implemented ranch projects. The individual Project Profiles summarize the monitoring work accomplished as of June 2016 (Appendix B), which includes required reporting information per project permits. Table 4 lists PCP projects since 2013 that required permits, the associated agencies and permit numbers, as well as, as summary of the reporting measures and performance standards. In Appendix B, Projects 11-14 are older PCP projects with updated monitoring information to satisfy permitting requirements.

In 2016, the PCP program successfully supported agriculture and the environment by providing assistance to the ranching community by implementing 22 voluntary MPs on agricultural lands in west Marin County, California. As the Marin RCD proceeds into the fourteenth year of the program 6 landowners are waiting to receive permitting assistance with new conservation projects. The Marin RCD is committed to the success of the individual projects, watershed health and will continue to assist landowners. Through voluntary participation in the program and successful implementation of habitat improvement of projects, ranchers will be able to continue pro-active approaches towards improving watershed health.

<sup>&</sup>lt;sup>2</sup> Riparian Zone Monitoring Plan (2010) developed by University of California Cooperative Extension and Marin Resource Conservation District. Approved by Regional Water Quality Control Board.

Project #	Watershed	Project Completed	Permit	Permit #	Reporting Requirement
2013-001 & 2013-002	Chileno Crk > Walker Crk	01/15/15	§1600	1600-2013-0394-R3	Monitor Plant Survival for 3 years
2013-003	Dillon Watershed	01/15/17	\$401 \$1600	SPN-2014-00314 1600-2013-0235-R3	Monitor Plant Survival for 3 years (75% survival required)
2014-03	Keys Crk > Walker Crk	11/17/15	§1600	1600-2015-0227-R3	Monitor Willow Pole Survival for 5 years
2016-03	Stemple Crk	01/24/17	\$401 (equvil.) \$1653	WDID# 1B16645WNSOl ECM PIN CW-825284 1653-2016-002-001-R3	Monitor Plant Survival for 3 years (80% survival required); including performance of mitigation plantings, adapative management or maintenance, irrigation status and effectiveness, photo monitoring
2016-11	Halleck Creek > Lagunitas Creek	Scheduled for 2017	§401 (equvil.) §404 §1654 County Creek Permit	CIWQS Place ID 8254062016-00202N 1600-2016-0208-R3 CP16-006	Monitor plant cover for 5 years (65% at 5 years) submit report at year 1, 2, 3, and 5; annual hydrology/geomorphic evaluation due July 31 for 5 years

Table 4. List of PCP projects dating back to 2013 with current permit reporting requirements.

PCP Year	Project Number	PCP Year	Year Completed	Watershed	# of MPs	Project's PCP Practice(s)
	1	2013	2015	Chileno Creek	4	critical area planting, grade stabilization structure, lined waterway, structure for water control
	2	2013	2015	Chileno Creek	6	critical area planting, filter strip, lined waterway, streambank protection, channel bed stabilization
2013	3	2013	2014	Dillon Watershed	7	critical area planting, grade stabilization, grassed waterway, lined waterway, structure for water control, spring development, pipeline
	4	2013	2015	Keys Creek to Walker Creek	1	pipeline
	5	20132015Keys Creek to Walker Creek3	3	structure for water control, water development, pipeline		
	6	2013	2015	Keys Creek to Walker Creek	4	critical area planting, streambank protection, grade stabilization, structure for water control
	7	2013	2014	Tomales Bay East Shore Watershed	1	critical area planting
		·		·		

# Appendix A: List of all PCP projects since 2013

PCP Year	Project Number	PCP Year	Year Completed	Watershed	# of MPs	Project's PCP Practice(s)
	2014-01	2014	2014	Keys Creek to Walker Creek	3	critical area planting, structure for water control, lined waterway
	2014-02 (prev. 2013-02)	2014	-	Chileno Creek	2	critical area planting, streambank repair
2014	2014-03	2014	2015	Keys Creek to Walker Creek	2	critical area planting , grade stabilization
7	2014-04	2014	-	Abbotts Lagoon-Pacific Ocean	1	spring development
	2014-05	2014	-	Drakes Estero- Drakes Bay	1	spring development
	2014-06	2014	-	Abbotts Lagoon-Pacific Ocean	1	pipeline
	2015-01	2015	2016	San Antonio	1	water development
	2015-02	2015	2016	San Antonio	1	water development
	2015-03	2015	Planned for late 2017	San Antonio	1	water development
	2015-04	2015	Planned for late 2017	Nicasio Creek	1	water development
2015	2015-05	2015	Planned for late 2017	Tomales Bay	1	water development
	2015-06	2015	2016	Walker Creek	1	water development
	2015-07	2015	2016	Keys Creek to Walker Creek	1	water development
	2015-08	2015	2016	Walker Creek	1	water developments
	2015-09	2015	2015	Tomales Bay	1	critical area planting
	2015-10	2015	2015	Stemple Creek	1	critical area planting

PCP Year	Project Number	PCP Year	Year Completed	Watershed	# of MPs	Project's PCP Practice(s)
	2016 -01	2016	2016	Chileno Creek	1	pipeline
	2016-02	2016	2016	Keys Creek to Walker Creek	1	pipeline
	2016-04	2016	2017	Millerton Creek to Tomales Bay	1	pipeline
	2016-06	2016	Planned for late 2017	Nicasio Creek	1	pipeline
	2016-08	2016	2016	Keys Creek to Walker Creek	1	pipeline
116	2016-09	2016	2016	Walker Creek	1	pipeline
5(	2016-12	2016	2016	Walker Creek	1	critical area planting
	2016-13	2016	2016	Tomales Bay	1	animal walkway
	2016-14	2016	2016	Tomales Bay	1	animal walkway
	2016-15	2016	Planned for late 2017	Tomales Bay	1	critical planting area
	2016-16	2016	Planned for late 2017	Tomales Bay	1	critical planting area
	2016-17	2016	Planned for late 2017	Tomales Bay	1	critical planting area

# **Appendix B: Project Profiles**

Profiles Included:

- 1. 2012-01 (by Point Blue Conservation Science)
- 2. 2016-01
- 3. 2016-02
- 4. 2016-03
- 5. 2016-07
- 6. 2016-08
- 7. 2016-09
- 8. 2016-10
- 9. 2016-12 (by Point Blue Conservation Science)

10. 2016-13 & 2014-14 (by Point Reyes National Seashore)

Project Profiles Updated with Monitoring Information

- 11.2013-01
- 12.2013-02
- 13. 2013-03
- 14. 2013-06



# **PROJECT REPORT**

Project #2012-01 The STRAW Project A Project of Point Blue Conservation Science

# **PROJECT GOALS**

During the 2016/2017 season, Point Blue Conservation Science (Point Blue) Students and Teachers Restoring A Watershed (STRAW) Program, in partnership with Marin Resource Conservation District (MRCD) and Marin Agricultural Land Trust (MALT), completed two days of restoration work on January 26<sup>th</sup> and January 27<sup>th</sup> at a riparian area on Project #2012-01. The work completed slows water flow to filter nutrients from the dairy area, controls erosion for improved water quality, increases overall riparian vegetation and tree canopy cover, improves carbon sequestration, and provides educational opportunities to local schools.

# **PROJECT DESCRIPTION**

The property is located in the heart of the Chileno Valley in Petaluma and is part of the Chileno Creek watershed which flows to Walker Creek and Tomales Bay. The property is currently used as grazing range for dairy cows. The project area was formerly used as a field loafing area located downstream of the dairy facility. It is newly fenced to exclude livestock from the riparian area to reduce disturbance to the creek banks and new plantings and reduce sediment and nutrient inputs (see Figure 1 for approximate location). Livestock will be excluded for the first 3 years after planting, then stakeholders will determine how controlled grazing can be utilized in the planting area.



Figure 1. Planting location at the Dairy. Blue line indicates approximate location of exclusionary fencing. Planting occurred inside the fenced area.

Prunuske Chatham, Inc. (PCI) designed the creek revegetation plan and STRAW staff and students participating in the STRAW project installed all plantings. Students who participated in the two restoration days are participants in the STRAW Multi-visit Program (MVP) program which provides additional classroom lessons to facilitate a greater connection and stronger understanding of the restoration project. The work completed includes the installation of willow sprigs and *Juncus* species along eroding banks at the toe of the slope and on bank benches and tree and shrub container plantings at the top of bank (Figure 2). Site preparation included the removal of noxious weed species including French broom (*Genista monspessulana*), Milk Thistle (*Silybum marianum*), and Poison Hemlock (*Conium maculatum*).

Container plants were sourced from local native plant nurseries and willow material was collected onsite from established willows. The number and species of container plants was determined by existing plant species on site, the site's ecological needs, their niche in a climate-smart planting palette as determined by Point Blue's Climate Smart Restoration Toolkit (www.pointblue.org/restoration), prior performance of candidate species at similar sites in Chileno Valley where riparian restoration has been implemented over the past decade, landowner preferences, and plant availability at nurseries.

Container plants have browse protection with two u-posts, wire caging, and coir mat weed suppression. Installed container plants will require irrigation and localized weed removal for three summers. Additional site maintenance will include continued removal of the noxious weed species listed above, deer browse protectors for willows, and tree wrap for protection against voles and field mice.

# NUMBER AND TYPE OF PLANTING

Species	Common Name	
-		TOTAL
Acer macrophyllum	Big Leaf Maple	4
Frangula californica	Coffeeberry	10
Heteromeles arbutifolia	Toyon	5
Holodiscus discolor	Oceanspray	5
Juglans hindsii	CA black walnut	4
Physocarpus capitatus	Ninebark	5
Quercus agrifolia	Coast Live Oak	5
Quercus garryana	Oregon White Oak	5
Rosa californica	CA Rose	10
Sambucus nigra ssp. cerulea	Blue elderberry	7
	Total Container Plants	60
Salix lasiolepis	Arroyo willow	30
Juncus patens	Common rush	50
Juncus effuses	Bog rush	2
Juncus xiphioides	Iris-leaved rush	2
	<b>Total Erosion Control Plants</b>	84
	TOTAL PLANTS	144

# **PROJECT SIZE**

357 LINEAR FEET; 0.4 ACRES

# **PROJECT PARTICIPANTS**

Date	School	Grade	# Volunteers	Volunteer match
				amount
1/26/17	Sheppard Elementary	3	57	\$8,057
1/27/17	Sheppard Elementary	3	57	\$8,057
			114	\$16,115

#### SERVICES PROVIDED BY POINT BLUE DESIGN AND IMPLEMENTATION:

- STRAW staff visited the property to determine planting plans.
- Staff and interns procured all materials for the project.
- Staff prepared site for student planting days, including layout marking and identification and marking of hazards.
- Staff installed tree and shrub containers and critical area plantings with student and community volunteers.
- Staff and interns oversaw the distribution of students, adult volunteers, and supervisors throughout the work site to ensure project quality and success.
- Staff noted the number and type of plantings installed.

**EDUCATION:** 

- Teachers had the opportunity to participate in our annual Watershed Week, a three-day professional development workshop that focuses on the many aspects of watershed science.
- Teachers had the opportunity to participate in one network event.
- Students received an in-class pre-planting presentation about their project, including watershed and restoration science, as well as on-site training and details. Students also received additional on-going lessons and classroom visits by STRAW staff as part of the MVP program.
- Classes received any additional in-class and/or field activities as requested by their teacher to supplement their traditional class curriculum.

**Project 2016-01** *Livestock Exclusion Fencing and Water Development* 

# **PROJECT PROFILE: #2016-01**



Project: Watershed: Practices: Project Cost	2016-01 Walker Creek Riparian Feno	r, Subwatershed: Chileno Creek cing and Water Development (4 Management Practices)
& Partners:	\$193,613	Total Cost
	\$117,217	Marin Resource Conservation District, California Department of Water Resources
	\$31,444	Landowner
	\$44,952	Point Blue Conservation Science's Students and Teachers Restoring a Watershed Program Match

# **Project Overview**

The **Riparian Fencing and Water Development Project, 2016-01**, was part of a Marin Resource Conservation District (MRCD) program entitled Conserving Our Watersheds. The program supports water quality improvements on ranches by reducing non-point source pollutants entering into Tomales Bay. In 2015 the worst drought in California's history culminated; approximately 92% of the state was recorded to be affected by severe drought conditions. The drought persisted into 2016, although Marin County received average rainfall, and it wasn't until 2017 that above average rains provided drought relief to the state. The Conserving Our Watershed program was able to assist landowners with project that not only improved water quality but increase water quantity/availability. The implementation of water developments, such as this project, increased on-farm water availability and improve livestock distribution; practices designed to improve rangeland health and water holding capacity.

The intention of Project 2016-01 was to implement conservation practices that restrict livestock access to a pond and an unnamed tributary of Chileno Creek by installing a riparian fence and providing livestock alternative watering sources. The riparian fencing and extensive water development project will aid in distributing livestock throughout the property, thus reducing pathogen loading into the local creeks and streams of the Walker Creek and Tomales Bay watersheds. In addition, a critical area planting will stabilize the banks of the creek which will reduce sediment loads over time.

The ranch completed four management practices (United States Department of Agriculture Natural Resources Conservation Service [USDA NRCS] conservation practice number): a critical area planting (#342) to control erosion spots within a tributary to Chileno Creek; a 760 LF tree and shrub establishment (#612) along a tributary to Chileno Creek; one regular terrain fence (#382); and one water development involving a solar pump (#533), livestock pipeline (#516) and watering facilities (#614) which included two water tanks, 1 new concrete trough, shown in the distance in the photograph below, and refurbished two existing troughs.



## Ranch Location:

The ranch is located approximately eight miles southeast of Tomales, in northwestern Marin County, California. It is accessible from Chileno Valley Road and approximately one mile west following the driveway.

# **Project Location:**

The project area is located within the watershed of an unnamed intermittent stream/tributary that drains into Chileno Creek, a subwatershed to Walker Creek, and thence Tomales Bay. HUC 12: 180500050202 STREAM REACH CODE: 18050005001003



# Environmental Conditions:

The site is located on coastal rangeland in West Marin County with elevations ranging from 100 – 750 feet. The 606-acre ranch supports 115 cattle. The rangeland vegetation on site is composed mainly of non-native grassland species, grasses and forbs throughout the property. The planting portion of the project is located within a riparian corridor composed of a few scattered riparian woodland trees, Himalayan blackberry thickets, and herbaceous wetland plants both up and downstream of the site.

Within the project area, the dominant soil is Clear Lake Clay (113), a very deep, poorly-drained soil that typically formed in fine-textured alluvium derived from sandstone or shale with slopes ranging from 0 - 2%. The uplands of the project are comprised of Yorkville clay loam (205, 206 and 207) and Tomales-Steinbeck loam (198). The Yorkville clay loam range from 9 - 50% slopes and residuum weathered from shale, moderately well drained with a restrictive layer of 40 – 60 inches. Tomales-Steinbeck loams with 5 - 15% slopes and residuum weathered from sandstone. These soils are moderately well-drained with a restrictive layer of 40 – 60 inches. For the entire property, Clear Lake Clay (113) covers about 8.6% (52.7 acre), Yorkville clay loam (205, 206 and 207) cover about 340.1 acres (56.2% of the ranch) and Tomales-Steinbeck loam (198) is 19.7 acres (3.3%) of the property. Other soil types make up the remaining portions of the property: Los-Osos Bonnydoon Complex is 14% (88.5 acres) and Tomales Loam is 13% (79.9 acres) according to USDA NRCS Web Soil Survey<sup>1</sup>.

# Historical Partnership and Commitment:

The landowner acquired the property in 2013. Project 2016-01 is the first project that the new landowner has undertaken in cooperation with the MRCD. The landowner has engaged with USDA NRCS and will partner with them in 2017.

Past and Current Projects:

2016: Conserving Our Watersheds, MRCD, water development and fencing 2016: Carbon Farm Plan, Marin Carbon Project written by MRCD

<sup>&</sup>lt;sup>1</sup> Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

2017: Environmental Incentives Program, USDA NRCS water development

# Phase I. Design and Implementation

# Design:

In the spring of 2016, the landowner, the Marin RCD Conservation Scientist and a Rangeland Technical Service Provider (TSP) developed a conservation plan to meet the goals and objectives of the program. The plan was designed to meet the goals and objectives set by all partners and the landowner. The design involved fencing out the riparian corridor, pond and livestock water facilities. The riparian fence will prevent livestock from accessing the previous water source. A NRCS Rangeland Specialist and the Rangeland TSP, specializing in solar powered pump systems, co-designed the alternate water facility.

MRCD uses USDA NRCS defined practices and objectives to describe our projects, even when the agency is not involved in the project. The planned conservation practices include (USDA NRCS practice number):

- Critical Planting Area (342) *Objective*: Stabilization of soil by planting willows and grasses on highly erodible or critically eroding area. This practice reduces damage from sediment and runoff to downstream areas.
- Tree and Shrub Establishment (612) *Objective:* Plant a diverse variety of native plant species consisting of trees and shrubs to improve wildlife habitat.
- 3. Regular/Difficult Terrain Fence (328) *Objective*: Manage land impacts caused by livestock activity.

# 4. Solar pump and Piping (533/516) *Objective:* The purpose of the piping system is to convey water up a steep slope to achieve the adequate capacity for livestock watering and distribution.

5. Watering Facility (614)

*Objective:* Additional water sources in remote locations will provide drinking water to livestock and improve animal distribution while reducing non-point source pollutants and grazing pressure on sensitive areas near and around the livestock pond.

# Environmental Documentation

This project, #2016-01, was authorized through Marin Resource Conservation District's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance.

# Permits required and received for project:

- $\boxtimes$  No Permit Required
- □ §1600 CA Department of Fish and Wildlife
- □ §401 Water Quality Certification

□ §404 US Army Corps Wetland

□ County of Marin

### Implementation:

Marin RCD secured a qualified contractor approved by the landowner and Marin RCD Board to complete the water development and another contractor to install the solar pump. Two new 400-gallon troughs installed on a gravel pad, fitted with a wildlife escape ramps, were installed and hooked up to two 5,000-gallon tanks. The tanks (elevation 445 feet) are filled by a solar pump located at the pond (elevation 220 feet) that then gravity feed two new troughs (elevations 430 and 420) and two older troughs (elevation 223 feet). It took 5,357 linear feet of pipeline to connect the entire system to the pump at the pond. A submersible pump (5 gallons/minute) was set into the pond within a culvert pipe with a well screen (~20 feet) and hooked up to a solar pump (Grundfos 6SQF3), a IO101 generator box for foggy days, and a battery-operated timer were installed. A Technical Service Provider conducted the final observation and sign off.

Project Information	Area	Unit			
Ranch area	606	Acres			
Watershed area (estimate for unnamed tributary to Chileno Creek)	416	Acres			
Watershed project area	166	Acres			
Total length of riparian fencing	3,490	Linear feet			
Total length of creek protected by riparian fence	2,730	Linear feet			
Sediment load reduction	159.8	Tons/year			
Estimated Mg C02eq <sup>1</sup> sequestered by planting over 20 years	40	Mg C02eq			
<sup>1</sup> Estimated using USDA NRCS COMET-Planner model: Mg CO2 eq per acre, Mg =					
Megagrams (1 Mg or Metric Ton = 1.1 English (short) tons); and CO2 eq = Carbon Dioxide					
Equivalents. Carbon dioxide equivalent is a measure used to compare the emissions from various					
greenhouse gases (carbon dioxide, nitrous oxide and methane) in standardized units.					

Table 1. Project area dimensions.

The landowner installed the 5-strand barb wire riparian fence as cost-share to the project. The riparian fence measured 3,490 linear feet excluding nearly 2,730 linear feet of intermittent tributary including the pond (Table 1). The riparian fence was a regular terrain fence that started at the property boundary on the east side of the unnamed tributary. The fence was built along the eastern side of the tributary and pond continuing above the pond about 1,337 linear feet; it crosses the ranch driveway to tie into a cross fence. MRCD's Soil Health and GIS Manager and a Technical Service Provider conducted the final observation and sign off.

Once the fence was installed and the wet season arrived, the Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW) Program installed 181 native container plants (17 different species), 100 willow stakes, and 52 *Juncus* plugs in the

### **Project 2016-01** *Livestock Exclusion Fencing and Water Development*

unnamed tributary. STRAW completed the work in four days with 318 volunteers from four different schools. The STRAW team set up irrigation line to every container plant; however, willows and *Juncus* plugs are not being watered during the dry season. STRAW will monitor and weed the site for three years. Exhibit A is STRAW's plant installation report for their work on the ranch; it includes a species list.

# Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes photo monitoring (Exhibit B), and at least one year post-project Marin RCD staff complete a Landowner Questionnaire and Project Assessment Checklist to evaluate the functionality of the implemented project. Since it is only four months post-project (last planting date was in March), the Landowner Questionnaire and Project Assessment Checklist have not been completed at this time.



Livestock Fencing and Water Development Enhancement: Project #2016

Figure 1. Map of Project 2015-011 showing the location of completed conservation practices.

# Exhibit A: STRAW Project Report



PROJECT 2016-01 PLANTING REPORT The STRAW Project A Project of Point Blue Conservation Science

# **PROJECT GOALS**

During the 2016/2017 season, Point Blue Conservation Science (Point Blue) Students and Teachers Restoring a Watershed (STRAW) Program, in partnership with Marin Resource Conservation District (MRCD), completed four days of restoration work on February 24<sup>th</sup>, February 28<sup>th</sup>, March 2<sup>nd</sup>, and March 3<sup>rd</sup> at Project 2016-01. The work completed minimizes and controls erosion, improves water quality, increases biodiversity, provides tree cover and shading, and provides educational opportunities to local schools. Additionally, the planting palette is designed to be climate smart, providing a higher assurance of survival against climate change factors by including a wide range of species that have tolerances to predicted changes. This design approach contributes to plantings that sequester carbon, provide new habitat for wildlife throughout the calendar year, and improve water quality and flood protection in the face of increased storm severity.

# **PROJECT DESCRIPTION**

Project 2016-0 is located at 6195 Chileno Valley Road in Petaluma and is part of the Chileno Creek Watershed which flows to Walker Creek and Tomales Bay. The property is currently used as rotational cattle range and owners are making efforts toward carbon neutral beef production. Prunuske Chatham, Inc. (PCI) designed the creek revegetation plan and STRAW staff and students participating in the STRAW project installed all plantings. The riparian project area is divided into 4 zones and the completed planting area consists of zone 4—a section of the property downstream of a retention pond (Figure 1). Because of limited funds, planting was prioritized to start in zone 4 to address pressing erosion concerns. As more funds become available, work in the remaining zones will continue.

#### **Project 2016-01**

Livestock Exclusion Fencing and Water Development



Figure 1-Planting Area. Zone 1, upstream of the road crossing, Zone 2, downstream to the beginning of the pond, Zone 3, shore line of the pond, Zone 4, downstream of the pond to the southern fence-line.

The work completed includes the installation of tree and shrub container plantings at bank benches, bank slopes, and the top of banks and willow sprigs and *Juncus* plugs along eroding banks and drainages. Sprigs were installed throughout the project reach at the toe of the slope, bank benches, and slumping banks. All container plants have heavy duty browse protection including two t-posts and wire caging, as well as coir mat for weed suppression. Installed container plants will require irrigation and localized weed removal for three summers.

Container plants were purchased at local native plant nurseries and selected for climate smart traits. The number and species of native plants was determined by existing plant species on site, the site's ecological needs, their niche in a climate-smart planting palette as determined by Point Blue's Climate Smart Restoration Toolkit (www.pointblue.org/restoration), prior performance of candidate species at similar sites in Chileno Valley where riparian restoration has been implemented over the past decade, landowner preferences, and plant availability at nurseries.

# **PROJECT SIZE**

ZONE 4: 760 LINEAR FEET, 1.25 ACRES

Date	School	Grade	# Volunteers	Volunteer Match
2/24/17	La Tercera	6	54	\$7,633
2/28/17	Petaluma Junior High	7	70	\$9,895
3/2/17	Mary Collins	4/5	120	\$16,963

# **PROJECT PARTICIPANTS**

**Project 2016-01** *Livestock Exclusion Fencing and Water Development* 

3/3/17	Mary Collins	2/3/6	74	\$10,460
			318	\$44,952

# OF PLANIS	SCIENTIFIC NAME	COMMON NAME			
4	Acer negundo	Boxelder			
5	Aesculus californica	Buckeye			
15	Artemesia californica	CA Sagebrush			
19	Cornus sericea	Dogwood			
10	Erangula californica	Coffeeberry			
14	Heteromeles arbutifolia	Tovon			
11	Holodiscus discolor				
7	l onicera involucrata	Twinberry			
5	Physocarpus capitatus	Ninebark			
19	Quercus agrifolia	Coast live oak			
5	Quercus lobata	Valley Oak			
4	Sambucus nigra	Blue Elderberry			
20	Symphorocarpus albus	snowberry			
5	Ribes californicum	Gooseberry			
10	Rosa californica	CA Rose			
9	Rubus parviflorus	Thimbleberry			
15	Vitis californica CA grape				
181	181 Total Container Plants				
	· ·				
50	Juncus patens	CA Grey Rush			
2	Juncus effusus	Common Rush			
100	Salix spp. Willow				
152	152 Total Erosion Control Plants				
333	TOTAL PLANTS				

# NUMBER AND TYPE OF PLANTING

# SERVICES PROVIDED BY POINT BLUE

**DESIGN AND IMPLEMENTATION:** 

- STRAW staff visited the property to determine planting plans.
- Staff and interns procured all materials for the project.
- Staff prepared site for student planting days, including layout marking and identification and marking of hazards.
- Staff installed tree and shrub containers and critical area plantings with student and community volunteers.
- Staff and interns oversaw the distribution of students, adult volunteers, and supervisors throughout the work site to ensure project quality and success.
- Staff noted the number and type of plantings installed.

### **EDUCATION:**

• Teachers had the opportunity to participate in our annual Watershed Week, a three-day professional development workshop that focuses on the many aspects of watershed science.

- Teachers had the opportunity to participate in one network event.
- Students received an in-class pre-planting presentation about their project, including watershed and restoration science, as well as on-site training and details.
- Classes received any additional in-class and/or field activities as requested by their teacher to supplement their traditional class curriculum.

# Exhibit B: Photo Monitoring



Pre-construction (7/27/16) photo looking upstream of gully.



Post-construction (6/28/17) project photo displaying the riparian fence on the right side of the photo.



Pre-construction (7/27/16) photo of the solar pump location that will take pond water to tanks to be installed at the top of hill.



Post-construction (6/28/17) of solar pump solar panel and the above ground pipeline going to the pond can be seen through the dry grass.

#### Project 2013-001

Gully Repairs, Erosion Control, Revegetation and Fencing



View from the top of the pond damn looking downstream at the tributary to Chileno Creek thence Walker Creek (03/2016).



Post-construction (6/28/17) photo of tributary planted by STRAW. Plants installed were less than 3 feet tall, and the cages around the trees are difficult to see in this photo.



During construction photo of completed solar pumping station and the riparian fence under construction (11/16/16).



Post-construction (6/28/17) of pond, solar panel and riparian fence.

#### Project 2013-001

Gully Repairs, Erosion Control, Revegetation and Fencing



Pre-construction photo of circular trough below rock and the pathway of the riparian fence (7/2016).



Container plantings located at the end of the Chileno Creek tributary (6/2017). The property boundary fence is visible in the top right of the photo.



Post-construction photo displaying constructed fence passing below the circular water trough plumped to uphill tanks (6/2017).



View of container plantings from the middle of the tributary (06/2017). The large logs were placed by the landowner to slow erosion. The pond damn is in the background.

**Project 2016-02** *Riparian Fencing & Water Development* 

# **PROJECT PROFILE: #2016-02**



Project:	2016-02		
Watershed:	Walker Creek, Subwatershed: Keys Creek		
Practices:	Riparian Fencing & Water Development (2 Management Practices)		
Project Funding			
& Partners:	\$43,286	Total Cost	
	\$23,701	Marin Resource Conservation District, California Department of Water Resources and	
	\$19,585	California Water Quality Control Board Landowner	

#### **Project 2016-02** *Riparian Fencing & Water Development*

# **Project Overview**

The **Riparian Fencing & Water Development, 2016-02,** was part of the Conserving Our Watersheds Program, a ten-year program, supporting water quality improvements on ranches by reducing non-point source pollutants entering into Tomales Bay. In 2015 the worst drought in California's history culminated; approximately 92% of the state was recorded to be affected by severe drought conditions. The drought persisted into 2016, although Marin County received average rainfall, and it wasn't until 2017 that above average rains provided drought relief to the state. The Conserving Our Watershed program was able to assist landowners with project that not only improved water quality but increase water quantity/availability. The implementation of water developments, such as this project, increased on-farm water availability and improve livestock distribution; practices designed to improve rangeland health and water holding capacity.

The goals of Project 2016-02 were to exclude livestock from a tributary to Keys Creek, and provide an alternative water source for the livestock to improve livestock distribution across the ranch and increase on-farm water availability. The ranch completed two (2) management practices: water developments and riparian fencing. Best management practices are established by the United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS). USDA NRCS gives each practice a number (#516, #614, and #328) and develops a set of standards for each practice. Map 1 shows the locations of the implemented best management practices.

### Ranch Location:

The ranch is located in Tomales, Marin County, California. The property is located along a tributary to Keys Creek.

### **Project Location:**

The riparian fencing project is located directly behind the lamb barns adjacent to the homestead, while the water development is situated at the top of the hill west of the homestead.

HUC 12: 180500050203 STREAM REACH CODE: 18050005001183

# Project 2016-02

Riparian Fencing & Water Development

# Environmental Conditions:

The ranch is located in coastal Marin County and supports sheep and beef cattle. Rangeland varies in elevation from 130–380 feet. The dominant soil is Tomales loam (190–193), 2–50% slopes. The parent material consists of a residuum weathered from sandstone. Tomales loam soils are moderately well-drained and have a restrictive depth of 40–60 inch depth to the paralithic bedrock (coastal loamy claypan). The rangeland vegetation consists of annual and perennial grasses and forbs. The riparian corridor is vegetated in patches with some trees and herbaceous species.

Table 1.	Dimensions	of proje	ect and wa	atershed.
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Dimensions of project and watershed.	Area	Unit
Ranch area	240.0	Acres
Area of ranch affected by the installed practices	196.0	Acres
Length of tributary fenced by project	1,784.0	Linear Feet
Keys Creek tributary: total length on ranch	6,032.0	Linear Feet
Keys Creek tributary: total length of tributary	6,666.0	Linear Feet
Keys Creek: entire length of the creek	3.5	Miles
Keys Creek: total watershed area	3,035.0	Acres

# Historical Partnership and Commitment:

The Jensen ranch was settled in 1856 by Joseph Irvin, one of the original settlers of the Tomales township. It has stayed in the family for six generations with continued land stewardships and infrastructure upgrades. The current landowner has worked with the Marin RCD and USDA NRCS on land they lease nearby, the Mitchell Ranch, which is also in the Keys Creek watershed. The Jensen family is committed to maintaining and improving soil and water quality on the lands they manage.

# Past and current projects include:

- No-till seeding of pastures, invasive species control, historical willow and tree plantings, and riparian fencing
  - Work completed by the Landowner
- Multiple spring developments for off-stream water sources
  - The Landowner and MALT partnered on this project



# Project 2016-02

Riparian Fencing & Water Development

- Gully repair Mitchell Ranch
  - o Marin RCD, Marin County Measure A funds
- Solar water distribution system Mitchell Ranch (MRCD/NRCS)
  - Marin RCD, Prop 84 funded the design, and USDA NRCS' Environmental Quality Incentives Program funded construction.

# Phase I. Design and Implementation

**Design:** A USDA NRCS Technical Service Provider evaluated the project proposal and discussed options with the landowner. The project is simple and straight forward, so minimal design input was needed. The Technical Service Provider compiled the necessary specifications for the installation of the planned USDA NRCS' conservation practices, practice number and associated practice objectives included:

# 1. Fencing (328)

*Objective 1:* Manage land impacts caused by livestock activity. Prevent livestock from slipping through the electric fence and accessing Keys Creek throughout the year.

2. Water Development: Pipeline and Trough (516/614)

*Objective 2:* Create a permanent water source for livestock that seasonal graze the field. This will create a reliable source of water that isn't a tributary to Keys Creek and decrease sedimentation of water by placing the trough in a better location with a better foundation.

# The following CEQA authorization and permits were obtained for this project:

This project, #2016-02, was authorized through Marin Resource Conservation District's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance. Biological and archaeological assessments were conducted during the project planning phase to determine if to proceed with the project and which mitigation measures were applicable to the project.

- $\boxtimes$  No Permits Required
- $\square$  §1600 CA Dept. of Fish and Wildlife
- □ §401 Water Quality Certification
- □ §404 US Army Corps of Engineers
- $\Box$  County of Marin


Riparian Fencing & Water Development

*Implementation:* Marin RCD secured a qualified contractor approved by the landowner and Marin RCD Board to complete the work. The 400-gallon trough, complete with a wildlife escape ramp (see photo to the right), was installed on a gravel pad and hooked up to a 5,000-gallon tank filled by a solar pump. The trough was installed in line with the fence in order to service two fields for the livestock. The trough water comes from a hilltop well drilled by the landowners. It took 1,011 linear feet of pipeline to connect the trough to the tank and well. Photos of the water development including before construction, during construction and after construction are on page4. The riparian fence installed around a tributary to Keys Creek was completed by the landowner. The western portion of fencing along the tributary already existed, so the landowner repaired and revamped the existing fence, and they built a new fence along the eastern side of the tributary to restrict livestock access to the creek. Photos of the fence are on page 5. Table 2 summarizes the final project dimensions measured by the Technical Service Provider during the final observation and sign off.

Best Management	USDA NRCS Conservation	Measurement	Unit	
Practice	Practices			
Riparian Fence			Linear foot	
Water Development	Tank -1	5,000	Gallon	
	Pipeline	1,011	Linear foot	
	Trough- 1	400	Gallon	
Load Reduction from Practice Installation				
Sediment Load Reduction	175.8	Tons/Year		
(calculated from Water B	oard approved Region 5 Model)			
Estimated Pathogen Red	uction	90-99%	Pathogen	
(Based on several studies		concentration		
Waterborne Pathogens in				
USDA in 2012 and Conservation Benefits of Rangeland				
Practices by Briske in 20	11)			

Table 2.	Final dimensions	of Project and	subsequent non-	point source	pollutant load	reductions
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## **Phase II. Monitoring**

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes photo monitoring, a Landowner Questionnaire, and Project Assessment Checklist to evaluate the functionality of the implemented project.

#### Landowner Questionnaire:

At this time (4 months post-project installation), a landowner questionnaire has not been completed because it is scheduled to occur once the landowner has been able to see the

Riparian Fencing & Water Development

project perform through a rainy season and to give them enough time to evaluate how the project affects their operation.

#### **Project Assessment Checklist:**

On 09/08/2016, the water development rated "Excellent" by Marin RCD's Conservation Scientist when evaluating the project using the rating matrix on the Project Assessment Checklist. At the time of this assessment, the fence was not completed; therefore, the Conservation Scientist has not conducted the Project Assessment Checklist on the fence project, which was reviewed and approved by the Project's TSP on 12/01/2016.



Map 1. Project 2016-02 showing the location of completed conservation practices.

Riparian Fencing & Water Development



Pre-construction photo of hilltop where the water development will be installed and tapped into a well. Photo taken 07/15/16.



'During' construction photo of the installation of the tank and trough. Taken on 08/23/16.



View of solar array and pump which taps into a well that will fill a tank thence a trough. Photo taken 09/08/2016.



New wildlife friendly trough services two fields and will encourage livestock to spend more time upland. Photo taken 09/08/2016.

#### **Project 2016-02** *Riparian Fencing & Water Development*



Tributary to Keys Creek on the ranch before completely fenced. Photo taken on 07/15/16.



Keys Creek tributary completely fenced on the ranch (new fence on right side). Photo taken on 11/16/16.



Old pond site in tributary to Keys Creek that is dry and occupied by large *Juncus* plants. The fence will be installed on the hillside. Photo taken on 07/15/16.



View of old pond site and the new fence installed along the hillside. Photo taken on 11/16/16.

# **PROJECT PROFILE: #2016-03**



Project:	2016-03				
Watershed:	Stemple Cre	Stemple Creek, Subwatershed: Unnamed Creek			
Practices:	Streambank	Streambank Protection (4 Management Practices)			
Project Funding & Partners:	\$88,271	Total Cost			
	\$58,989	Marin Resource Conservation District, Marin County Measure A Funds			
	\$ 4,262	Landowner/Marin Agricultural Land Trust			
	\$25,020	Point Blue Conservation Science's Students and Teachers Restoring a Watershed Program Match			

## **Project Overview**

The **Erosion and Sediment Control Project, 2016-03**, was part of the Marin Resource Conservation District's (MRCD) Conserving Our Watersheds Program. The program assists agricultural operations with stewardship activities that improve water quality. The conservation practices in this project improved water quality by removing previously placed rock material within the stream channel, which was deflecting high magnitude flow events causing streambank erosion, lateral channel migration and sediment delivery directly into Stemple Creek.

In total, 100 cubic yards of riprap and associated fill was removed and stockpiled on the ranch above the 100-year flood line.

#### Ranch Location:

The ranch is located off of Fallon Road, approximately 0.7 miles east of Twin Bridge Road and 0.2 miles west of Carmody Road, and is bisected by Stemple Creek (Map 1).

#### **Project Location:**

The project is located on a parcel with a Marin Agricultural Land Trust (MALT) easement. The project site is within Stemple Creek (stream HUC 12 number: 180500050303) approximately 1.21 river miles downstream of the Alexander Road crossing, and 0.48 miles upstream of the Twin Bridge Road crossing.

#### Environmental Conditions:

The site is located within the Stemple Creek watershed in west Marin County, California. Stemple Creek has TMDLs for both nutrients and sediment. Prior to current ownership, rip rap was placed in the channel for an unknown purpose; it possibly provided a low-water crossing, or inhibited erosion of the streambank opposite of a tributary confluence. Analysis of historical aerial photography suggests that erosion of the left bank, just downstream and opposite the rip rap has increased markedly since 2009. Remote sensing indicates that the streambank has retreated approximately seven feet in the past six years.

## Historical Partnership and Commitment:

The ranch has undertaken numerous projects in cooperation with the MRCD, MALT, and United States Department of Agriculture Natural Resources Conservation Services (USDA NRCS) to improve and enhance the ecological value of the land.

## Past and Current projects include:

- 1997, 2001, 2016; Stemple Creek riparian fencing,
  MALT and USDA NRCS
- 2000 2010 Stemple Creek riparian planting,

Erosion and Sediment Control

o MRCD, MALT and Point Blue Conservation Science's STRAW Program

## Phase I. Design and Implementation

#### Design:

Designs were developed by Lee Erickson, P.E., with consultation from Prunuske-Chatham, in cooperation with the MRCD, MALT, and the landowner (Attachment A). In addition, representatives from the Region 1 Water Quality Control Board and California Department of Fish and Wildlife commented on the designs during the development process. The project removed approximately 100 cubic yards of rip rap, which was deflected flow into the left bank of Stemple Creek, and causing it to erode at a rate of approximately 1 foot per year. By removing this material streambank erosion has been reduced.



*Figure 1. View of project site including the pile of rip rap (left side of the photo, with orange arrow) and the eroding bank (right side of photo). The rip rap was removed in this project.* 

The design included the following USDA NRCS conservation practice:

1. Streambank and Shoreline Protection (580)

*Objective 1*: To prevent the loss of land or damage to land uses, or facilities adjacent to the banks of streams or constructed channels, shoreline of lakes, reservoirs, or estuaries including the protection of known historical, archeological, and traditional cultural properties.

*Objective 2*: To maintain the flow capacity of streams or channels.

Erosion and Sediment Control

*Objective 3*: Reduce the offsite or downstream effects of sediment resulting from bank erosion.

*Objective 4*: To improve or enhance the stream corridor for fish and wildlife habitat, aesthetics, and recreation.

2. Critical Area Planting (342)

*Objective 1*: Stabilization of soil by planting willows and grasses on highly erodible or critically eroding area. This practice reduces damage from sediment and runoff to downstream areas and improves wildlife habitat and visual resources.

#### Environmental Documentation

CEQA authorization for this project was provided by MRCD Permit Coordination Program in 2016. Since the project only removed fill from Stemple Creek, the US Army Corps of Engineers did not claim jurisdiction of the project. The Water Quality Control Board wrote a §401 Water Quality Certification and MRCD received a §1653 from the California Department of Fish and Wildlife.

 $\Box$  No Permit Required

 $\boxtimes$  §1600 CA Department of Fish and Wildlife\*

S401 Water Quality Certification (equivalent) \*

□ §404 US Army Corps Wetland

 $\Box$  County of Marin

\*Permits required reports; reporting requirements are addressed in the Phase II: Monitoring Section under Permit Reporting Requirements.

#### Implementation:

Project #2016-03 Creek was completed on March 17, 2017, and was implemented in two stages: 1) a few days of earthwork in September 2016; and 2) three planting days in January 2017 and March 2017.

MRCD secured a contractor and restricted the construction window to late summer in order to avoid summer pools in Stemple Creek and winter storms. Construction started September 12, 2016. The contractor removed the rip rock while a biologist oversaw the work to ensure wildlife safety and to help outline work area boundaries. The area where the rock was removed was then graded and erosion control fabric was installed to cover bare dirt (Figure 1). The work was finished on September 15, 2016. Table 1 summarizes the amount of rip rap removed and length of streambank protected. Figure 2 and 3 show the graded slope just after construction and then after the project's first winter.

Table 1. Project as-built dimensions.

Project Information	Quantity	Unit		
Ranch Area	185	Acres		
Project Area	5,000	Square feet		
Area of riprap and associated material to be removed	1,500	Square feet		
Excavated riprap and associated material	100	Cubic yards		
Length of streambank protected	75	Linear feet		
Length of streambank restored	75	Linear feet		
Area planted	1.32	Acres		
Number of willow springs installed	70	Count		
Estimated Sediment Load Reduction	48	Tons/Year		
Estimated Mg C02eq <sup>1</sup> sequestered by planting over 20 years	484	Mg C02eq		
Lauria DI M Lannay A O'Coon I Crease V Eviner C Largen I Harner M Deven and				

<sup>1</sup> Lewis, D.J., M. Lennox, A. O'Geen, J. Creque, V. Eviner, S. Larson, J. Harper, M. Doran, and K.W. Tate. 2015. Creek carbon: Mitigating greenhouse gas emissions through riparian restoration. University of California Cooperative Extension in Marin County. Novato, California.

Mg CO2 eq per acre, Mg = Megagrams (1 Mg or Metric Ton = 1.1 English (short) tons); and CO2 eq = Carbon Dioxide Equivalents. Carbon dioxide equivalent is a measure used to compare the emissions from various greenhouse gases (carbon dioxide, nitrous oxide and methane) in standardized units.



*Figure 2. Civil Engineer reviewing earthwork completed by contractor. Photo taken looking upstream with the rehabilitated rip rap site on the left side of the photo.* 



Figure 3. Smooth grass slope on the left is the graded area where the rip rap was removed. This photo was taken on 04/25/2017 after the first winter post-construction.

#### Erosion and Sediment Control

Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW) Program installed the 40 willow stakes in the project plans; STRAW determined the ultimate location of the willow stakes at the 'Downstream Site' due to their expertise in planting eroding banks. In addition, MRCD, in partnership with MALT, STRAW installed 43 container plants at the Downstream Site, and STRAW planted two additional areas: Upstream Site (on mainstem Stemple Creek above the Downstream Site); and Upstream Tributary Site (upstream from the Downstream Site, Figure 4). To complete all plantings, STRAW scheduled three days in January, but the heavy winter rains of 2017 brought Stemple Creek flows to flood level (Figure 5), thus two planting days were postponed to March (Figure 6). Stemple Creek flooded after the January planting date, and again after the March planting dates, which required STRAW to return and clean up cages and debris. Exhibit A is a map of the Downstream Site willows staking locations and Exhibit B is STRAW's plant installation report for all three sites.



Figure 4. Map created by Point Blue Conservation Science Students and Teachers Restoring a Watershed that indicates the location of the three planting sites.



Figure 6. Stemple Creek at flood stage on 1/10/17. Photo is looking at the Upstream Site to be planted by STRAW.



*Figure 5. The STRAW Program installing plants at the Downstream Site (01/24/17).* 

## Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes photo monitoring (Exhibit C), and at least one year post-project Marin RCD staff complete a Landowner Questionnaire and Project Assessment Checklist to evaluate the functionality of the implemented project.

#### Permit Reporting Requirements:

The permit files numbers are: WDID NO. 1B16645WNSO; ECM PIN CW-825284, and Habitat Restoration and Enhancement Act Consistency Determination No. 1653-2016-002-001-R3. This Project Profile serves to fulfill the reporting requirements of these permits: a Notice of Completion and reporting willow stake survival for three years (irrigation type and effectiveness). This Project Profile also includes permit requirements for adaptive management and maintenance, along with success criteria.

On June 28, 2017, MRCD staff visited the Project Site (Downstream Site) and the two other planting sites. MRCD staff took photos (see Exhibit C), mapped the location of willow stakes and collected plant survival and vigor data (Table 2). The map of the Upstream Tributary willow sites is not included in this report; however the map of the Downstream Site willow placement is Exhibit A. MRCD noted that the willow stakes along the repaired slope had low vigor, and will continue to monitor the status of these willows as time goes on. Meanwhile, willows at top of the eroding bank (the scoured area as noted by the plans) had high vigor. Not to mention, many seedling willows are sprouting from natural causes. The entire slope of the scoured area is less drastic and more vegetated since removal of the rip rap.

#### Landowner Questionnaire:

Overall, the installation of the conservation practices met the intended goals of the landowner. The landowner foresees an improvement in the way he can manage his livestock around these areas. He also expects the project to reduce stress upon the property's natural resources by reducing erosion and sedimentation. During the entire process, the landowner was pleased with the Marin RCD's performance although he did state the funding process and paperwork was confusing at times and could be simplified. The landowner is interested in working with Marin RCD again, but has no specific project in mind at this time.

Erosion and Sediment Control

Table 2. Plant Installation Data

Planting Sites & Type of Plants Installed on 1/24/17, 3/7/17, 3/9/17		Post-Construction 6/28/2017			
		Plant Size	<3 ft.	>3 ft.	
	Downstream Site:	High Vigor:	22	0	
	40 willow stakes	Low Vigor:	19	0	
	Irrigation: none*	Dead:	3	0	
s		Survival:	93.2%	ó	
ing	Downstream Site:	High Vigor:	32	1	
ant	43 native container plants	Low Vigor:	3	0	
. Pla	Irrigation: weekly hand watering	Dead:	3	0	
e of		Survival:	92.3%	<u>6</u>	
nce	Upstream Site:	High Vigor:	74	2	
ma	101 native container plants	Low Vigor:	7	0	
for	Irrigation: weekly hand watering	Dead:	15	0	
er		Survival:	84.7%	6	
Ц	Upstream Tributary Site:	High Vigor:	25	0	
	40 willow stakes	Low Vigor:	16	0	
	Irrigation: none	Dead:	1	0	
		Survival:	97.6%	'n	

\*The STRAW Program does not water willow plantings due to high survival rates without irrigation; however, the program is hand watering the container plants.

#### Adaptive Management or Maintenance

As of June 28, 2017, no adaptive management or maintenance measures are required. MRCD staff and STRAW will continue to monitor the status of the plants for three years, especially the willow stakes with low vigor on the right bank (rip rap removal location). MRCD will continue to check in with the landowner regarding the importance of the survivability of the plants and to abide by the Livestock Management Agreement.

#### Success Criteria

The ultimate goal of the project is to arrest the eroding bank (scour area). The success criteria of the project include:

- 1. Willow stake survival: 80%
- 2. Native container plant survival: 60% (drought conditions have resulted in STRAW reducing its performance standards for container plantings)
- 3. Bank Stabilization: Increase stability of the eroding bank (scoured area)
  - a. Measure the distance between the top of eroding bank and the fence line (specifically a three-post brace). As of June 28, 2017, the top of bank is 7 feet from southern most wooden post and 11 feet from the northern most post.
  - b. Photo document the eroding bank.



Figure 1. Map of Project 2016-03 showing the location of completed conservation practices implemented September 2016.

Exhibit A: Marin RCD Willow Stake Location Map



Exhibit B: STRAW Project Report



PROJECT 2016-03 PLANTING REPORT

The STRAW Project

A Project of Point Blue Conservation Science

#### **PROJECT GOALS**

During the 2016/2017 season, Point Blue Conservation Science (Point Blue) Students and Teachers Restoring a Watershed (STRAW) Program, in partnership with Marin Resource Conservation District (MRCD) and Marin Agricultural Land Trust (MALT), completed three days of restoration work on January 24<sup>th</sup>, March 7<sup>th</sup>, and March 9<sup>th</sup> at the ranch along Stemple Creek. STRAW has been involved with the planting and restoration of this ranch's reach of Stemple Creek for over ten years. The work completed minimizes and controls erosion to improve water quality, increases riparian vegetation, shades the creek, filters nutrients from the pasture area, and connects existing riparian corridors.

## **PROJECT DESCRIPTION**

The property is on Fallon Road in Petaluma. The area is currently used as active cattle range. Prunuske Chatham, Inc. (PCI) designed the creek revegetation plan and STRAW staff and students participating in the STRAW project installed all plantings. The student volunteer work was completed at two sites: an upstream and downstream riparian area on the ranch (Figure 1). STRAW staff and interns completed work at a third upstream tributary site in order to connect to an established population of willows from a previous STRAW project installation. The work completed includes the installation of willow sprigs along eroding banks and installation of tree and shrub container plantings at the top of bank. Container plants have browse protection with two 1" wide bamboo posts, chicken wire, and coir mat weed suppression. Willow sprigs were installed throughout the project reach at the toe of the slope, bank benches, and slumping banks.

#### **Project 2016-03** *Erosion and Sediment Control Project*



## Figure 7-Planting Areas

### **PROJECT SIZE**

SITE LOCATION	LINEAR FEET	ACRES
UPSTREAM	245	0.71
DOWNSTREAM	289	0.51
UPSTREAM TRIBUTARY	103	0.1
Τοται	637	1.32

## **PROJECT PARTICIPANTS**

Date	School	Grade	# Volunteers	Volunteer Match
1/24/17	McDowell Elementary	2/4	58	\$8,198
3/7/17	McDowell Elementary	3	59	\$8,340
3/9/17	Grant School	2	60	\$8,481
· · · ·			177	\$25,020

#### **Downstream Site**

The location coordinates for the downstream site are: N 38° 15.490', W122° 51.057' (Figure 1). Plans for channel adjustment and bank stabilization were developed by Erickson Engineering, Inc. dated 5/27/2016. These plans include specifications for planting willows on the creek banks as well as at the top of the bank. Plant palette includes a variety of native plants chosen for site suitability and climate change resilience (Table 1).

Materials used in planting container plants include, coir weed mats, light duty deer browse control (chicken wire cylinders secured with bamboo poles). Willows may have Tubex deer browse protection installed in the spring/summer if browse is evidenced.

# of plants	Scientific Name	Common Name
3	Acer negundo	boxelder
3	Cornus sericea	Dogwood
4	Frangula californica	Coffeeberry
10	Holodiscus discolor	Oceanspray
3	Juglans hindsii	CA Black Walnut
4	Physocarpus capitatus	ninebark
3	Quercus agrifolia	coast live oak
5	Ribes sanguineum	Red Flowering Currant
5	Rubus parviflorus	Thimbleberry
3	Sambucus nigra ssp. Cerulea	Blue Elderberry
40	Salix spp.	Willow

Table 1. Plants installed in Downstream site of Project 2016-03.

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#### **Upstream Site**

The upstream site (N 38° 15.746', W122° 50.995') is an extension of the existing fenced area that was planted by STRAW along Stemple Creek in the past. By extending the fenced area, habitat connectivity, water quality, and biodiversity will all be improved. The landowner prefers low-growing native plants for this area to maintain visibility of pastures from the house. Plant palette includes a variety of native plants chosen for site suitability, climate change resilience, and landowner preferences (Table 2).

# of plants	Scientific Name	Common Name
2	Acer negundo	boxelder
6	Calycanthus occidentalis	Spicebush
17	Ceanothus thyrsiflorus	Blue Blossom
10	Frangula californica	Coffeeberry
10	Heteromeles arbutifolia	Toyon
14	Holodiscus discolor	Oceanspray
2	Juglans hindsii	Black Walnut
8	Lonicera involucrata	Twinberry
2	Quercus agrifolia	Coast live oak
6	Ribes sanguineum	Red Flowering Currant
3	Rosa californica	CA Rose
11	Rubus parviflorus	Thimbleberry
2	Sambucus nigra ssp.Cerulea	blue elderberry
8	Symphoricarpos albus	Snowberry

Table 2. Plants installed in Upstream site of Project 2016-03.

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#### **Upstream Tributary Site**

Willow sprigging was completed by staff at the upstream tributary site N 38°15.227', W 122° 51.104' (Figure 1). This was installed with the goal of reducing sediment input, shading the creek, and connecting existing habitat. There is approximately 100 feet of bank space where willows were installed approximately 5 feet apart for a total of 40 willow sprigs installed.

## SERVICES PROVIDED BY POINT BLUE

#### **DESIGN AND IMPLEMENTATION:**

- STRAW staff visited the property to determine planting plans.
- Staff and interns procured all materials for the project.
- Staff prepared site for student planting days, including layout marking and identification and marking of hazards.
- Staff installed tree and shrub containers and critical area plantings with student and community volunteers.
- Staff and interns oversaw the distribution of students, adult volunteers, and supervisors throughout the work site to ensure project quality and success.
- Staff noted the number and type of plantings installed.

#### **EDUCATION:**

- Teachers had the opportunity to participate in our annual Watershed Week, a three-day professional development workshop that focuses on the many aspects of watershed science.
- Teachers had the opportunity to participate in one network event.
- Students received an in-class pre-planting presentation about their project, including watershed and restoration science, as well as on-site training.
- Classes received any additional in-class and/or field activities as requested by their teacher to supplement their traditional class curriculum.

#### Exhibit C: Photo Monitoring



Pre-construction view when the project was first proposed (4/2015). The pile of rip rap (left) is visible just downstream of the large willow tree.



Post-construction (06/28/17) view of the removed rip rap and eroding bank. Tposts and coages are protecting native plant installations.



View looking upstream at the recently sloped grade (07/213/17) with erosion control blanket where the rip rap pile was removed. Willow stakes were installed later that fall.



Post-construction (o6/28/17) photo of the removed rip rap pile. At top of bank, willow stakes with 3' spacing are difficult to see due to low vigor; the cages of the container plants on the bank within cages and t-posts are easy to see.



Construction site spoils pile placed above the 100-year storm mark (09/13/17).



Post-construction (06/28/17) view of the spoils pile.



Downstream view located above the recently repaired site (09/13/17). Construction waited until creek pools were low enough and before the winter rains.



Post-construction (06/28/17) downstream view located above project site. The graded repair held up after a wet winter and several flood stage events.



Pre-construction (7/2016) view of eroding bank caused by the historical pile of riprap. This bank will be planted.



Post-construction (06/28/17) view of eroding bank with willow stakes installed at top of bank.



Pre-construction (7/2016) view of the steep bare eroding bank.



Post-construction (06/28/17) view of the eroding bank that is less steep and naturally revegetating.



Close up of sprouting willow stake installed at the top of the eroding bank with 2'-4' spacing. These willow stakes at the top of bank had high vigor.



View of the row of willow stakes installed at the top of bank with about 2'-3' spacing (06/28/17). Several volunteer willows are taking root along the slope.



Post-construction (06/28/17) view of fence proximity (7') to eroding bank. Sprouting willow stakes are visible at top of eroding bank.



Post-construction view of container plantings with eroding bank in the background (06/28/17).

**Project 2016-03** Erosion and Sediment Control Project



View of the Upstream Site planted by STRAW.



Close up of one of the native plants in the Upstream Site (06/28/17).



View of Upstream Tributary Site along the Tomales-Petaluma Road where STRAW installed 40 willow stakes with 5' spacing.



An eroding bank at the Upstream Tributary Site with several willow stakes installed that are sprouting with high vigor (06/28/17).

## **PROJECT PROFILE: #2016-07**



Project: Watershed: Practices: Project Funding	2016-07 Stemple Creek, Heavy Use Area	, Subwatershed: Unnamed Creek a Protection (1 Management Practice)
& Parnters:	\$78,000	Total Project
	\$35,552	Marin Resource Conservation District, Marin County Measure A
	\$34,648	United States Department of Agriculture Natural Resources Conservation Service's Environmental Quality Incontinues Program
	\$ 7,800	Landowner/Marin Agricultural Land Trust

## **Project Overview**

The **Heavy Use Area Protection Project, 2016-07**, was part of the Conserving Our Watersheds (COW) Program. The program assists agricultural operations with stewardship activities that improve water quality. The conservation practices in this project improved water quality by reducing pathogen, nutrient and sediment inputs from a livestock heavy use area into a watershed drainage. This was achieved by constructing a concrete pad and curb to reduce soil erosion, improve storm water management and manure removal (Table 1). In total, approximately 160 cubic yards of concrete was poured to construct the heavy use area. The new concrete pad and curb will prevent nearly 10 tons of sediment from eroding and delivering sediment to Stemple Creek annually.

1 /		6 6
Project Information	Quantity	Unit
Ranch area	219	Acres
Heavy use project area	7,202	Square feet
Heavy use area pad and curb	127	Cubic yards concrete
Heavy use area stand-alone curb	13	Cubic yards concrete

Table 1. Pr	e-construction	project area	dimensions	and engin	eering estimates.
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#### Ranch Location:

The ranch is located on Tomales-Petaluma Road, approximately 0.8 miles east of Alexander Road and 0.5 miles west of Chileno Valley Road, and is bisected by an unnamed tributary stream to Stemple Creek (Figure 1: Map).

#### **Project Location:**

The project is located on an upland area adjacent to the left bank of the unnamed tributary, approximately 0.89 river miles upstream from its confluence with Stemple Creek, and approximately 0.66 river miles upstream of the Tomales-Petaluma Road stream crossing.

#### HUC 12: 180500050303

#### Environmental Conditions:

The site is located within the Stemple Creek watershed in west Marin County, California. Stemple Creek has U.S. Environmental Protection Agency mandated Total Maximum Daily Load requirements for both nutrients and sediment. The dairy is adjacent to a tributary. A concrete walkway (see right photo) takes the milking stock to the milking barn, free-stall barn and a pasture across the creek,



which the cows access by crossing a livestock bridge. Between the tributary and walkway is a heavy use area that the dairy wanted to make improvements to, hence the operators started this project. The landowner's heavy use area project addresses the Stemple Creek TMDLs by prohibiting soil erosion and the delivery of sediment to the stream, as well as allowing for more efficient manure removal and the reduction of nutrients in stormwater runoff.

## Historical Partnership and Commitment:

The ranch has undertaken numerous projects in cooperation with the Marin Resource Conservation District (Marin RCD), the Marin Agricultural Land Trust, and United States Department of Agriculture Natural Resources Conservation Services (USDA NRCS) to improve and enhance the ecological value of the land.

## Past and Current projects include:

- Fence (382), 3,900 feet for use as a barrier to wildlife, livestock or people. Completed in 2012.
- Watering Facility (614), four troughs installed to provide drinking water for livestock and/or wildlife. Completed in 2012.
- Heavy Use Area Protection (561), 1 acre of heavily used areas protected from erosion with vegetation, surfacing material or mechanical structures. Completed in 2012.
- Pipeline (516), 4,260ft of 4-inch buried plastic pipeline installed to convey water from supply source to points of use. Completed in 2012.
- Irrigation System, Sprinkler (442), sprinkler system installed to irrigate 50 acres without waste or erosion. Completed in 2013.
- Watering Facility (614), three troughs installed to provide drinking water for livestock and/or wildlife. Completed in 2014.
- Heavy Use Area Protection (561), 1 acre of heavily used areas protected from erosion with vegetation, surfacing material or mechanical structures. Completed in 2014.
- Watering Facility (614), one 5,000 gallon tank installed to provide drinking water for livestock which will facilitate improved livestock distribution. Completed in 2014.
- Fence (382), 4,100 feet for use as a barrier to wildlife, livestock or people. Completed in 2014.
- Herbaceous Weed Control (315), removal and/or control of herbaceous weeds including invasive, noxious prohibited plants on 119 acres. Completed in 2014.
- Nutrient Management (590), management of the amount, form, placement and timing of plant nutrient application on 35 acres. Completed in 2014.
- Range Planting (550), establish adapted perennial vegetation to restore a plant community similar to historic climax community on 119 acres utilizing a drill. Completed 2015.

Heavy Use Area Protection Project

• Range Planting (550), establish adapted perennial vegetation to restore a plant community similar to historic climax community on 15 acres utilizing broadcast seeder. Completed 2015.

## Phase I. Design and Implementation

## Design:

Designs were developed by Erica Mikesh, P.E., with the USDA NRCS, in cooperation with the Marin RCD, MALT, and the landowner (Attachment A). The project constructed a heavy use area concrete slab to provide a stable, non-erodible surface for an area used by cattle, and a concrete curb to prevent runoff from the heavy use area from entering the adjacent stream course. By constructing the slab and curb, the USDA NRCS practice, Heavy Use Area Protection has been realized.

Heavy Use Area Protection (561)
 *Objective 1:* To protect water quality, air quality, reduce soil erosion and improve aesthetics and/or livestock health.

## The following CEQA authorization and permits were obtained for this project:

This project, #2016-08, fit within a categorical exempt under CEQA, therefore, the Marin RCD filed a Notice of Exemption. A biological report and an archeological report were created by USDA NRCS for this location before any work commenced.

- 🛛 No Permits Required
- $\square$  §1600 CA Department of Fish and Wildlife
- $\square$  §401 Water Quality Certification
- $\square$  §404 US Army Corps of Engineers
- County of Marin

## Implementation:

Marin RCD contracted with Gold Ridge Resource Conservation District to manage this project and hired the contractor to install this project: concrete pad and curbs creating the Heavy Use Area Protection (see photo right from installation). The work was completed in late September 2016 (Table 2).



Project Information	Quantity	Unit
Heavy use project area pad and curb	140.0	Cubic yards concrete
Heavy use project area stand-alone curb	20.0	Cubic yards concrete
Estimated sediment load reduction <sup>1</sup>	9.6	Tons/year

#### Table 2. As-built project dimensions.

<sup>1</sup> Assumes a lowering rate of 0.3 feet per decade for the heavy use area if the project had not been constructed.

## Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes photo monitoring, a Landowner Questionnaire, and Project Assessment Checklist to evaluate the functionality of the implemented project.

#### Photo Monitoring:

The Project Manager documented construction before, during and after, see photos taken on pages 6-7.

#### Landowner Questionnaire:

Overall, the installation of the conservation practices met the intended goals of the landowner. The landowner foresees an improvement in the way he can manage his livestock and enhance the productivity of the land by implementing rotational grazing through the division of fields. He also expects the project to reduce stress upon the property's natural resources by reducing sedimentation and increasing vegetation. During the process, the landowner was pleased with the Marin RCD's performance although he did state the funding process and paperwork was confusing at times and could be simplified. The landowner is interested in working with Marin RCD again, but has no specific project in mind at this time.

#### **Project Assessment Checklist:**

As of June 2017, the Project Assessment Checklist has not been filled out for this project, because the form is designed to evaluate a project after at least one rainy season. Marin RCD staff plan to visit the project and complete this monitoring protocol pending funding constraints.

Project #2016-07 Heavy Use Area Protection Project





S 0 -0 N # θL Figure 1.

#### Project 2016-07 *Heavy Use Area Protection Project*



Pre-construction view of heavy use area with freestall barn in the back ground and corner of old hay barn at right (looking west).



During construction view of heavy use area during import and spreading of the base rock with free-stall barn in the background. (08/2016).



During construction photo of the installation of steel reinforcement bars on 1ft centers per NRCS standards (09/2016).



Pouring stand-alone concrete curb along fence line (09/2016).

Project 2016-07 Heavy Use Area Protection Project



During construction view of pouring and grooving concrete pad (09/2016).



Pot-construction view of the finished grooved slab and curb following concrete pour (10/2016).

## **PROJECT PROFILE: #2016-08**



Project: Watershed: Practices:	2016-08 Walker Creek Pipeline Troi	2016-08 Walker Creek, Subwatershed: Keys Creek Pipeline, Trough (1 Management Practice)			
Project Cost:	ripenne, rro	ripolino, rrough (r hundgomone rruotico)			
& Partners:	\$11,286.73	Total Cost			
	\$ 3,250.00	Marin Resource Conservation District, California Department of Water Resources			
	\$ 8,036.73	Landowner			

## **Project Overview**

The **Water Development, Project 2016-08,** was part of the Conserving Our Watersheds Program. This program supports water quality improvements on ranches by reducing non-point source pollutants entering into Tomales Bay. The program was positioned to assist ranchers with projects to increase water quantity which proved timely in 2015 when the worst drought in California's history culminated; approximately 92% of the state was recorded to be affected by severe drought conditions. The Conserving Our Watershed program, beginning in 2015, shifted its focus to assist ranchers with drought concerns with the implementation of water developments to increase on-farm water availability and improve livestock distribution; practices designed to improve rangeland health and water holding capacity. The drought persisted into 2016, although Marin County received average rainfall, and it wasn't until 2017 that above average rains provided drought relief to the state.

The goal of Project 2016-08 was to improve water availability for the farm's leased paddock, and will decrease pathogen discharge off the paddock by increasing the distance between the trough and a waterway running into Keys Creek, a high priority reach of Walker Creek (Map 1). Water quality samples taken from Keys Creek frequently test high for fecal coliform; therefore, it is important for local agricultural business to implement best management practices that will help reduce concentration of livestock coliform into the creek.

#### Farm Location:

The farm is located in Tomales, Marin County, California. The property is located along a tributary to Keys Creek. See Table 1 for dimensions of the farm and Keys Creek.

## Project Location:

The project is located in the center of an open pasture west of the apple orchard.

HUC 12: 180500050304 STREAM REACH CODE: 18050005000117

#### Environmental Conditions:

Located in coastal Marin County, the farm produces apples. A side paddock on the farm supports a herd of Highlander cattle seasonally (summer). Rangeland varies in elevation from 50–150 feet. The dominant soil mapped in the paddock is Sobega loam (173-174) with 9–15% slopes. The parent material consists of a residuum weathered from sandstone. Tomales loam soils are moderately well-drained and have a restrictive depth of 40–60 inch depth to the paralithic bedrock (coastal loamy claypan). The Sobega loam soils are well drained with restrictive paralithic bedrock ranging from 20–40 inches.

Rangeland vegetation consists of annual and perennial grasses and forbs with a tall windbreak of Cypress trees. A small stretch of a Keys Creek tributary is the south end border of the property is well vegetated

#### **Project 2013-004** *Riparian Planting, Livestock Fencing and Water Development*

with a moderate canopy cover from willows, and vegetated banks from blackberry thickets, poison oak, rushes, sedges and herbaceous wetland plants.

#### Partnership:

This is the first time the landowner is working with the Marin Resource Conservation District (Marin RCD) on a conservation project.

Table 1. Project area dimensions.

Project Information	Area	Unit
Ranch area	18.4	Acres
Project area: paddock	14.5	Acres
Keys Creek tributary total length on ranch	0.1	Mile
Total length of mainstem Keys Creek	3.5	Miles
Keys Creek watershed area	3,035.0	Acres

## Phase I. Design and Implementation

**Design:** The landowners began planning their project before asking Marin RCD for assistance. They installed a solar pump, tank and a portion of pipeline for this water development (Figure 1 and Map 1). The landowners requested funding assistance from Marin RCD for the final segment of pipeline, 65 LF,

and a trough. Marin RCD hired a United State Department of Agriculture Natural Resources Conservation Service (USDA NRCS) Technical Service (TSP) to evaluate the project proposal and discuss with the landowner. The project is simple and straight so minimal design input was needed. The TSP compiled necessary specifications for the installation of the USDA NRCS conservation practices.

The practice number and associated practice objectives

1. Water Development: Pipeline and Trough (516/614) *Objective 1:* Create a permanent water source for



Figure 1. The landowners developed this spring with a tank and solar pump in preparation for the installation of the trough.

Provider options forward, the planned

included:

livestock

that seasonal graze the field. This will create a reliable source of water, so the farm doesn't have to borrow water from their neighbor. In addition, the new location will improve water quality by increasing the distance between cow patties and waterways because the old water facility was located by a road drainage and got very muddy, while the new water facility is located in the middle of a field with a gravel pad. Therefore, sediment and pathogen discharging to Keys Creek will decrease by placing the trough in a better location with a better foundation.

#### **Project 2013-004** *Riparian Planting, Livestock Fencing and Water Development*

**Implementation:** Marin RCD secured a qualified contractor to complete the work. The 400-gallon trough, complete with a wildlife escape ramp, was installed on a gravel pad in the middle of the paddock (Figure 3-4). The trough is connected to a pipeline the runs along the east boundary of the paddock from the spring development. It took 65LF of pipeline to connect the trough to the main pipeline. The work was finished in a few days; Table 2 summarizes the final project dimensions measured by the TSP during the final observation and sign off.

Table 2. Final dimensions of Project 2016-08, and subsequent non-point source pollutant load reduction.

Best Management Practice	USDA NRCS Conservation Practices	Amount	Unit		
Water Development	Pipeline	65	Linear foot		
	Trough	400	Gallon		
Load Reduction from Practice Installation					
Estimated Pathogen Reduction	on <sup>1</sup>	90-99%	Pathogen concentration		
<sup>1</sup> Based on several studies identified in Introduction to Waterborne Pathogens in Agricultural					
Water sheus by USDA III 2012 and Conservation benefits of Rangeland Practices by briske iii 2011					

## The following CEQA authorization and permits were obtained for this project:

This project, #2016-08, was authorized through Marin RCD's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance. A biological report and an archeological report were created for this location before any work commenced.

- 🛛 No Permits Required
- S1600 CA Department of Fish and Wildlife
- $\square$  §401 Water Quality Certification
- □ §404 US Army Corps of Engineers
- $\Box$  County of Marin

## Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard RZMP monitoring protocol includes filling out the following paperwork 1-year post-construction: a Landowner Questionnaire, so the landowner can reflect on their project and a Project Assessment Checklist to evaluate the functionality of the implemented project. As of June 2017, these monitoring forms have not been filled out; however, pending funding constraints, Marin RCD will complete these forms in the near future.
#### Project 2013-004

Riparian Planting, Livestock Fencing and Water Development



Map 1. Arial view of Project 2016-08. The pink lines are the parcel boundary lines. The landowners installed the 'livestock and irrigation supply' north of the drinking water supply. The trough (shown as the orange polygon) tied into existing a pipeline (new pipeline going from trough to existing pipeline is the orange dashed line) and installed south of the old spring in the center of the field to provide livestock with a better water source. The proposed exclusionary fencing was not installed due to minimal livestock use of the riparian area. The riparian corridor is well vegetated without blatant damage from livestock. Cattle take shade by the windbreak more often than the riparian corridor.

### **Project 2016-08** *Water Development*

Before and After Construction Photos



Figure 2. Pre-construction photo of trough location (07/15/16).



Figure 3. Post-construction photo of trough location (09/22/16).

# **PROJECT PROFILE: #2016-09**



Watershed:	Tomales I	Tomales Bay			
Practices:	Water Dev	Water Development (1 Management Practice)			
Project Cost					
& Partners:	\$50,060	Total Cost			
	\$32,944	Marin Resource Conservation District,			
		319(h) State Water Resources Control Board			
	\$11,258	United States Department of Agriculture, Natural Resources			
		Conservation Service's Environmental Quality Incentives			
		Program			
	\$5,006	Landowner/ Marin Agricultural Land Trust			

# **Project Overview**

The **Front Field Spring Development Project**, **#2016-09**, is part of an extensive regional stewardship program entitled, Conserving Our Watershed, established in part to promote and support the advancement of water quality improvements to improve water quality by targeting pathogen load reduction. The purpose of the project was to assist the ranch by providing an alternative water source for livestock therefore limiting livestock impacts along an intermittent tributary to Walker Creek. The tributary was fenced and erosion control measures were implemented to reduce erosion in the tributary through the Conserving Our Watersheds Program Phase II (Figure. 1), but no water source was viable at the time of installation; therefore, a series of gates were installed to limit livestock access to the bedrock areas of the tributary to drink. A viable water source was found was a couple years later and funded through Phase V of the Conserving Our Watersheds Program.

The ranch completed one (1) management project that is made up of a suite of United States Department of Agriculture Natural Resources Conservation District (USDA NRCS) conservation practices: spring development, pipeline, and water facilities. The implemented conservation practices were installed to improve water quality by providing an alternative water source for livestock to reduce contact with the tributary, thus reducing pathogens.



Figure 1. Aerial photo with design call-outs of the various practices to protect a tributary to Walker Creek. A reliable water source was not found at the time of installation; hence a series of gates and flood gates were installed on the downstream end of the tributary (left side of photo) to control livestock access.

# Project 2016-09

Front Field Spring Development

### Ranch Location:

The ranch is located approximately 18 miles northeast of Point Reyes Station in Marin County. It is accessible from Cerini Road south of the Tomales–Petaluma Road.

### **Project Location:**

The project is at the northern end of the property near Cerini Road and the ranch driveway. To the west of the driveway is an unnamed, intermittent tributary of lower Walker Creek which discharges into Tomales Bay and Pacific Ocean. The location of the spring development is in the slope just before the tributary plunges down a steep grade to Walker Creek. The rest of the project (pipeline and water facilities) is located in the fields around the tributary (Map 1).

# Environmental conditions:

The ranch is 350 acres of coastal rangeland with elevations ranging from 225 - 280 feet. The ranch supports a sheep and cattle livestock operation.

The soil type of the project location is Sobega loam (173), 5-15 % slopes, parent material weathered from coarse grained sandstone. Sobega soil types are found on uplands and are moderately deep, well-drained soils with a restrictive depth of 20-40 inches to the paralithic bedrock. Vegetation consists of annual and perennial grasses, and forbes with scattered stands of eucalyptus trees throughout the rangeland. The tributary supports willows, a few oaks, California rose and other herbaceous species, sedges and rushes.

# Historical Partnership and Commitment:

The landowner has engaged in past conservation projects partnering with the Marin Resource Conservation District (RCD). The ranch is protected by a Marin Agricultural Land Trust (MALT) agricultural conservation easement and has participated with USDA NRCS programs in the past to improve and enhance the ecological value of the land. Past known partnership conservation improvements include:

Past and current projects include:

- 2016, Front Field Spring Development
   Marin RCD, MALT and NRCS funded
- 2016, Back Field Spring Developments

   NRCS funded
- 2014, Gully and Headcut Repair and Stream Restoration.
  - Marin RCD, MALT and NRCS funded
- 2012, Walker Creek Mainstem and Tributary Riparian Planting, Climate Adaption
  - Marin RCD, 319(h) and Point Blue Conservation Science Student and Teachers Restoring a Watershed funds
- 2011, Mainstem Walker Creek Streambank Repair, Riparian fencing, Water Development and Gorse Removal: Walker Creek Mercury Control Project
  - Marin RCD, MALT and USDA NRCS Environmental Quality Incentives Program funded project
- 2001, Riparian Fencing and Water Development: Walker Creek Watershed Program

# • Marin RCD Design and Implementation

### Design:

The landowner proposed a viable water source to supply the ranch's front field in January 2016, which was evaluated by Marin RCD's Partner Civil Engineer. The two determined the spring was a reliable source and engaged Marin RCD and NRCS, since both entities had contracts with the landowner to complete an alternative water source in the front field to keep livestock out of a tributary to Walker Creek. The design process began in February 2016 with all the necessary partners: Partner Civil Engineer, USDA NRCS Rangeland Specialist, Marin RCD staff and MALT to meet the goals and objectives set by all partners and landowner. By March 2016, the project design was submitted to NRCS for review.

The design plan involved developing a spring, installing a 500 gal. pressure tank and holding tank along with a solar pump to move water to an upland 5,000 gal. tank that would then gravity feed water to several new troughs. The design consisted of a suite of USDA NRCS conservation practices and specifications prescribed to meet the matching funding requirements of NRCS's Environmental Quality Incentives Program.

The practice, practice number, and associated practice objective included:

Spring Development (574, 533, 516, & 614)
 *Objective 1:* The alternative water source will provide drinking water to livestock, reduce livestock from direct contact with the tributary and improve animal distribution.

### Environmental Documentation:

This project, # 2016-09, was authorized through Marin RCD's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance. The following permits were obtained for this project:

- ⊠ No Permits Required
- $\square$  §1600 CA Department of Fish and Wildlife
- □ §401 Water Quality Certification
- □ §404 US Army Corps Wetland
- $\Box$  County of Marin

### Implementation:

The pre-construction meeting was held on July 19, 2016. A spring box was installed with a spring overflow. The spring was connected to a 550 gal. holding tank (with an overflow pipe) connected to a solar pump paired with a pressure tank. The solar pump moved water uphill to an upland tank (5,000 gal.), which then gravity fed lines to two new water troughs in rangeland pastures. The total length of 1¼" PVC pipeline installed was 3,762 linear feet.

Troughs included wildlife escape ramps. The final walk though was held October 4, 2016 and the sign off letter was finished on Oct. 5, 2016.

Project Information	Area	Unit			
Ranch area	350	Acres			
Area of ranch front field		170	Acres		
Project area (where prac	tices were installed)	10.6	Acres		
Total length of tributary	to walker creek	3,360	Linear feet		
Total length of tributary section of tributary is not	protected due to project; the lower t the livestock's water source.	1,050	Linear feet		
Management Practice	USDA NRCS Conservation Practices	Amount	Unit		
Spring Development	Water Facility: Tank – 1 installed Water Facility : Tank – 1 installed Water Facility Trough- 2 installed	5,000 550 450	Gallon Gallon Gallon		
	Spring Development	1	Count		
	Pumping Plant	1	Solar Pump		
	Pipeline	3,762	Linear foot		
Load Reduction from Practice Installation					
Sediment Load Reduction <sup>1</sup>	91.5	Tons/Year			
Estimated Pathogen Reduc	90-99%	Pathogen concentration			

Table 1. Project area dimensions.

<sup>1</sup>Calculated from Water Board approved Region 5 Model

<sup>2</sup>Based on several studies identified in Introduction to Waterborne Pathogens in Agricultural Watersheds by USDA in 2012 and Conservation Benefits of Rangeland Practices by Briske in 2011

### Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard RZMP monitoring protocol includes filling out the following paperwork 1-year post-construction: a Landowner Questionnaire, so the landowner can reflect on their project and a Project Assessment Checklist to evaluate the functionality of the implemented project. As of June 2017, these monitoring forms have not been filled out; however, pending funding constraints, Marin RCD will complete these forms in the near future.



Map 1. An aerial photo with topographic lines in green and periwinkle of the project location. The layout of Project 2016-09 is shown by a blue line that is the pipeline route. The fenced out tributary runs southeast and into Walker Creek (southwest in the photo).



Pre-construction photo of tank location in the upland area north of the tributary to Walker Creek. Photo taken 07/2016.



Pre-construction photo of spring development located at the far west side of the tributary. Photo taken before construction in 05/2016.



Post-construction photo of tank installed in the upland area north of the tributary to Walker Creek. Photo taken 10/2016.



Post-construction photo of spring development located at the far west side of the tributary. Photo taken after construction in 10/2016.



New trough and recently covered pipeline indicated by the line of hay on the ground in the background. Photo taken in 10/2016.



The Walker Creek tributary and the gate system installed for livestock access before the spring was developed. Photo taken in 10/2016.



View of crossing over the tributary to Walker Creek and one of the newly installed troughs in the background. Photo taken in 10/2016.



Photo of the installed solar panels and pressure tank used to pump the water from the spring to the tanks in the upland areas. Photo taken in 10/2016.

# **PROJECT PROFILE: #2016-10**



Watershed:	Tomales E	Bay		
Practices:	Water Dev	Water Development (1 Management Practice)		
Project Cost & Partners:	\$39,450	Total Cost		
	\$ 26,800	Marin Resource Conservation District, 319(h) State Water Resources Control Board		
	\$ 12,650	Landowner		

# **Project Overview**

The Water Development Project, 2016-10, was part of the Conserving Our Watersheds Program. A ten-year program supporting water quality improvements on ranches by reducing non-point source pollutants entering into Tomales Bay. In 2015 the worst drought in California's history culminated; approximately 92% of the state was recorded to be affected by severe drought conditions. The drought persisted into 2016, although Marin County received average rainfall, and it wasn't until 2017 that above average rains provided drought relief to the state. The Conserving Our Watershed program was able to assist landowners with project that not only improved water quality but increase water quantity/availability. The implementation of water developments, such as this project, increased on-farm water availability and improve livestock distribution; practices designed to improve rangeland health and water holding capacity.

The intention of the project was to reduce non-point source pollutants loading in a direct tributary to Tomales Bay from an instream livestock pond. The pond spillway was failing and a reliable water source was needed in the field to keep livestock out of the pond. In order to protect the pond and reduce erosion into Tomales Bay, the landowner fixed the spillway and the Conserving Our Watersheds Program installed a solar pump system to create a reliable water supply system to ensure that the livestock have an alternative water supply other than the pond. This work will help keep livestock out of the pond area, thus preventing pathogens from directly loading into the pond, spillway and creek area.

Through the COW Program, the ranch completed one (1) project: water development, which is made up of a suite of United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) conservation practices: pumping facility, water facility and pipeline. The implemented management practice was installed to improve water quality by providing an alternative water source to reduce livestock contact with the tributary, thus reducing pathogens.

This Project Profile focuses on the management practices implemented through the COW Program; therefore, the spillway repair will not be discussed in detail in this report. The spillway repair (see photo to the right) was completed by the landowner without Marin Resource Conservation District's (RCD) assistance, yet the fix was critical to the overall project.



### Ranch Location:

The ranch is located approximately 10 miles northwest of Point Reyes Station in Marin County. It is accessible from the Shoreline Highway.

### **Project Location:**

The project sited on a 261 acre parcel just north of Marshall, CA (Map 1). The parcel has two unnamed tributaries: a smaller one with two in-stream ponds that drains into a larger tributary that flows directly into Tomales Bay (Table 1).

### Environmental conditions:

The site is located on coastal rangeland in Marin County off the eastern shore of Tomales Bay. The ranch elevations range from 225 - 280 feet. The ranch is used to graze cattle livestock. The soil type of the project location is Yorkville-Rock outcrop complex, 15 - 30% slopes, and Olompali loan, 9 – 15% slopes. The Yorkville-Rock outcrop complex is moderately well drained and has a depth of 40 – 60 inches to paralithic bedrock. Olompali loam drains poorly and at a depth of 13 inches there is an abrupt textural change. The small intermittent tributary with the two in-stream ponds is in the Olompali loam soil type, which is mainly vegetated by grasses and lacks a robust riparian corridor. The Yorkville-Rock outcrop complex is more upland and supports rangeland annual and perennial grasses and forbes. The main unnamed tributary has a different soil type of Tocaloma-Saurin association and supports a robust riparian corridor.

### Table 1. Project area dimensions.

Project Information	Area	Unit
Ranch area	261.0	Acres
Area of ranch affected by project	173.0	Acres
Total length of tributary with in-stream ponds	0.8	Miles
Total length of stream (not including side ephemerals/tributaries)	1.9	Miles
Total length of stream protected	2,420.0	Linear feet

### Historical Partnership and Commitment:

The landowner has engaged in past conservation projects partnering with the Marin RCD. Past known partnership conservation improvements include:

### Past and current projects include:

- 2016, water development: solar pump, tank and trough installation
   Marin RCD, 319(h)
- 2010, fencing and water development
  - Marin RCD, 319(h)

# **Design and Implementation**

### Design:

In April 2016, Marin RCD's partner Civil Engineer designed the water development with the assistance of Marin RCD staff and an USDA NRCS Rangeland Specialist to meet the goals and objectives set by all partners and landowner. The design included the placement of a

solar pump in the upper pond and tank (Map 2). The project was designed using USDA NRCS's conservation practices and standards.

The practice, practice number, and associated practice objective included:

1) Water Development included 1<sup>1</sup>/<sub>4</sub>" PVC pipe pipeline (2,000 linear feet), pump facility, and one water tank (5,000 gallons).

*Objective 1:* The alternative water source will provide a reliable source of drinking water to livestock in order to maintain animal distribution and reduce non-point source pollutants loading into a direct tributary of Tomales Bay.

### Environmental Documentation:

This project, # 2016-09, was authorized through Marin RCD's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance. The following permits were obtained for this project:

 $\boxtimes$  No Permits Required

- □ §1600 CA Department of Fish and Wildlife
- □ §401 Water Quality Certification
- □ §404 US Army Corps Wetland
- $\Box$  County of Marin

### Implementation:

Marin RCD secured a qualified contractor and construction began in 10/2016. The contractor installed a solar pump system to move water from the pond to a 5,000-gallon tank at the top of the hill by a rock outcropping. To convey the water from pond to tank, 2,000 LF of 1¼" PVC pipeline was installed in 1,000 LF of ditch which includes electrical lines to shut down the pump when the tank float hits capacity. Lastly, a 400-gallon trough with a wildlife escape ramp was installed adjacent to the tank. The Project Civil Engineer certified the project installation on 11/28/2016 (Table 2). Before and after photos as well as close ups of the installed practices are on page 6.

Management Practice	USDA NRCS Conservation Practices	Measurement	Unit
Water development	Tank (1 installed) Pipeline Trough (1 installed)	5,000 1,011 400	Gallon Linear foot Gallon
Estimated pathogen reduction <sup>1</sup>		90-99%	Pathogen concentration

### Table 2. Completed project dimensions.

<sup>1</sup>Based on several studies identified in Introduction to Waterborne Pathogens in Agricultural Watersheds by USDA in 2012 and Conservation Benefits of Rangeland Practices by Briske in 2011

# Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard RZMP monitoring protocol includes filling out the following paperwork 1-year post-construction: a Landowner Questionnaire, so the landowner can reflect on their project and a Project Assessment Checklist to evaluate the functionality of the implemented project. As of June 2017, these monitoring forms have not been filled out; however, pending funding contstraints, Marin RCD will complete these forms in the near future.



Map 1. Project 2016-10 is located on the highlighted parcel in the map just north of Marshall, CA.



Map 2. Arial photo of upper instream pond map and layout of Project 2016-10: blue line is the pipeline route and the white call out boxes show locations for solar pump, tank and trough. This map was created by the Project Civil Engineer.

# Treating Remaining High Priority Rangeland Pathogens Sites on Parklands in Tomales Bay Watershed

SWRCB Agreement # 14-422-252

# 2016 As-Built Drawings

Prepared for California State Water Resources Control Board

Prepared by Roxanne Hulme Foss, Range Management Specialist Point Reyes National Seashore National Park Service U.S. Department of Interior

2/8/2017

#### **Preface and Acknowledgements**

The preparation of this report was funded by a federal grant from the US Environmental Protection Agency (EPA) to the State Water Resources Control Board (SWRCB) to implement California's Nonpoint Source Program pursuant to Clean Water Act Section 319(h).

Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board. The contents of this document do not necessarily reflect the views and policies of the State Water resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

#### I. INTRODUCTION

The project 'Treating Remaining High Priority Rangeland Pathogens Sites on Parklands in Tomales Bay Watershed' is currently being implemented by Point Reyes National Seashore (PORE). PORE received support through a grant from the California State Water Resources Control Board (SWRCB) with funding from the U.S. Environmental Protection Agency (EPA) under the Federal Nonpoint Source Pollution Control Program (Clean Water Act Section 319h). The overall project goals are to: (1) implement remaining high-priority agricultural pollutant reduction conservation practices on National Park Service (NPS) lands within the Tomales Bay Watershed (TBW) consistent with the Tomales Bay Pathogen Total Maximum Daily Load (TMDL), and (2) increase understanding of variability in, and sources of potential pollutants within, the Olema Creek watershed (SFRWQCB 2001; SFRWQCB 2013).

This report acts in partial fulfillment of the first goal and the Deliverable Exhibit A: B 2.2 MPs Implementation: As-Built Drawings, as described in the Project-Specific Requirements of the Grant Agreement. This report summarizes all construction work completed in 2016 in accordance with the Grant Agreement. Draft and Final Project Reports will be submitted in a future quarter.

The following sections describe constructed conservation practices (CPs) that were implemented on two livestock-grazed PORE ranches: Cheda and R. Giacomini. These CPs follow existing standards and recommendations from the Natural Resources Conservation Service (NRCS). Both of these CPs are components of ongoing larger projects that include cattle exclusion fencing along adjacent riparian corridors.

#### **II. PROJECT DESCRIPTIONS**

#### A. Cheda Ranch Controlled Crossing (CHCC03)

<u>Project Conservation Practice Type</u>: Controlled Crossing/Road Improvements (NRCS CP: Access Road – 560 and Stream Crossing – 578)

Implementation Period: Construction occurred October 12-13, 2016

<u>Components Installed</u>: 920 sq. ft. of 4-8" cobble overlaid with Class II permeable aggregate base redirecting flow over road and filling in eroded areas.

<u>Additional Information</u>: This project is one component of a two-part project that will include riparian fencing on Cheda Creek. Fencing implementation was delayed due to contractor availability and unsuitable weather conditions. Fencing is expected to occur in Spring-Summer 2017. Riparian planting occurred in January 2017.

<u>Project Outcomes</u>: 20 linear feet of stream reach was protected. This project reduces potential pollutant delivery from the ranch road to Cheda Creek.

<u>Lessons Learned</u>: Although not part of the project scope, additional rock material applied to nonproblem areas of the road would have further increased resilience.

<u>Environmental Setting</u>: This project occurred upstream of the Cheda Ranch headquarters on the west slope of Cheda Creek (see figure below). The construction footprint of the rolling dip was limited to the existing road footprint and did not impact natural vegetation communities. Adjacent vegetation is dominated by upland grassland species, such as slender wild oat (*Avena barbata*), Italian thistle (*Carduus pycnocephalus*) and hedgehog dogtail grass (*Cynosurus echinatus*). The road project occurred within Cronkhite-Barnabe complex (#117) and Tocaloma-Saurin association (#185)<sup>1</sup>.

<u>Project Summary:</u> Road improvements were completed within the fenced Cheda Ranch controlled crossing on October 12-13, 2016. The road improvements were located at a series of sharp turns between ranch headquarters and the Cheda Creek stream crossing. All work occurred upslope of the Ordinary High Water Mark (OHWM). This portion of the road is fenced off and can be managed independently of the adjacent pastures, headquarters and riparian areas. Road improvements included the construction of one rolling dip feature along the existing ranch road that redirects flow off-road into natural vegetation to filter potential pollutants. Road work footprint consisted of recontouring and rocking approximately 920 sq. ft. of the ranch access road. Rock consisted of 4-8 inch cobble/gabion rock covered with class 2 permeable aggregate base rock applied to the rolling dip and eroded areas. All construction impacts occurred on the existing ranch road. No construction equipment crossed the creek.

<sup>&</sup>lt;sup>1</sup> USDA Soil Conservation Service. 1985. Soil Survey of Marin County, California.



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Treating Remaining High Priority Rangeland Pathogens Sites on Parklands in Tomales Bay Watershed SWRCB Agreement # 14-422-252

# Cheda Crossing (CHCC03)



# Cheda Crossing (CHCC03)



# Cheda Crossing (CHCC03)



#### B. R. Giacomini Ranch Controlled Crossing (GICC06)

Project Conservation Practice Type: Controlled Crossing (NRCS CP: Steam Crossing - 578)

#### Implementation Period: Construction October 11-12, 2016

<u>Components Installed</u>: 1210 sq. ft. of 4-8" cobble overlaid with Class II permeable aggregate base placed over contoured cattle access through fenced crossing area.

<u>Additional Information</u>: This project is one component of a two-part project that will include riparian fencing on John West Fork Creek. Fencing implementation was delayed due to contractor availability and unsuitable weather conditions. Fencing is expected to occur in Spring-Fall 2017. Riparian planting is expected to occur in winter of 2017-2018.

<u>Project Outcomes</u>: 20 linear feet of stream reach was protected. This project reduces potential pollutant delivery to a tributary of John West Fork Creek.

<u>Lessons Learned</u>: Layering the Class II permeable aggregate base on top of the 4-8" cobble locks in the smaller base rock into the larger cobble, forming a durable cattle crossing.

<u>Environmental Setting</u>: A cattle crossing on a tributary to John West Fork Creek was improved on October 11-12, 2016. This controlled crossing project is located less than 0.5 miles southeast of the R. Giacomini ranch headquarters and is within 250 feet of State Route 1 (SR1; see figure below). John West Fork Creek is an intermittent stream that flows down Bolinas Ridge passing through largely forested canyons before entering a culvert under SR1 just prior to its confluence with Olema Creek. Channel bed material within the tributary is comprised of cobble and gravel with finer materials (sand and silt) throughout. The site occurs in Yorkville clay loam (#206) at 15 to 30% slopes, characterized by high runoff rates and hazard of erosion<sup>2</sup>. Vegetation at the controlled crossing is dominated by an overstory of bay laurel (*Umbellularia californica*) with an understory of weedy annuals, such as hedgehog dogtail grass and Italian thistle.

<u>Project Summary</u>: This crossing allows for necessary cattle movement across the tributary between adjacent pastures. The crossing was previously fenced and can be managed separately from the adjacent grazed pastures. Minor grading and rock placement occurred on approximately 745 sq. ft. on the west bank and 465 sq. ft. on the east banks. Rock work consisted of placing 4-8 inch cobble/gabion rock covered with class 2 permeable aggregate base rock above the OHWM of the tributary. A small berm was installed at the top of each side of the crossing to prevent runoff from forming channels down each side of the crossing over time. Streambeds in this area are naturally cobbled and function with new rock laid down above the OHWM to reduce erosion and cattle residence time in the stream. This intermittent tributary was dry during the construction period.

<sup>&</sup>lt;sup>2</sup> USDA Soil Conservation Service. 1985. Soil Survey of Marin County, California.

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# R. Giacomini Crossing (GICC06)

# R. Giacomini Crossing (GICC06)



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### **PROJECT REPORT**

Project #2016-12 The STRAW Project A Project of Point Blue Conservation Science

# **PROJECT GOALS**

During the 2016/2017 season, Point Blue Conservation Science (Point Blue) Students and Teachers Restoring A Watershed (STRAW) Program, in partnership with Marin Resource Conservation District (MRCD) and Marin Agricultural Land Trust (MALT), completed one day of restoration work on November 21, 2016 along the banks of Walker Creek on Project #2016-12. The work completed stabilizes the streambank and slows erosion for improved water quality, increases overall riparian vegetation and tree canopy cover, improves carbon sequestration, and provides educational opportunities to local schools.

### **PROJECT DESCRIPTION**

The property is located at N 38° 13.441' W122° 54.568' in Tomales off of Hwy 1 and is part of the Walker Creek watershed which flows to Tomales Bay. At this location in the lower reaches, Walker Creek is tidally influenced and has perennial flow augmented by releases from the Soulajule reservoir. Soils are silty with moisture wicking up above the waterline. Substantial active erosion is evident at the site. Native vegetation in the area include red alder (*Alnus rubra*), willows (*Salix spp.*), boxelders (*Acer negundo*) and a variety of other species including native rushes and sedges.

Prunuske Chatham, Inc. (PCI) designed the creek revegetation plan and STRAW staff and students participating in the STRAW project installed all plantings. The work completed includes the installation of willow and alder sprigs on 5-foot on-center spacing along eroding banks at the toe of the slope to the base of the vertical bank face with *Juncus* and sedge species planted in between the woody species. All plant material was locally collected from existing mature vegetation.

# NUMBER AND TYPE OF PLANTING

Alder and Willow sprigs	76
Juncus and sedge transplants	74
TOTAL	150

**PROJECT SIZE** 

184 LINEAR FEET; 0.1 ACRES

# **PROJECT PARTICIPANTS**

Date	School	Grade	# Volunteers	Volunteer match amount
11/21/17	Tomales High School	9, 10, 11, 12	10	\$1,178

# SERVICES PROVIDED BY POINT BLUE

**DESIGN AND IMPLEMENTATION:** 

- STRAW staff visited the property to determine planting plans.
- Staff and interns procured all materials for the project.
- Staff prepared site for student planting days, including layout marking and identification and marking of hazards.
- Staff installed critical area plantings with student and community volunteers.
- Staff and interns oversaw the distribution of students, adult volunteers, and supervisors throughout the work site to ensure project quality and success.
- Staff noted the number and type of plantings installed.

### **EDUCATION:**

- Teachers had the opportunity to participate in our annual Watershed Week, a three-day professional development workshop that focuses on the many aspects of watershed science.
- Teachers had the opportunity to participate in one network event.
- Students received an in-class pre-planting presentation about their project, including watershed and restoration science, as well as on-site training and details.
- Classes received any additional in-class and/or field activities as requested by their teacher to supplement their traditional class curriculum.

# PROJECT PROFILE: #2013-001



Project:	2013-001		
Watershed:	Walker Creek, Subwatershed: Chileno Creek		
Practices:	Gully Repairs, Erosion Control, Revegetation and Fencing (8 total practices)		
Project Cost	\$98,867.00		
and Partners:	\$74,258.34	Marin Resource Conservation District,	
		319(h) State Water Resources Control Board,	
		State Coastal Conservancy	
	\$16,941.66	United States Department of Agriculture Natural	
		Resources Conservation Service Environmental Quality	
		Incentives Program 2013	
	\$ 7,667.00	Point Blue Conservation Science's Students and	
		Teachers Restoring A Watershed Program	

# **Project Overview**

The **Gully Repairs, Erosion Control, Revegetation and Fencing Project, 2013-001**, was part of the Tomales Bay Watershed Habitat Enhancement Program funded by the State Coastal Conservancy (SCC) and 319(h) State Water Resources Control Board (SWRCB) included within the Conserving Our Watersheds (COW) Program. The program assists agricultural operations with stewardship activities that improve water quality and native habitat. The conservation practices in this project improve water quality and native habitat by restoring and stabilizing portions of the 1,040 linear foot upland intermittent stream. The project repairs included stabilizing several active headcuts with grade control structures, riparian fencing, and critical area planting. The project also included restoring livestock crossings: one structure for water control with rock armoring at the inlet and outlet; and the other with a wet crossing.

In total, the ranch completed eight best management practices listed below with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) conservation practice name: two biotechnical repairs (a large and small grade stabilization structure/headcut repairs), one streambank stabilization, one structure for water control, one lined waterway, one wet crossing, riparian fencing, and critical area plantings throughout the gully with *Juncus* and willows. The conservation practices were implemented to improve water quality by reducing erosion and approximately 87.3 tons/ year of sedimentation transportation into the unnamed tributary of Chileno Creek.

### Ranch Location:

The ranch is located approximately 7.5 miles southeast of Tomales, California. The ranch is accessible by Chileno Valley Rd near mile marker 2.09, just off Tomales–Petaluma Road.

### **Project Location:**

The project is at the northern end of a 188.5-acre property off Chileno Valley Road. The project addresses issues at an unnamed, intermittent, tributary of Chileno Creek, which discharges into Walker Creek which outlets into Tomales Bay (Table 1 and Figure 1).

HUC 12: 180500050202 STREAM REACH CODE: 18050005001003

### Environmental Conditions:

The site is located on coastal rangeland in Marin County, elevations ranging from 263 - 345 feet. The ranch supports a cattle livestock operation. There are two main soil types found throughout project location. The upper area from the top of the tributary to the middle consists of Tomales-Steinbeck loams with 5 - 15 % slopes and residuum weathered from sandstone. These soils are moderately well-drained with a restrictive layer of 40 - 60

inches. The lower tributary along the creek is dominantly Clear Lake Clay (113), with 0 - 2% slopes, which are very deep and poorly drained soils. Clear Lake Clay soils are typically formed in fine-textured alluvium derived from sandstone or shale and generally located in basins and swales of drainages.

The vegetation is composed of forbes, primarily supporting annual non-native species such as Italian ryegrass (*Lolium multiflorum*), rabbitsfoot grass (*Polypogon monspeliensis*), Italian thistle (*Carduus pycnocephalus*), and other grasses not identifiable at the time of the site visit. Along the unnamed seasonal stream, the riparian corridor is composed of a few riparian clusters of low growing willows (*Salix lasiolepis*) and patches of native and non-native wetland plants including rushes (*Juncus sp.*), pennyroyal (*Mentha pulegium*), dock (*Rumex sp.*) and Himalayan blackberry (*Rubus armeniacus*).

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Project Information	Area	Unit
Ranch Area	188.5	Acres
Project Area	1.2	Acres
Total Length of Headcut	180	Linear feet
Total Length of Stream (including side ephemerals/tributaries)	1040	Linear feet

# Historical Partnership and Commitment:

The ranch has undertaken numerous projects in cooperation with the Marin Resource Conservation District (Marin RCD) and United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) to improve and enhance the ecological value of the land (Fig. 1).

Past and Current projects include:

- 2013 Gully Repairs, Erosion Control, Revegetation and Riparian Fencing
  - Marin RCD, NRCS Environmental Quality Incentives Program (EQIP)
- 2002 Walker Creek Watershed Program: Biotechnical Erosion Control, Revegetation and Riparian Fencing
  - Marin RCD, SCC, SWRCB, Department of Conservation and Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW)
- 1990 Walker Creek Watershed Program: Gully Repair
  - o Marin RCD, SCC

# Phase I. Design and Implementation

# Design:

A conservation plan was developed in the spring of 2012 through 2014 by a USDA NRCS Rangeland Specialist, NRCS Engineer and a consulting engineer from Prunuske Chatham, Inc. (PCI). The plan was designed to meet the goals and objectives set by all partners and the landowner. The plan involved stabilizing the active gully, repairing two cattle crossings and a side headcut advancing outward. To address the site issues, the design included biotechnical repairs and three types of critical area plantings along with riparian fencing to encompass the entire project of the upper and lower portions of the unnamed stream. The design consisted of a suite of NRCS conservation practices and specifications prescribed to meet the matching funding requirements of NRCS' EQIP.

The planned USDA NRCS' conservation practices (its number) and associated objectives:

1. Critical Area Planting (342)

*Objective 1*: Stabilize soil by planting willows and grasses, on highly erodible or critically eroding areas. This practice reduces damage from sediment and runoff to downstream areas and improves wildlife habitat and visual resources.

2. Fencing (328)

*Objective 2*: Manage land impacts caused by livestock activity.

# 3. Grade Stabilization (410)

*Objective 3:* Stabilize and protect side bank of stream against erosion to reduce sediment loads causing downstream damage and pollution, improve the stream for fish and wildlife habitat, and protect adjacent land from erosion damage.

# 4. Lined Waterways (468)

*Objective 4*: Install lined waterways adjacent conservation structures provides safe conveyance of runoff reducing sediment delivery to the creek.

# 5. Stream Crossing (578)

*Objective 5*: Convey water during high flow events and reduce the accumulated debris deposits contributing to upside bank erosion while providing passage for cattle between pastures.

# 6. Streambank Stabilization (580)

*Objective 6:* Stabilize and protect side bank of stream against erosion to reduce sediment loads causing downstream damage and pollution, improve the stream for fish and wildlife habitat, and protect adjacent land from erosion damage.

7. Structure for Water Control (587)

*Objective 7*: A structure for water control transports water controlling the rate of flow throughout the lined waterway.

### Implementation:

# <u>Gully Repairs, Erosion Control, Revegetation and Fencing – completed January 2015</u>

The Marin RCD Environmental Planner inspected the completed riparian fence. The fence measured 2,001 linear feet, encompassing 1,040 linear feet of the stream (Table 1). The fence installation started at the lower livestock crossing at the property boundary near Chileno Valley Road and continued upstream encompassing the entire tributary and side headcut (Figures 1 & 2). A series of gates were mounted along the fence line to allow for managed livestock flash grazing.

The gully and erosion control repairs involved constructing seven rock grade stabilization structures to arrest the actively eroding headcuts throughout the intermittent stream and side gully. Overall there were five small and two large rock headcut repairs ranging in size from 10 to nearly 40 linear feet and a width matching the size channel dimensions. Each structure was excavated and installed at and below grade. Repairs were constructed using ¼-ton rock fill, ½ keyway rock, and 6-inch minus chinking rock fill and class two permeable rocks. The 6-inch minus chinking-rock fill was carefully overlaid on top of a filter fabric to create an interlocking matrix to support appropriate stream flows. Surrounding all repairs, erosion control blankets, native grass seed and mulch were applied to aid in stabilization.

Two degraded livestock crossings were improved upon. The upstream livestock crossing, structure for water control repair involved replacing and restoring an existing culvert. This structure included upgrading the a 24-inch diameter culvert to a 30-inch HDPE culvert nearly 38-feet long to match the channel grade. The culvert inlet and outlet were armored with 24 feet of rock to dissipate the energy on each end of the structure. The lower livestock stream crossing was graded 10:1 slope and lined with 6-inch minus rock and is approximately 12 feet wide along the streambank and 30 feet long across the stream channel.

STRAW program completed one day of restoration work at the ranch. PCI designed the planting plan that consisted of stabilizing the streambanks, headcuts and revegetation placement with willow sprigs and *Juncus* plugs throughout the intermittent stream.

On January 22 2015, STRAW staff, 68 volunteers, students from Mary Collins Elementary School planted a total of 532 plants: 90 *Juncus patens*, 442 *Salix sp*. and three 15-linear foot long willow wattles.

The critical planting area consisted of three types of planting. The first type of planting involved planting a 76 foot by 10 foot area (0.17 acres total) with *Juncus* plugs and a 711

### Project 2013-001 Gully Repairs, Erosion Control, Revegetation and Fencing Project

foot by 22 foot area (0.36 acres total) with willow poles on each side of the streambank. The second type of planting included willow poles and *Juncus* plugs to target specific areas to address grade stabilization, headcuts or sidebank stabilizations. The third type of planting was located in-stream where willow wattles were placed. Willow wattles were installed at three locations in the upper stream to address small instream headcuts.

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Project Information	Area	Unit
Riparian Fencing	2,001	Linear foot
Intermittent Stream	860	Linear foot
Total Length of Stream Protected (fenced)	1,020	Linear foot
Length of Stream Planted	790	Linear foot
Total Length of Stream Restored	960	Linear foot
Sediment Load Reduction (Region 5 Model)	87.3	Tons/Year

### Table 2. Completed project dimensions.

**The following CEQA authorization and permits were obtained for this project:** CEQA authorization for this project, #2013.001, was provided by Marin RCD Permit Coordination Program:

- □ No Permit Required
- ⊠ §1600 CA Department of Fish and Wildlife\*
- S401 Water Quality Certification
- □ §404 US Army Corps Wetland

 $\Box$  County of Marin

\*Permits required reports; reporting requirements are addressed in the Phase II: Monitoring Section under Permit Reporting Requirements.
#### Project 2013-001 Gully Repairs, Erosion Control, Revegetation and Fencing Project



Author: Lynette K Niebrugge Date: 2/15/2018



#### Project 2013-001 *Gully Repairs, Erosion Control, Revegetation and Fencing Project*

#### Pre-construction Photo 01/2012

Upstream view before riparian fence and grade stabilzation repairs were installed.



**Pre-construction Photo 02/2013** View of livestock culvert crossing and active side gully headcutting before construction.

#### Post-construction Photo 01/2015

Upstream view after construction of the following practices: riparian, fence, grade stabilization repairs and revegetation.



Project site after construction showing the riparian fence encompassing the gully headcut and bordering a livestock culvert crossing repair.





Figure 2. Photo-monitoring documentation of project site before and after construction of conservation practice.

#### Project 2013-001 Gully Repairs, Erosion Control, Revegetation and Fencing Project

#### Pre-construction Photo 02/2013

Pre-construction photo of project viewing active headcut side gully before construction.



Project site before construction displaying downstream view of degraded stream channel riparian before fencing and vegetation.

#### Post-construction Photo 01/2015

Post-construction project photo displaying side headcut gully repairs and fencing.



Post-construction Photo 06/2015

Downstream view after construction of the riparian fence, grade stabilization repairs and STRAW plantings of willow sprigs and *Juncus*.





Figure 3. Photo-monitoring documentation of project site before and after construction of conservation practice.

# Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Management Zone Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes asking the landowner to reflect on the project process using a Landowner Questionnaire form from the RZMP and evaluating the functionality of the implemented project using a Project Assessment Checklist from the RZMP.

# Landowner Questionnaire:

Overall, the installation of the conservation practices met the intended goals of the landowner. The landowner foresees an improvement in the way he can manage his livestock and enhance the productivity of the land by implementing rotational grazing through the division of fields. He also expects the project to reduce stress upon the property's natural resources by reducing sedimentation and increasing vegetation. During the entire process, the landowner was pleased with the Marin RCD's performance although he did state the funding process and paperwork was confusing at times and could be simplified. The landowner is definitely interested in working with Marin RCD again, but has no specific project in mind at this time.

# Project Assessment Checklist:

A post-project monitoring visit was conducted in both January and June 2015. All components of project met standards and specifications required by USDA NRCS. Overall, the project rating is "Good" which is determined by using the effectiveness rating matrix and Project Assessment Checklist, see details below:

The project effectiveness rating matrix summary for Project #2013.001:

- Objectives: Excellent
  - Reduced sedimentation delivery.
  - Reduced pathogens through the implementation of riparian livestock fence exclusion.
- Target Values: Good
  - Too early to determine whether targets have been met.
  - Expected to meet intended target values set: early results show increased ground cover stabilized soil, increased native woody and herbaceous vegetative cover and increased plant diversity.
- Unintended Effects: Good
  - No unforeseen consequences occurred from the implementation of the Best Management Practices to create a negative effect to offset the objectives of the project.
- Structural Condition: Good
  - The project was excellent to fair and has the intended functional value.

Individual practices were rated as follows:

# Erosion Control Repairs and Structures: Effectiveness Rating = Good/Fair

In early 2015, the Project Assessment Checklist was completed. At the time of inspection the side gully headcut and grade stabilization repairs showed no evidence of erosion or rock movement at the top or toe of the structures. All rock appeared to be secure and holding in place. There was no evidence of erosion scour around the rock structure, soil piping through or under the rock structures. The only flaw observed was evidence of visible fabric remaining from the repairs. The contractor was asked to trim back the remaining fabric surrounding the repairs before completion of the project. The effectiveness and stability rating for post-project was 'good' for post-project construction.

The stream grade stabilization headcut repairs however both rated 'fair' in effectiveness and stability and needed attention post-construction. The larger headcut repair below the culvert crossing and the side headcut upstream showed evidence of rock movement. The smaller rock washed out, exposing the erosion control fabric and leaving large voids between the larger placed rocks. The side headcut experienced rock movement, exposing the erosion control fabric and channeling the flow of water and cause additional erosion. Both of these issues were brought to the attention of both the PCI design engineer and contractor. Repairs were made immediately following the post construction assessment and the project rating improved from 'fair' to 'good' in effectiveness and stability.

# Livestock Fence Exclusion: Effectiveness Rating = Excellent

Post-Construction inspection: The riparian fence surrounding the entire project was rated 'excellent' after installation. The H-braces were sound, all fence clips were present, no evidence of cracked fence or livestock disturbance. The wire was taut throughout the fence line. All gates were placed along the fence line according to the ranchers liking. At the time of the assessment, STRAW completed the planting only one week prior; therefore, plant survival will be re-evaluated at a later date.

# <u>Revegetation : Effectiveness Rating = TBD</u>

At the time of the first assessment in June 2015, STRAW completed the planting six months prior; therefore, plant survival will be re-evaluated later.

In June 2015, the project appeared to be successful with only a few minor flaws that were corrected. All repairs will continue to be monitored throughout the next three to five wet seasons to ensure restoration efforts and survivorship of the vegetation are successful.

# Revegetation Survival Maintenance and Monitoring:

Marin RCD entered into a Safe Harbor Agreement: 1600-2013-0394-R3 with California Department of Fish and Wildlife to implement Project #2013-02. The permit required annual reporting for three-years the success and establishment of planted species.

The vegetation monitoring includes photo documentation of vegetative cover and plant survivorship as measures of success, of the willows, *Juncus* plugs, and sedge plugs were assessed at six months (June 2015) and one year (Feburary, 2016 & December 2016) post project. Two metrics of plant success were used to plant height and plant vigor. Height was measured in inches, and the vigor was rated low vigor (LV) indicating the plant was displaying systemic stress or high vigor (HV) showing the plant contained healthy new growth.

Pre-construction	6 Months Post-construction	1 Year Post-construction
Project site before construction, June 2012 displaying downstream view of degraded stream channel riparian before fencing and vegetation	Downstream view after construction, June 2016, of the riparian fence, grade stabilization repairs and STRAW plantings of willow sprigs and Juncus.	The downstream view was taken December 2016 of the riparian fence, grade stabilization repairs and STRAW plantings of willow sprigs and Juncus.

The six-month evaluation the critical planting area site was thriving with new growth emerging from the willow springs approximately 2 - 3 feet high and displaying high vigor. At the one year post project evaluation, approximately 60 willows were surveyed throughout the lower tributary below the main livestock crossing. The results for height and vigor are as follows: 20 willows at <3ft height with low vigor; 10 willows at < 3ft height with high vigor; 25 willows at > 3ft height with high vigor; and five willows > 15ft tall displaying high vigor. The upper tributary 119 willows were surveyed, The results for height and vigor are as follows: 28 willows, < 3ft height low vigor; 42 willows at < 3ft height with high vigor; 40 willows at > 3ft height with high vigor and nine willows above

#### **Project 2013-001** Gully Repairs, Erosion Control, Revegetation and Fencing

15ft in height displaying high vigor. The streambank stabilization repairs, three (willow wattle) were assessed. At the time of inspection, the willow wattle was secure, and there was no evidence of scour surrounding the structure all were thriving and functioning as intended. There was no indication of livestock damage or disturbance from any outside predators. Due to the drought season after the plant installation, there was evidence of water deficiency and mortality. Thus lead to a decrease in survival of willow, as to be expected. Overall the survival and success of the willows, Juncus and sedge are high even with the mortality. The plantings are functioning as intended stabilizing the streambanks and reducing erosion; the site will continue to be monitored for the next two years. In conclusion, the project sites are planted in accordance with approved permits and specifications. All plantings are establishing well, and are anticipated to meet performance criteria by year three. No remedial plantings are recommended at this time.

# **PROJECT HIGHLIGHTS, 2013-002**



Project: 2013 Watershed: Walk	-002 er Creek, Subwatershed: Chileno Creek		
Practices: Strea	Streambank Repair, BMP's (2 total)		
Project Cost & Partners: \$33,	003.00		
\$33,0	03.00 – Marin Resource Conservation District, State Coastal Conservancy		

# **Project Overview:**

The **Project 2013-002: Streambank Repair** is part of the Tomales Bay Watershed Habitat Enhancement Grant Program funded by The State Coastal Conservancy, and is included within the Conserving Our Watersheds Program which assists agricultural operations with stewardship activities that improve water quality and native habitat. The intent of Project 2013-002 was to improve water quality and native habitat of Chileno Creek, an immediate tributary to Walker Creek, by repairing 190 linear feet of an actively eroding streambank along the mainstem Chileno Creek (Table 1). This long-term streambank erosion problem was arrested from advancing by implementing two (2) practices: 1) critical area planting, and 2) streambank stabilization/shoreline protection, which entailed installing willow stakes to establish a dense riparian vegetation along the streambank and a willow wattle at the toe of the bank.

# **Ranch Location:**

The ranch is located approximately four (4) miles southeast of the town of Tomales in northwestern Marin County, California. It is accessible from Chileno Valley Road (Fig. 1).

# **Project Location:**

The project was located on Chileno Creek a direct tributary to Walker Creek, a subwatershed of the Tomales Bay watershed (Fig. 1).

## **Environmental Conditions:**

The site is located on 384 acres of coastal rangeland in Marin County, elevations ranging from 150 - 800 feet. The ranch is an active rangeland supporting beef cattle.

The soil type throughout the project location, along the creek, is dominantly Clear Lake Clay (113), 0 - 2% slopes, very deep and poorly drained soils. Clear Lake Clay soils are typically formed in fine-textured alluvium derived from sandstone or shale and generally located in basins and swales of drainages. Vegetation consists of annual and perennial grasses and forbs with scattered oaks. The project takes place within a riparian corridor composed of a few scattered riparian woodland trees, Himalaya blackberry thickets, and herbaceous wetland plants both up and downstream of the site.

Project Information	Area	Unit
Ranch Area	384	Acre
Project Area	0.14	Acre
Total Length of Stream Bordering Property	5,150	Linear Feet
Total Length of Stream Fenced	250	Linear Feet
Total Length of Streambank Restored	190	Linear Feet

Table 1.Project area dimensions.

# **Phase I. Design and Implementation**

#### **Design:**

A conservation design plan was developed in the spring of 2012 through 2014, by a NRCS Rangeland Specialist, NRCS Engineer and a consulting engineer from Prunuske Chatham, Inc. (PCI) to meet the goals and objectives set by the landowner and all partners. The overall plan consisted of two components including critical area planting along the sidebank and streambank stabilization through a willow wattle installation. The intent of the repair is to establish a dense riparian vegetation along the eroding streambank. The overall purpose is to reduce sediment delivery to Chileno Creek and to provide habitat improvements (e.g., bird nesting opportunities, nutrients for microorganisms that nourish steelhead). The subject bank, located just opposite of a densely vegetated bank, resists erosion during high flows. As the existing vegetation grows, it further directs flows into the vulnerable bank causing it to erode. By establishing equivalent riparian vegetation on the bank of concern, it will in turn balance the erosive forces and substantially arrest erosion during regularly occurring flows.



Figure 1. Map of Project 2013-002. Streambank repair identified by red box.

The plan consisted of two (2) NRCS conservation practices including: #342 Critical Area Planting, and #580 Streambank Stabilization and Shoreline Protection.

# The NRCS practices and associated practice objective included:

1) Critical Area Planting (342)

*Objective 1*: Stabilization of soil by planting willows and grasses, on highly erodible or critically eroding areas. This practice reduces damage from sediment and runoff to downstream areas and improves wildlife habitat and visual resources (Fig. 1 & 2).

 Streambank Stabilization and Shoreline Protection (580) *Objective 2:* Stabilize and protect side bank of stream against erosion to reduce sediment loads causing downstream damage and pollution, improve the stream for fish and wildlife habitat, and protect adjacent land from erosion damage (Fig. 1 & 2).

# Implementation:

Critical Area Planting—completed February/March 2015

# Critical Area Planting (No. 342)

A Certified Professional Soil Erosion and Sediment Control Specialist from PCI designed the biotechnical erosion control plans, for the streambank repair. The planning was conducted under the guidance of the NRCS Rangeland Specialist/Planner and Engineer using the required USDA standards and specifications for conservation practices.

The site preparation and installation of the streambank repairs consisted of planting a combination of willow poles and sprigs throughout the project site and the installation of a live fascine (willow wattle) at the toe of a recent slump in the streambank. All of the willow cuttings were harvested upstream from the project site in the Chileno Creek watershed on the ranch. Willow poles consisted of 2 - 3 inch diameter cuttings and were installed 4 - 6 feet deep. Willow sprigs cuttings consisted of  $\frac{34}{4} - \frac{11}{2}$  inch diameter and were installed 3 - 5 feet deep. Both willow poles and sprigs were planted 2 - 3 feet on center along the bankfull bench as well as approximately halfway up the slope of the bank. A gas-powered auger and rock bars were used to establish a pilot hole for the poles/sprigs, which were then driven to the point of refusal using a sledgehammer.

The exposed portions or the installed willows were pruned to 6 inches to minimize the amount of debris caught and snagged along them causing injury during high flow events. The willow wattle was approximately 18 foot long and made from small willows tied into a

1-foot buddle with biodegradable coir twine and secured into the bank with wedge stakes, for additional toe protection (Fig 1). After planting, straw was applied to the project area for additional protection.

# The following permits were obtained for this project:

This project, #2013-002, went through Marin Resource Conservation District's Permit Coordination Program for CEQA compliance. The original design of this project required and received a Streambed Alteration Agreement from the CA Department of Fish and Wildlife. Ultimately, due to budget constraints, the project was simplified to only include the willow stake portion of the design. All work conducted was completed above the stream high water mark and no earthwork occurred.

- □ No Permit Required
- ⊠ §1600 CA Department of Fish and Wildlife\*
- ⊠ §401 Water Quality Certification
- □ §404 US Army Corps Wetland
- $\Box$  County of Marin

\*Permit required reports; reporting requirements are addressed in the Phase II: Monitoring Section under Permit Reporting Requirements.

#### **Project 2013-002** Streambank Repair

#### **Before and After Construction Photos:**

#### Pre-construction Photos 01/2012

Pre-construction photo of project site area taken from top of bank. View looking down into slump, sidebank erosion before construction.



#### Pre-construction Photos 01/2012

Pre-construction photo of project site area taken from downstream. Upstream view of Chileno creek at project site before construction of streambank critical area planting and stabilization repairs.



#### Post-construction Photos 1/2015

Post-construction photo of project site area taken from top bank. View displaying critical area planting of willow spig in slump, sidebank erosion.



#### Post-construction Photos 1/2015

Post-construction photo of project site area taken from downstream.Project site after construction displaying the streambank critical area planting and the willow wattle streambank stabilization repair in the background.



# Phase III. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Zone Management Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes photo monitoring (Exhibit B), and at least one year post-project Marin RCD staff complete a Landowner Questionnaire and Project Assessment Checklist to evaluate the functionality of the implemented project.

#### Project Assessment Checklist:

Approximately one month after the project was implemented; the project was evaluated using a Project Assessment Checklist. At the time of the evaluation, the condition of the critical planting area, the willow sprig installation, appeared to be in satisfactory condition. There was no evidence of livestock damage, water deficiency or disturbance from any outside predators. Due to the timing of inspection, it was too early to make adequate observations of natural regeneration or survivorship. The streambank stabilization repair (willow wattle) approximately 18 linear feet was installed at the toe of the bank. At the time of inspection, the willow wattle was secure and showing no evidence of scour surrounding the structure. The only evidence of erosion identified around the project area was at the top of the bank where active sluffing was evident. This sluffing is predicted to continue until the vegetation stabilizes the bank. It is important to note that the top of bank was not treated in the project and will be monitored for erosion along with the survivorship of the vegetation.

#### Landowner Questionnaire:

Overall, the installation of the conservation practices met the intended goals of the landowner. The landowner foresees an improvement in the way he can manage his livestock and enhance the productivity of the land by implementing rotational grazing through the division of fields. He also expects the project to reduce stress upon the property's natural resources by reducing sedimentation and increasing vegetation. During the entire process, the landowner was pleased with the Marin RCD's performance although he did state the funding process and paperwork was confusing at times and could be simplified. The landowner is definitely interested in working with Marin RCD again, but has no specific project in mind at this time.

#### Revegetation Survival Maintenance and Monitoring:

Marin RCD entered into a Safe Harbor Agreement: 1600-2013-0394-R3 with California Department of Fish and Wildlife to implement Project #2013-02. The permit required annual reporting for three-years the success and establishment of planted species.

The success of the vegetation survival of the willows was assessed on June 2015 and February 2016. At the six-month and one-year evaluation, the critical planting area was thriving with new growth emerging from the willow springs approximately 2 - 3 feet high and displaying high vigor. There was no evidence of livestock damage, water deficiency or disturbance from any outside

#### Project 2013-002 Streambank Repair

predators. The streambank stabilization repair (willow wattle) approximately 18 linear feet was installed at the toe of the bank. At the time of inspection, the willow wattle was secure, and there was no evidence of scour surrounding the structure. In conclusion, the project sites are planted in accordance with approved permits and specifications. All plantings are establishing well, and are anticipated to meet performance criteria by year three (see photo below). No remedial plantings are recommended at this time.

Pre-construction	1 Year Post-construction		
Photo of project site area taken downstream from a major slump,	Photo of project site area taken June 2016 post planting, downstream from		

downstream from a major slump, February 2013 pre-construction. Upstream view of Chileno Creek at the site before construction of streambank critical area planting and stabilization repairs. Photo of project site area taken June 2016 post planting, downstream from a major slump. View displaying newly vegetated streambank six months after planting.

# PROJECT HIGHLIGHTS, 2013-003



Project: Watershed:	2013-003 Dillion Creek			
Practices:	Stream Crossing Repair, Headcut Repair, Fencing & Critical Area Planting (6 total practices)			
Project Cost & Partners:	\$76,700.00			
	\$ 61,213.00	Marin Resource Conservation District , State Coastal Conservancy		
	\$15,487.00	United States Department of Agriculture Natural Resources Conservation District		

# **Project Overview**

The **Gully Repairs, Erosion Control, Revegetation and Fencing Project Repair, 2013-003** is part of the Tomales Bay Watershed Habitat Enhancement Grant Program funded by the State Coastal Conservancy, and is included within the Conserving Our Watersheds Program which assists agricultural operations with stewardship activities that improve water quality and native habitat. The intent of the project 2013-003 was to improve ranch habitat, restore and stabilize two areas along an intermittent stream north of Dillion Beach Road. The upper reach of the stream, site one, restoration work included the installation of a rock armored wet crossing, stabilizing a headcut below the crossing, native planting and fencing. The lower reach, site two, adjacent to Dillion Beach Rd, included stabilizing an advancing headcut with a rock lined waterway and check dam, native planting and fencing. The repairs are intended to stabilize the crossing, arrest the headcuts and prevent incising sidebanks through planting and fencing.

The ranch completed six (6) best management practices (BMPs) consisting of: one (1) stream crossing repair; three (3) biotechnical repairs which were stabilization and headcut repairs, two (2) grade stabilization headcut repairs and one (1) rock- lined waterway; one (1) critical area planting that spanned the upper and lower reach of the intermittent stream stabilizing the streambanks through planting of *Juncus* plugs and willow planting; and one (1) riparian fencing around the intermittent stream. One (1) remaining BMP will be installed in the fall of 2015 as a second phase of the project; this will consist of the installation of a riparian forest buffer planting of woody native plants. The implemented conservation practice will improve water quality by reducing erosion and sedimentation transportation into the unnamed intermittent stream discharging directly into Dillon Creek.

## Ranch Location:

The Lawson Ranch is located approximately three miles west of Tomales in west Marin County, California. The ranch is accessible from Dillon Beach Rd just off Valley Ford Franklin School Road (Fig 1).

## **Project Location:**

The project is situated on an intermittent stream within the open rangeland. The stream originates on the upper portion of the hillside just above Dillon Beach Road, and flows southwest towards Dillon Creek, thence to Tomales Bay (Fig 1).

## Environmental Conditions:

The site is located on 623 acres of coastal rangeland in west Marin County. Site elevations range from 319 to 430 feet. The ranch is an active rangeland supporting mainly heifers year-round and a small number of goat and sheep seasonally. (See Table 1 for Project area dimensions).

The project area is composed of three soil types. Located at the top of the upper hillslopes where the upper portion of the tributary is located and site one, the soil type is Sobega

loam (173) with 0 to 15% slopes. Sobega loams are moderately deep and well-drained soils formed in material derived from coarse-grained sandstone with a restrictive rooting depth and depth to bedrock of 20 to 40 inches. This soil type displays a moderate permeability, low available water holding capacity ensuing a moderate runoff rating, which can limit forage production. In the middle of the tributary, there is an exposed sandstone rock outcrop. Here the soil type transitions into Tomales loam (192), 15 to 30% slope and formed in material derive from sandstone. This soil is deep, moderately well drained, exhibits very low permeability and a moderate available water holding capacity resulting in a high to rapid runoff rate. This soil type has a restrictive layer, Coastal Loamy Clay Pan, at a depth of 40 to 60 inch. The lower section of the intermittent stream, project site two, upslope from Dillion Beach Road, the soils type transitions into a Rodeo clay loam (160), 2 to 15% slopes. Rodeo clay loam soils are derived from alluvium and typically found in depressions, basins or narrow valleys. These soils are very deep and poorly drain, exhibiting a slow permeability and high available water holding capacity.

The grazed rangeland vegetation supports primarily annual non-native grassland species such as Italian ryegrass (*Lolium multiflorum*), dogtail grass (*Cynosurus echinatus*), velvet grass (*Holcus lanatus*), and other grasses not identifiable with patches of native iris (*Iris* sp.) occurring throughout the grasslands. Wetland plants, rushes (*Juncus sp.*), are scattered throughout the site and a stand of woodland trees, eucalyptus (*Eucalyptus* sp.), line the property boundary at Dillion Beach Road. The vegetation throughout the intermittent stream consists of emergent wetland vegetation. The channel bottom and banks are lined with hydrophilic vegetation, including clusters of rush, aquatic buttercup (*Ranunculus* sp.), common lady fern (*Athyrium filix-femina*), common yellow monkeyflower (*Mimulusguttatus*), and California blackberry (*Rubus ursinus*).

Project Information	Area	Unit
Ranch Area	623	Acres
Project Area	1.7	Acres
Watershed Headcut	29.6/26.1	Acres
Watershed Wet Crossing	8/10.6	Acres
Total length of Intermittent Stream	1158	Linear feet

Table 1. Project area dimensions.

# Historical Partnership and Commitment:

The landowner has not engaged in past conservation projects with the Marin Resource Conservation District (RCD). The ranch has participated in United States Department of Agriculture Natural Resource Conservation Service (USDA NRCS) programs in the past to improve and enhance the ecological value of the land. Historical documentation of past known partnership conservation improvements are listed below.

## Past and current projects include:

- 2010 Present, Coastal Conservancy Program: install wildlife planting, hedgerows and fence.
  - o USDA NRCS, Wildlife Habitat Incentive Program funded project



Figure 1. NRCS Conservation Map of Project 2012-003: Map shows location of completed conservation practices and dimensions.

# Phase I. Design and Implementation

## Design:

In the spring of 2013, a conservation design plan was developed by a NRCS Rangeland Specialist, NRCS Engineer and a consulting engineer from Prunuske Chatham, Inc. (PCI) to meet the goals and objectives set by all partners and landowners. The design involved restoring a stream crossing containing active sidebank erosion, stabilizing an active headcut at the lower gully, planting and fencing the entire stream. Additionally, a planting plan was designed and planned in the fall of 2015, for a second phase of the project to create a riparian forest buffer throughout the riparian corridor. The designs consisted of a suite of USDA NRCS conservation practices and specifications prescribed to meet the matching funding requirements of NRCS's Environmental Quality Incentives Program.

The practice and associated practice objectives included:

1) Critical Area Planting (342)

*Objective 1*: Stabilization of soil by planting willows and grasses, on highly erodible or critically eroding areas. This practice reduces damage from sediment and runoff to downstream areas and improves wildlife habitat and visual resources.

2) Fencing (328)

*Objective 2*: Eliminate land impacts caused by livestock activity.

3) Grade Stabilization (410)

*Objective 3:* Stabilize and protect side bank of stream against erosion to reduce sediment loads causing downstream damage and pollution, improve the stream for fish and wildlife habitat, and protect adjacent land from erosion damage.

4) Lined Waterway or Outlet (468)

*Objective 4*: Installation of lined waterways adjacent conservation structures for safe conveyance of runoff to reduce sediment delivery to the creek.

5) Stream Crossing/Stream (578)

*Objective 5*: Convey water during high flow events and reduce the accumulated debris deposits contributing to upside bank erosion.

6) Streambank Stabilization (580)

*Objective 6:* Stabilize and protect sidebank of stream against erosion to reduce sediment loads causing downstream damage and pollution, improve the stream for fish and wildlife habitat, and protect adjacent land from erosion damage.

Gully Repairs, Erosion Control, Revegetation and Fencing

7) Riparian Forest Buffer (391)

*Objective 7*: Planting will establish or increase the numbers of plants to intercept sediment, nutrients, pathogens and other materials in surface runoff and to reduce nutrients and other pollutants in shallow subsurface water flow. In addition, the woody vegetation in the buffer provides food and cover for wildlife.

#### Implementation:

The project was completed in December 2014. The NRCS Rangeland Specialist, NRCS Engineer and the consulting engineer, inspected the construction of the two project site repairs along the intermittent stream.

Site one, located along the upper reach of the intermittent stream, involved restoring a ranch road stream crossing, once containing a culvert, and installing a biotechnical repair to stabilize a small instream headcut and sidebanks below the crossing. To adjust for seasonal high flows and ranching activities, the repaired stream crossing and the ranch road were graded to convey flows into the integrated headcut grade stabilization structure. The crossing was approximately 15 to 20 feet wide and nearly 70 linear feet long, with containing 6 inch minus base rock with a 10:1 slope to adjust for ranching vehicles and armored downstream edge with 6 to 12 inch rock and permeable material. The entire cross section of the wet crossing was adjusted to a 2% slope to allow for the proper flow of stormwater and runoff into the stream. The repaired integrated headcut grade stabilization just below the crossing was approximately 10 feet wide and nearly as wide as bank to bank, with ¼ to ½ ton of rock, 24 inch thickness along the upper repair and 18 inch minimum thickness downstream then chink filled with 4 to 12 inch rock and <sup>3</sup>/<sub>4</sub> inches permeable material.

The lower reach of intermittent stream, site two, just above a Marin County concrete culvert under Dillon Beach Road, involved installing a grade stabilization structure in conjunction with a rock-lined waterway to repair a headcut. The entire feature was approximately 10 feet wide at the top, 20 feet at the toe and approximately 40 feet long. The top of the structure was lined with coir twine matting over laying the erosion control blanket, and then the entire disturbed area exhibiting exposed soil was mulched and seeded with native seed to aid in stabilization. The rock-lined waterway was constructed by creating a straight grade, joining the up and downstream elevations, laying ¼ and ½-ton rock with a 24-inch minimum rock thickness along the channel bottom and sides, and then chinking with 4 to 12 inch rock and finishing with ¾ inch permeable material. A line of ½ ton boulders were individually stacked at the toe of the structure.

A regular terrain fence, 2,240 linear feet long, was constructed along the perimeter of the two project sites along the intermittent stream. A total of 1,910 linear feet of riparian fence was installed encompassing the upper stream reach, site one of the project. The fence encompassed the upper portion of the stream at the hilltop where the stream emerges, past the repaired stream crossing and ending below the sandstone outcropping. The lower stream reach amounted to 415 linear feet of riparian fencing, encompassing the entire project, site two, down to the property boundary adjacent to Dillon Beach Road (Table 2).

Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW) program completed one day of restoration work at the ranch. PCI designed two phases of planting: phase 1 consisted of stabilizing the streambanks, headcuts and revegetation placement with willow sprigs and *Juncus* plugs, while phase 2 is a riparian forest buffer to enhance wildlife habitat.

After the construction of the riparian fencing, phase 1 of the revegetation plan was established by STRAW. A total of 280 plugs or transplants of *Juncus patens* (spreading rush) and *Carex barbarae* (Santa Barbara sedge) were planted on areas of bare soil on the banks of both the upper and lower reach of the stream and on areas of the floodplain. The plants were spaced roughly 18-inches by 18-inches within the existing bunches of vegetation totaling approximately 0.32 acres, throughout the upper and lower reach of the intermittent stream. Additionally, 15 willow sprigs were planted in the lower stream reach covering 0.05 acres and 8 willow sprigs were planted within the rock armored headcut repair in the upper stream reach.

Table 2. Completed project dimensions.

Project Information	Area	Unit
Total Riparian Fencing	2,240	Linear feet
Total Length of Stream Protected (fenced)	880	Linear feet
Total Length of Stream Restored	540	Linear feet

The phase 2 planting, riparian forest buffer, is planned for installation in fall of 2015. The plan includes the planting of nearly 100 additional rush and sedge. In addition, approximately 400 woody native plants will also be installed within the fenced riparian corridor near the top of bank on 10 to 12 foot spacing. These container plants will be selected from a list of plants based on the site conditions and riparian forest buffer planting palette (see Table 2. and NRCS Conservation Practice 391).

## Project 2013-003

Gully Repairs, Erosion Control, Revegetation and Fencing

Plant Species	Common Name	Quantity	Size of Plant to	Protectio
			Install	n
Acer negundo	box elder	To Be determined	Treepot or larger	deer
		(TBD)		
Carex barbarae	Santa Barbara	TBD	supercells or larger	0
Corylus cornuta	hazelnut	TBD	Dee pot or larger	hare
Crataegus douglasii	hawthorne	TBD	Dee pot or larger	deer
Garrya elliptica	silk tassel bush	TBD	Dee pot or larger	hare
Heteromeles	toyon	TBD	Dee pot or larger	hare
arbutifolia				
Holodiscus discolor	ocean spray	TBD	Dee pot or larger	hare
Juncus patens	rush	TBD	supercells,	0
			transplants or	
			larger	
Mimulus	monkeyflower	TBD	Dee pot or larger	hare
aurantiacus				
Myrica californica	wax myrtle	TBD	Dee pot or larger	deer
Rhamnus californica	coffeeberry	TBD	Dee pot or larger	hare
Rosa californica	California rose	TBD	Dee pot or larger	hare
Rubus parviflorus	thimbleberry	TBD	Dee pot or larger	hare
Salix sp.	local willow	TBD	3-foot sprigs	deer
	sprigs			
Sambucus racemosa	red elderberry	TBD	Dee pot or larger	deer
Symphorocarpos albus	snowberry	TBD	Dee pot or larger	hare

#### Table 2. Riparian Forest Buffer planting palette.

## The following permits were obtained for this project:

This project, #2013-002, went through Marin RCD's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance. This project also required and received a Streambed Alteration Agreement with CA Department of Fish and Wildlife and a Nationwide Permit 27 from the US Army Corps of Engineers. In addition, a Notice of Intent for Small Habitat Restoration Project was submitted to the State Water Quality Control Board.

- $\Box$  No Permit Required
- S1600 CA Department of Fish and Wildlife\*
- ⊠ §401 Water Quality Certification
- ⊠ §404 US Army Corps of Engineers
- $\Box$  County of Marin

\*Permit required reports; reporting requirements are addressed in the Phase II: Monitoring Section under Permit Reporting Requirements.

# **Before and After Implementation Photos:**

#### Before Project Photos 03/2013

Pre-construction photo of mid- stream degraded stream crossing; view taken from Photo Point fence installation.

#### AfterProject Photos 01/2015

Post-construction photo of mid-stream project site one. This image shows the stream crossing and rock armored sidebanks below enclosed by a newly constructed fence line.



Pre-construction photo taken from a photo point. The image taken mid-stream looking downstream below stream crossing displaying unstable sidebanks from cattle trailing. Post-construction photo taken from a photo point , displaying riparian fencing encompassing the critical area planting.



#### Before Project Photos 03/201

Pre-construction photo of landscape view. Project site area prior to construction.



#### After Project Photos 01/2015

Post-Construction photo of the landscape view displaying the riparian fencing.



Pre-construction photo of site two taken from top of headcut looking down towards the culvert along Dillon Beach Rd. The photo displays the width and depth of the active headcut. Post-construction photo of site two taken from top of headcut repairs. The photo displays the reshaped rock lined waterway with a wide channel and shallow channel bottom surrounded by riparin fencing.





# Phase III. Monitoring

## Landowner Questionnaire:

The Landowner was very satisfied with the outcome of the Gully Restoration Improvement and Stream Crossing Project. In December 2014, nearly one month post implementation, the landowner confirmed that the project has been functioning as planned and anticipated. He stated that the project has already improved sedimentation into the creek and this was observed in the first heavy storm of the season.

The landowner was happy to report that the project has met his intended goals of increasing ecosystem benefits by enhancing water quality, increasing wildlife and riparian habitat, and assisting range management. He hopes the improvements will aid in the overall productivity of both vegetation and livestock health, as well as, reduce extra costs related to annual road and crossing repairs. As a conservation advocate, the landowner will continue to work with the Marin RCD. As a suggestion for future projects, he has recommended improving the project time length, along with design and construction stage of the project, which were unclear at times due to changes throughout the progression of project.

# Project Assessment Checklist:

In January 2015, approximately two month post-construction and one month post-planting the project was evaluated by filling out the Project Assessment Checklist (PAC). At the time of evaluation the fences were in excellent condition, all H-braces were sturdy, wire was tight, and no posts were missing or broken. The evaluation was conducted after the second rainfall in January 2015, at this time there was evidence of erosion around 3 postholes located along the fencing at the lower stream reach, site two. Due to the storms, vegetation debris had accumulated on the fence wires that are suspended above the confluence between the project tributary and another adjacent intermittent stream near Dillon Beach Rd. The landowner was notified regarding the debris and was asked to monitor future debris build up. During both evaluations, all gates were closed restricting livestock access to the riparian corridor and there was no evidence of livestock presence or damage to the sidebank stabilization or plantings.

The road leading up to the stream crossing and rock armored grade stabilization were all functioning as planned and in good condition. However, after the second heavy storm, stormwater runoff moved the stream crossing rock to form a rill, approximately 10 foot long, 1 foot wide and 6 - 12 inches deep along the road crossing. The rock armored sides and headcut stabilization below the crossing appeared to be in excellent condition. The top and toe of the rock structure was secure and no evidence of scour was apparent. There was evidence of smaller fine rock movement, but this would be expected because of the rock displacement from the rill upstream from the headcut from the crossing.

#### Project 2013-003

Gully Repairs, Erosion Control, Revegetation and Fencing

The lower reach of intermittent stream, site two, involved installing a grade stabilization structure in conjunction with a rock-lined waterway to repair a headcut. The PAC effectiveness and stability ratings for the post construction repairs were both rated "good to fair". The toe of the rock structure was secure and there was no evidence of toe scour or erosion. The top of the structure repair experienced damage after both the first and second heavy rain of the season. The erosion coir matting at the top of the headcut was only visible after the first storm, but became torn and bare ground was exposed after the second storm. Seeding and grass had not established and fine rock began to wash out after the first storm. After the second heavy rain, there was evidence of medium and larger rock movement at the top of the repair leaving the top of the structure unstable. It was evident that the water flow had paved through the area moving the rock and exposing the bare ground. The observed failures and rock movement appeared to be a result of natural and unforeseen conditions.

After the evaluation, all parties involved in the design and implementation phase were contacted to reevaluate the condition of the repairs. All parties concluded and agreed to repair the damages due to natural causes caused by heavy flows. Repairs are scheduled for the summer 2015.

## **Revegetation Survival Maintenance and Monitoring:**

Marin RCD entered into a Safe Harbor Agreement: 1600-2013-0235-R3 with California Department of Fish and Wildlife to implement Project #2013-03. The permit required annual reporting for three-years the success and establishment of planted species, and at the end of three years there shall be at least a 75% survival success rate and relative cover of native species after a complete season without irrigation.

Point Blue Conservation Science STRAW planted the project in two phases. Phase 1 consisted of installing *Juncus* and willows sprigs in January 2015, and Phase 2 was the planting a variety of native species (container-size plants) in January 2016. Marin RCD staff are monitoring Phase 1, while STRAW is in contract to monitor Phase 2.

*Phase 1 Planting:* The success of the revegetation survival of the willows of *Juncus* plugs and Santa Barbara sedge plugs was assessed on December 12, 2016 (two years post-planting). For the survival of the willows two metrics of plant success was used, plant height and plant vigor. Height was measured in inches, and the vigor was rated low vigor (LV) indicating the plant was displaying systemic stress or high vigor (HV) indicating the plant contained healthy new growth. At Site 1, below the stream crossing, a total of seven willows were counted. At Site 2, the lower gully, a total of 29 willows were counted of which 15 were located in the lower stream reach and 14 in the upper reach planted within

#### **Project 2013-003** Gully Repairs, Erosion Control, Revegetation and Fencing

the rock armored headcut repair. All surviving willows were recorded at approximately three foot in height and rated HV.

Photo documentation and a streambank line intercept transect were conducted to capture the survival success the 280 plugs or transplants of *Juncus* plugs and Santa Barbara sedge plugs planted (Figure 2). The monitoring survey recorded heights ranging from two to four feet and all sedges and rushes displayed high vigor. The overall observed vegetation cover throughout the lower gully is averaging 90-98%.

Pre-construction	1 Year Post-construction	2 Year Post-construction
Pre-construction photo of Site 2 taken from the top of headcut looking down towards the culvert along Dillon Beach Road. The photo displays the width and depth of the active headcut.	Monitoring photo taken on December 12, 2016 of Site 2. The rock-lined waterway repair has a wide and shallow channel bottom surrounded by the regrowth of the riparian revegetation. Willow stakes were install within the rock, while sedges and rushes were planted around the headcut repair.	The photo taken of Site 2 on December 12, 2016, during vegetation survey monitoring to document vigor and height of willow stakes, sedges and rushes along the stream.

Figure 2. Photo documentation of Site 2 showing before construction, one year after construction and two years post-construction.

*Phase 2 Planting:* STRAW monitored the Phase 2 planting on September 30, 2016 (over 8 months post-planting), and their results are summarized in Table 3. At the time, plant survival was 81.7%, which is above the permits minimal survival rate requirement. The

#### **Project 2013-003** Gully Repairs, Erosion Control, Revegetation and Fencing

report when the results are available.

STRAW team expressed concerns regarding the effect of drought on the plants. Marin RCD will receive a report from STRAW with a survival percentage for 2017, and will update this

Overall, the project sites are planted in accordance with approved permits and specifications. All plantings are establishing well, and are anticipated to meet performance criteria by year three. No remedial plantings are recommended at this time.

Table 3. The type and number of plants (scientific and common name) installed by STRAW for the Phase 2 planting at Project 2013-003. Table includes the percent plant survival and count of plant vigor (HV = high vigor, LV = low vigor), and height (greater than or less than three feet) of the container plants in September 2016 (8 months after installation).

The STRAW Pro	oject					HV = H	<b>High V</b> i	igor
Plant Establishment Data LV = Low Vigor					gor			
Site Date Monitored Date(s) Planted:	:: Lawson  : 9/30/2016 1/9/16, 12/11/15, 1	2/17/15						
		Number	Total		<3ft,	<3ft,	>3ft,	>3ft,
Species	Common Name	Planted	Alive 2016	% Survival	LV	HV	LV	HV
Acer negundo	Box Elder	6	6	100%		6		
Aesculus californica	Buckeye	12	9	75%		9		
Artemisia californica	California Sage	10	6	60%		6		
Corylus cornuta	Hazelnut	13	12	92%	2	9		1
Crataegus douglasii	Hawthorn	4	4	100%	2	2		
Frangula californica	Coffeeberry	17	13	76%		13		
Heteromeles arbutifolia	Toyon	24	22	92%		22		
Holodiscus discolor	Oceanspray	8	3	38%	1	2		
Mimulus aurantiacus	Sticky Monkey Flower	5	5	100%		5		
Myrica californica	Wax Myrtle	30	25	83%	1	24		
Quercus agrifolia	Coast Live Oak	24	18	75%	1	17		
Quercus lobata	Valley Oak	3	1	33%		1		
Rubus parviflorus	Thimbleberry	5	5	100%	2	3		
Sambucus racemosa	Red Elderberry	15	15	100%		13		2
Symphorocarpos albus	Snowberry	5	3	60%	1	2		
Umbrellica californica	California Bay Laurel	10	9	90%		9		
	Overall Survival	191	156	81.7%	10	143	0	3
				Percent	6%	92%	0%	2%

# **PROJECT PROFILE: #2013-006**



Project: Watershed:	2013-006 Walker Creek, Subwatershed: Keys Creek
Practices:	Livestock Exclusion and Gully Repairs (16 total BMPs)
Project Cost	\$101,556.75
and Partners:	\$ 73,732.75 Marin Resource Conservation District, 319(h) State Water Resources Control Board
	\$ 27,824.00 United States Department of Agriculture Natural Resources Conservation Service, Environmental Qualit Incentives Program 2013

# **Project Overview**

The **Livestock Exclusion and Gully Repair Project, 2013-006**, was part of a Marin Resource Conservation District (Marin RCD) program entitled Conserving Our Watersheds Phase III (COW). This particular phase of the program was designed to promote and support the advancement of water quality improvements by reducing pathogen and sediment loads into the Keys Creek Watershed and immediate tributaries draining into Tomales Bay.

The intention of Project 2013.006 was to implement conservation practices to address non-point source pollutants, specifically sediment and pathogens, from entering Tomales Creek. To achieve this goal the project involved stabilizing and protecting two actively eroding gullies; one located at the north end of the property along the upper bank of Tomales Creek and the second located along a western intermittent tributary. The conservation practices implemented included a riparian fence (1,754 LF) to keep livestock out of the riparian zone and a series of biotechnical repairs to manage runoff from the pasture into Tomales Creek. By implementing conservation practices on the ranch, the Landowner and Lessee will be addressing non-point source loading into the Keys Creek Watershed, a watershed that repeatedly tests poorly for water quality (Fig. 1).

Project 2013.006 included the implementation of 16 Best Management Practices listed below with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) conservation practice name and number consisted of: one obstruction removal (#500), one livestock stream crossing (#578), nine grade stabilization structures (#410) (four willow wattle headcut repairs, three small rock headcut repairs, two large head cut repairs), one streambank stabilization shoreline protection (#580), three Critical Area Plantings(#342) and riparian livestock fence exclusion (#328). The conservation practices will improve water quality by reducing erosion and approximately 52.03 tons/year of sediment transport into Keys Creek before discharging into Walker Creek thence Tomales Bay.

# Ranch Location:

The ranch is located approximately 0.5 miles north of Tomales in northwestern Marin County, California. The Ranch is accessible from State Route 1 near mile marker 46.00.

# **Project Location:**

The project site is located along the eastern border of the 173-acre ranch along the length of Tomales Creek. Tomales Creek is a direct tributary to Keys Creek that flows into Walker Creek, then Tomales Bay and ultimately the Pacific Ocean (Fig. 1).

HUC 12: 180500050203 STREAM REACH CODE: 18050005001179

# Project 2013-006 Livestock Exclusion Fencing and Gully Repair

# Environmental Conditions:

The site is located on coastal rangeland in West Marin County with elevations ranging from 150 - 250 feet. The ranch supports cattle and sheep livestock operations. Historically, a railway traveled through the main entrance of the property within the bed of Tomales Creek, which runs parallel to the extant State Highway 1. Since the railway was built within a creek, a berm was constructed to redirect hillslope runoff (33.5 acres) and the creek pathway. In addition, a State Highway 1 culvert discharges flows creating a small channel gulling towards the berm. Over time the efficiency of berm has failed to effectively transport runoff into the creek bed due anthropogenic factors and the increased runoff has concentrated to the point in which a sinkhole of nearly 100 linear foot has formed along the outside of the berm. As a result, a section of the berm eroded into the tributary.

The dominant soils throughout project location are the Blucher Cole Complex (105) with 2 - 5% slopes. The parent material for this soil is comprised of alluvium derived from shale, sandstone or granite. It is somewhat poorly drained and water movement in the most restrictive layer is moderately low. This soil has potential for occasional flooding. Another soil surrounding the project area is Tomales loam (191, 192 and 193), 0 - 50% slopes. The parent material consists of residuum weathered from sandstone. The restrictive depth is 40 - 60 inches to the root restrictive layer consisting of paralithic bedrock. These areas are moderately well drained, while water movement in the most restrictive layer is low. Both the Blucher-Cole Complex and Tomales loam were identified as having a low soil compaction resistance and high rutting hazard. This could be detrimental for land use and increase erosion.

Rangeland vegetation is composed mainly of non-native grassland species, grasses and forbs throughout the property. Sedges and rushes are common near natural springs and drainages. While the riparian corridor is composed of thickets of deciduous riparian trees, shrubs and other herbaceous riparian plants are found both up and downstream.

Project Information	Area	Unit
Ranch Area	173	Acres
Ranch Area located within Keys Creek Watershed	90.16	Acres
Watershed Project Area (North Gully Repairs)	33.5	Acres
Watershed Project Area (West Gully Repairs)	19.6	Acres
Total Length of Tomales Creek Located on the Ranch	1,319	Linear feet

 Table 1. Project area dimensions.

# Historical Partnership and Commitment:

Prior to Project 2013-006, the landowner had not undertaken projects in cooperation with the Marin Resource Conservation District (Marin RCD). However, the ranch has collaborated with the United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) in the past to implement conservation practices.

# Past and Current projects include:

- 2000-2015: Cross Fencing, Water Facilities and Nutrient Management.
  - NRCS, Environmental Quality Incentives Program (EQIP)

# Phase I. Design and Implementation

# Design:

A conservation design plan was developed between 2012-2015 with assistance from the NRCS Soil Conservationist, NRCS Engineer and a consulting engineer from Prunuske Chatham, Inc. (PCI). The plan was designed to meet the goals and objectives set by all partners and the landowner. The conservation design plan included the identification of projects including the following: obstruction removal of old fencing and other impending materials from the tributaries, the need for grade stabilization and streambank stabilization repairs to address the actively eroding headcuts and streambanks, livestock stream crossing repairs, culvert removal, critical area plantings and riparian fencing to encompass the entire project. The design consisted of a suite of NRCS conservation practices and specifications prescribed to meet the match funding requirements of NRCS' EQIP.

The planned USDA NRCS' conservation practices, practice number, and associated practice objectives included:

1. Critical Area Planting (342)

*Objective 1*: Stabilize soil by planting willows and grasses on highly erodible or critically eroding areas. This practice reduces damage from sediment and runoff to downstream areas and improves wildlife habitat and visual resources.

2. Regular Terrain Fence (328)

*Objective 2*: Manage land impacts caused by livestock activity.

# 3. Grade Stabilization (410)

*Objective 3:* Stabilize and control grade and head cutting in natural or artificial channels, prevent the formation or advancement of gullies and to reduce sediment loads causing downstream damage and pollution, improve the stream for fish and wildlife habitat, and protect adjacent land from erosion damage.

# 4. Precision Land Forming (462)

*Objective 4:* To improve surface drainage, provide land-forming operations for drainage and erosion control as well as other purposes such as moisture conservation, leaching, and improving water quality

# 5. Obstruction Removal (500)

*Objective 5:* To safely remove and dispose of unwanted obstructions in order to apply conservation practices or facilitate the planned land use.

# 6. Stream Crossing (578)

*Objective 6*: Convey water during high flow events and reduce the accumulated debris deposits contributing to upside bank erosion while providing passage for cattle between pastures.

# 7. Streambank Stabilization (580)

*Objective 7:* Stabilize and protect stream bank against erosion to reduce sediment loads causing downstream damage and pollution. Improve the stream for fish and wildlife habitat and protect adjacent land from erosion damage.

# Implementation:

The project was completed November 2015. The Marin RCD Conservation Scientist and NRCS Soil Conservationist completed the inspection of the regular terrain fence. The fence measured 1,754 linear feet long and it encompassed approximately 2.5 acres of the riparian project area (Table 1).

The final construction and project repairs for the gully and headcuts were inspected and certified in the winter of 2015 by an NRCS Conservation Specialist, NRCS Engineer and a consulting engineer from PCI. Along Tomales Creek, the gully forming on the outside of the berm was repaired using a series of biotechnical structures to treat three small headcuts and the berm sinkhole. The streambank work involved the construction of a large headcut repair, a drainage swale and a second large headcut repair combined with a rocked channel. The succession of three small headcut repairs covered 180 linear feet of pasture. The three structures were repaired with rock grade stabilization control structures ranging from 6 - 8 feet wide x 10 - 11 feet long. In addition to the small headcut repairs, 350 square feet of critical area planting was installed surrounding structures to aid in soil stabilization. The streambank repair along the upper bank of Tomales Creek was installed to arrest the actively eroding gully and berm sinkhole. The first repair addressed the large headcut located at the top of the gully, approximately 15 feet long x 25 feet wide. This will arrest the headcut from proceeding upward into the pasture. At the toe of the large headcut a drainage swale was constructed by grading along 35 - 40 linear feet of the earth's surface down to a depth of 4 - 8 feet. The graded area received seed, mulch, and was covered with erosion control matting. The drainage swale component ends at the top of the berm sinkhole, which was repaired with a headcut and rock channel repair. The purpose of the drainage swale is to direct concentrated flows down into the creek through the rocked channel structure. The rocked channel structure was combined with a second headcut repair and was keyed into the drainage swale located at the top of the berm. The rocked channel extends down the sidebank 55-75 linear feet towards Tomales Creek.

# Project 2013-006 Livestock Exclusion Fencing and Gully Repair

The objective of the series of repairs was to dissipate the energy of runoff prior to entering Tomales Creek and to prevent the gully from increasing in size (Fig. 3). Repairs were constructed using ¼ ton rock fill, ½ ton keyway rock, 6-inch minus chinking rock fill and class 2 permeable rocks. The 6-inch minus chinking-rock fill was carefully fitted in between larger rocks to create an interlocking matrix to support appropriate stream flows. Surrounding all repairs, erosion control blankets, native grass seed and mulch were applied to aid in stabilization.

Downstream from the large headcut repair is another berm sinkhole approximately 75 linear feet, which is predominantly stable with some bare banks active erosion is minimal. This site was treated with critical area planting. Approximately 3,500 square feet of streambank was planted with rushes and willow stakes to increase bank stability. The establishment of these plants is essential to the recovery of the area; therefore, this repair is within a livestock exclusion area.

The scope of the project also addressed a second gully which transports water to Tomales Creek from the west. Repairs consisted of stabilizing and restoring sections of the 350 liner foot western tributary, which once had three livestock crossings through it. The project reduced the number of crossing from three to one. One of these old crossings, in the upper reach of the tributary, had a 12-inch culvert that was in disrepair. The old culvert and other debris were removed from the tributary, and restored with erosion control matting and critical area planting. The project put in one livestock crossing positioned at the lower end of the reach, which was constructed on a minor grade 10:1 slope and lined with 6-inch minus rock. The final dimensions of the crossing are12 - 15 linear feet wide by 30 feet long across the stream channel (Fig. 2). Throughout this western tributary, four willow wattles were installed to address advancing headcuts upstream. The wattles were placed at the face of the headcut along the contour to stabilize the actively eroding channel. Wattles consisted of willow poles gathered together to create 9-inch diameter bundles ranging from 10 to 14 feet long. The total length of the three willow wattles was 38 linear feet. Overall, 1,250 square feet of the tributary was restored by critical area planting with Juncus plugs and willow sprigs. The entire tributary was fenced: some sections of fence were new, while along the south side of the tributary 164.5 linear foot of old fence line was removed and replace.
# Table 2. Project 2013-006 completed dimensions.

Project Information, Dimensions					
Site Location and Description	Measurement	Unit			
Total Project Area	2.5	Acres			
Total Riparian Fencing	1,754	Linear foot			
Total Critical Area Planting	0.19	Acres			
Total Length of Streams Protected fencing ( tributary)	350	Linear foot			
Total Length of Streams Protected fencing (mainstem Tomales Creek)	1,319	Linear foot			
Sediment Load Reduction (Region 5 Model)	52.03	Tons/Year			

Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW) program completed one day of restoration work at the ranch to install the critical area plantings and willow wattles. On November, 17 2015, STRAW staff and 53 students, teachers and parents from Mary Collins Elementary School, planted a total of 310 plants: 175 *Juncus patens*, 123 *Salix sp.* and 12 *Carax barbarae*. The critical planting area throughout the project sites involved planting an area 558 feet by 15 feet, totaling 8,370 square feet (0.19. acres total).

# The following CEQA authorization and permits were obtained for this project:

CEQA authorization for project, #2013.006, was provided by the Marin RCDs Marin Coastal Watersheds Permit Coordination Program.

- $\Box$  No Permit Required
- ⊠ §1600 CA Department of Fish and Wildlife\*
- ⊠ §401 Water Quality Certification
- □ §404 US Army Corps Wetland
- $\Box$  County of Marin

\*Permits required reports; reporting requirements are addressed in the Phase II: Monitoring Section under Permit Reporting Requirements.

# Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Management Zone Plan (RZMP) written by University California Cooperative Extension in 2008. Standard monitoring for Marin RCD restoration projects includes asking the landowner to reflect on the project process using a Landowner Questionnaire form from the RZMP and evaluating the functionality of the implemented project using a Project Assessment Checklist from the RZMP.

# Landowner Questionnaire:

The landowner questionnaire will be conducted nine to twelve months post project.

# Project 2013-006 Livestock Exclusion Fencing and Gully Repair

# Project Assessment Checklist:

A post-project monitoring visit was conducted on December 2015. All components of project met standards and specifications required by USDA NRCS. Overall, the project rating is "Good" which is determined by using the effectiveness rating matrix and Project Assessment Checklist, see details below:

The project effectiveness rating matrix summary for Project #2013.006:

- *Objectives:* **Excellent** 
  - o Reduced sedimentation delivery.
  - Reduced pathogens through the implementation of riparian livestock fence exclusion.
- Target Values: Good
  - Too early to determine whether targets have been met.
  - Expected to meet intended target values set: early results show increased ground cover stabilized soil, increased native w oody and herbaceous vegetative cover and increased plant diversity.
- Unintended Effects: Good
  - No unforeseen consequences occurred from the implementation of the Best Management Practices to create a negative effect to offset the objectives of the project.
- Structural Condition: Good
  - The project was excellent to fair, transitioned to good, and has the intended functional value.

Individual practices were rated as follows:

# <u>Livestock Fence Exclusion: Effectiveness Rating = Good</u>

Monitoring Assessment: December 2015, January and March 2016

Post-construction inspection: The riparian fence surrounding the entire project was rated 'good' after installation. The H-braces were sound, all fence clips were present. The wire was taut throughout the fence line. All gates were placed along the fence line according to the ranchers liking. All gates were closed although during monitoring inspection there was evidence of livestock within the enclosure. Both landowner and lessee were notified.

March 2016 follow up inspection no evidence of livestock within enclosure.

# Erosion Control Repairs and Structures: Effectiveness Rating = Good/Fair

Monitoring Assessment: December 2015 and January and March 2016 Large gully headcut repair: Rock at both the top and toe of the repair was secure. Erosion control fabric was exposed around the edges of the repair and was not keyed in properly at

specific locations. This compromised the effectiveness and stability of the structure and therefore needed attention post-construction. The contract engineer brought these issues to the attention of the construction contractor and was addressed.

Project 2013-006 Livestock Exclusion Fencing and Gully Repair

January 2016, the top of the large headcut repair experienced a failure due to natural causes. The engineer was notified immediately and repairs were completed by mid-February 2016. March 2016 follow up inspection, repairs were secure.

Three small rock headcut repairs: Top and toe rock secure, no exposed fabric, a small amount of erosion was noted at the toe of the upper structure. The erosion appeared to be caused by livestock not a construction or natural error. Erosion will heal on its own as long as livestock remain excluded from project area. Area will continue to be monitored.

Livestock crossing repair at the time of inspection showed little to no evidence of erosion or rock movement at the top or toe of the structures. All the rock appeared to be secure and holding in place. Erosion control fabric was not keyed in and was exposed along the upstream edge of the repairs. The contract engineer brought this to the attention of the construction contractor and the issue was addressed. The effectiveness and stability rating for post-project was and 'good' for post-project construction.

# Revegetation Survival Maintenance and Monitoring:

At the time of the first inspection in January 2016, the *Juncus patens*, *Salix sp.* and Carax *barbarae* were installed about two month prior. No evidence of stress or damage was detected during this initial visit post-planting.

Marin RCD staff conducted another site visit on June 26, 2017 to assess the survival of the installed *Salix species* sprigs, *Juncus patens* and Carax *barbarae* plugs (photo below taken during site visit). To assess willow survival, two metrics of plant success was used: plant height and vigor. Height was measured in inches, and vigor was rated either: low vigor (LV – plant showing signs of stress), or high vigor (HV plant has healthy new growth). Willows were grouped between two sites: Site 1: the north gully repairs that run parallel to Tomales Creek, and Site 2: the western upstream tributary parallel to Tomales Creek.



At Site 1, the seventy-nine willows stakes were alive and six were dead. At Site 2, thirteen willow stakes were live and two dead, while the four installed willow wattles were thriving. Of the 123 willows planted in November 2015 by Point Blue Conservation Science Students and Teachers Restoring a Watershed, 100 willows were accounted for during the June 2017 inspection (Table 3); the vegetative cover was dense making it difficult to identify willow stakes (Figure 3-4)

To assess rush and sedge survival, photo documentation was conducted. In November 2015 by Point Blue Conservation Science Students and Teachers Restoring a Watershed planted 175 *Juncus* plugs and 12 Santa Barbara sedge plugs along the stream banks of both the northern gully repair and western tributary. The monitoring survey concluded all plantings were well and recorded at heights ranging from 2-4 feet and displaying high vigor (Figure 2). Overall, the observed vegetation cover throughout both sites is averaging 90-98%.

	Dianting Sitos & Type of Diants	Post-Construction		
Installed in 11/15,		6/29/2017		
		Plant Size	<3 ft	>3 ft
Performance of Plantings	North Gully Repairs, Site 1	High Vigor:	54	6
		Low Vigor:	18	0
	Irrigation: none	Dead:	7	
		Survival		91.8%
	West Upstream Tributary, Site 2	High Vigor:		13
		Low Vigor:		0
	Irrigation: none	Dead:	2	0
		Survival		86.7%
	West Upstream Tributary, Site2	High Vigor:		4
	4 willow wattles	Low Vigor:		0
	Irrigation: none	Dead:		0
		Survival		100.0%

Table 3. Willow planting, re-vegetation survival and vigor.



# Livestock Exclusion and Gully Repairs: Project #2013-006



Figure 1. Map of Project 2013-006 showing the location of completed conservation practices implemented November 2015.

Parcel Boundary

#### COWIII Completed Practices

#### Regular Terrain Fencing

Livestock Crossings

🚫 Culvert Removal and Planting Repair

Wet Crossing Repair

🚫 Lower Crossing, no work

#### Grade Stabilization

Small Headcut Repairs

Rock Grade Stabilization Structures, 3

Willow Wattles, 4

### **Biotechnical Repairs**

Streambank Stabilization

Upstream, Headcut, Swale and Rocklined waterway

Downstream, Critical Area Planting Stabilization repair

#### Watershed Boundary

#### Tomales Bay Sub Watersheds

Stream

Lower Walker Creek

Upper Walker Creek

Tomales Bay East Shore

#### Contour 50 ft Marin RCD District Boundary

Marin County





#### Project 2013-006

Gully Repairs, Erosion Control, Revegetation and Fencing

#### Pre-construction Photo 11/2012

Upstream view of western tributary before riparian fence, livestock crossing repairs were installed.



#### Vegetation Survival Monitoring 06/2017

Upstream view of western tributary , photo taken downstream of livestock crossing. Photo displaying dense vegetation and streambank recovery

#### Post-construction Photo 11/2015

Upstream view of western tributary after construction of the following practices: riparian, fence and livestock crossing repairs.



### Vegetation Survival Monitoring 06/2017

View of the livestock crossing through the western tributary, which is barely visible due to tick vegetation





Figure 2. Photo-monitoring documentation of Site 2, before and after construction of conservation practice.

### Project 2013-006

Gully Repairs, Erosion Control, Revegetation and Fencing

#### Pre-construction Photo 08/2015

Pre-construction photo of the active headcut adjacent to the berm before construction above Tomales Creek.



Vegetation Survival Monitoring Photo 06/2017

Vegetation Monitoring photo displaying headcut repairs tieing into the drainage swale surrounded by the regrowth of the willows and juncus.



Figure 3. Photo-monitoring documentation of Site 1, before and after construction of conservation practice.

#### Post-construction Photo 12/2015

Post-construction project photo displaying headcut repair tieing into the drainage swale and and fencing .



**Vegetation Survival Monitoring Photo 06/2017** Close up view of the willow spring planted within headcut repair.



#### Project 2013-006

Gully Repairs, Erosion Control, Revegetation and Fencing

#### Pre-construction Photo 08/2015

Project site before construction showing the headcut and erosion along side and then curving into Tomales Creek.



### Post-construction Photo 12/2015

View after construction of the rock channel headcut repair and STRAW plantings of willow sprigs.



#### Pre-construction Photo 08/2015

View of the waterway curving into Tomales Creek due to headcut forming on the rangeland above (see photo to right).



#### Vegetation Survival Monitoring 06/2017

Looking down the rock channel repair, vegetation survey monitoring documenting vigor and height of plantings along the stream.



Figure 4. Photo-monitoring documentation of Site 1, lower section, before and after construction of conservation practice



Pre-construction photo of the water development (10/2015)



Post-construction photo of solar panel, tank and trough (12/2016). Only the tank is easy to locate near the rock outcropping at top of the hill.



A close up post-construction photo of the tank and trough taken (12/2016).



View of upper pond and spillway (to the left) with Tomales Bay is in the background. The new solar panel is on the right side of pond (12/2016).