MARIN COASTAL WATERSHEDS
PERMIT COORDINATION PROGRAM
2015 REPORT

June 2016

MARIN RESOURCE CONSERVATION DISTRICT

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

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Program Background

The Marin Coastal Watersheds Permit Coordination Program (PCP) facilitates the implementation of high quality restoration projects to reduce non-point source pollutant loading into watersheds and to enhance wildlife habitat. The program 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 Resource Conservation District's (Marin RCD) goal in establishing the PCP was to increase landowner willingness to participate in conservation projects by providing landowners with 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, also known as best management practices (BMPs). In order for projects to be processed through the PCP, the dimensions of the BMPs must fall within the size limitations and the project locations must reside within the geographic scope of the PCP. The types of BMPs 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. The table below lists the BMPs within the PCP:

Marin Coastal Watersheds Permit Coordination Program List of 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, Point Reyes National Seashore (PRNS) or the United States Department of Agriculture's Natural Resources Conservation Service (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.

Approval of projects being implemented under the program that year is obtained from local, state, and federal agencies with jurisdiction over one or more of the 17 conservation

practices included in the program. The following table outlines a list of agencies that may issue permits under the permit coordination program and the type of permit or approval.

Table 1. 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
California Department of Fish and Game	California Fish & Game Code §1602 Lake and Streambed Alteration or Routine Maintenance Agreement California Endangered Species Act Incidental Take Permit or Consistency Determination
North Coast or San Francisco Bay Regional Water Quality Control Board	Waste Discharge Requirements or Clean Water Act §401 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 (ESA) §7 Consultation/ Incidental Take Statement.
NOAA Fisheries	ESA §7 Consultation/ Incidental Take Permit
California Department of Transportation	Road Encroachment Permit
Gulf of Farallones National Marine Sanctuary	Sanctuary Permit

This report service to fulfill the following requirements of 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[1] of each year after project completion for the required duration of monitoring. As stated in the PCP report the 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. Photo-documentation will occur from photo points before construction and annually thereafter throughout the term of the monitoring program and will include both close-up and long-range shots." The Project Profiles included in this report under Exhibit A document the details stated above for all projects completed in the 2015. However due to funding and time constraints, this report does not include project information about PCP projects installed prior to 2015.

Over the past eleven 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, USDA NRCS, PRNS,

[1] Marin RCD has changed this due date to June 30 in order to incorporate additional project elements in the report including: plantings completed in the winter time, and monitoring conducted during the wintertime.

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

Program Highlights

Marin RCD has completed projects on over 42 ranches resulting in the implementation of 207 Best Management Practices.

The Marin RCD has completed the eleventh year of the PCP. Since the initiation of the PCP, Marin RCD has completed projects on over 42 ranches resulting in the implementation of 207 Best Management Practices (BMPs).

During the 2015 construction season, five projects were implemented with the assistance of the PCP. The projects in the PCP were assigned a numerical code name (year and project number) for the PCP list (Table 2 and Figure 1). These five (5) projects were approved into the PCP by Marin RCD in the following years: 2013, 2014 and 2015. Each year, a public notice was published to solicit 30-day public review for the annual PCP list of project going through the program. Some projects were adopted into the PCP and implemented within the same year, while one project (2013-006) went through the program twice due to slight variations in project scope. Overall notable achievements from the five projects implemented in 2015 include installing: 28,937 linear feet of riparian fencing, 13,495 linear feet of pipeline, three (3) streambank protection/stabilizations, four (4) grade stabilizations, one (1) structure for water controls, and over three (3) acres of critical planting area (Table 2, Table 3 and Figure 1).

All projects were conducted in West Marin, which is designated as critical habitat for California red-legged frogs (CRLF). In the listing of CRLF, the United States Fish and Wildlife Service (USFWS) included a special rule that exempts routine livestock ranching activities on non-federal lands to encourage continued responsible land uses that provide an overall benefit to CRLF. This special rule applied to all four out of the five projects; these projects included practices such as critical area plantings, fencing, and small watering facilities. The fifth project, #2013-006, went through a series of different permitting steps to get implemented. The scope of project #2013-006 included several grade control structures and a structure for water control within a tributary to Keys Creek, thus the project needed to comply with the Clean Water Act §401/§404. Marin RCD submitted a Notice of Intent to Regional Water Quality Control Board to comply with the terms of the General Water Quality Certification Order for Small Habitat Restoration Projects. Marin RCD also completed a Streambed Alteration Agreement for California Department of Fish and Wildlife. All permits were provided to the construction contractor. This project included funding from the USDA NRCS; therefore, USDA NRCS initiated consultation with the USFWS for CRLF. Although the project implemented routine livestock ranching, it was necessary for USFWS to provide

consultation because federal funds were providing cost-share assistance on the project. In accordance with permit requirements, hired consultants and USDA NRCS staff conducted pre-construction biological sweeps, training, during construction inspections and post-construction inspections.

Table 2. Projects implemented in 2015 with the assistance of the Marin Coastal Watershed Permit Coordination Program in 2013-2015. The table includes the permits required for each project including: §401 Water Quality Certification issued by State Water Resource Control Board, §1600 Lake and Streambed Alteration Agreements issued by California Department of Fish and Wildlife, and §404 Nationwide Permit US Army Corps of Engineers. The type and number of best management practices in each project.

Project Code	Project Name	Required Permit(s)	Best Management Practices (BMP)	Number Of BMPs Installed	Total BMPs Installed
2013-004	*Riparian Planting, Livestock Fencing and Water Development Project*	*N/A*	CRITICAL AREA PLANTING	1	**7**
			FENCING	2	
			STREAMBANK STABLIZATION	2	
			WATER DEVELOPMENT	2	
2013-005	*Riparian Fencing and Water Development Improvement Project*	*N/A*	FENCING	1	**4**
			WATER DEVELOPMENT	3	
2013-006	*Livestock Exclusion Fencing and Gully Repair Project*	*§1602 Lake & Streambed Alteration Agreement, & §401 Water Quality Certification*	CRITICAL AREA PLANTING	3	**11**
			FENCING	1	
			GRADE STABLIZATION STRUCTURE	4	
			STREAMBANK STABLIZATION	1	
			STREAM CROSSING	1	
			OBSTRUCTION REMOVAL	1	
2015-009	*Carbon Farm Planting Project*	*N/A*	CRITICAL AREA PLANTING	1	**1**
2015-010	*Carbon Farm Planting Project*	*N/A*	CRITICAL AREA PLANTING	1	**1**
GRAND TOTAL					**24**

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, University of California Cooperative Extension and Marin Municipal Water District. The success of the PCP was captured through two methods: 1) Performance Measures and Notable Achievements identified in each grant that captures

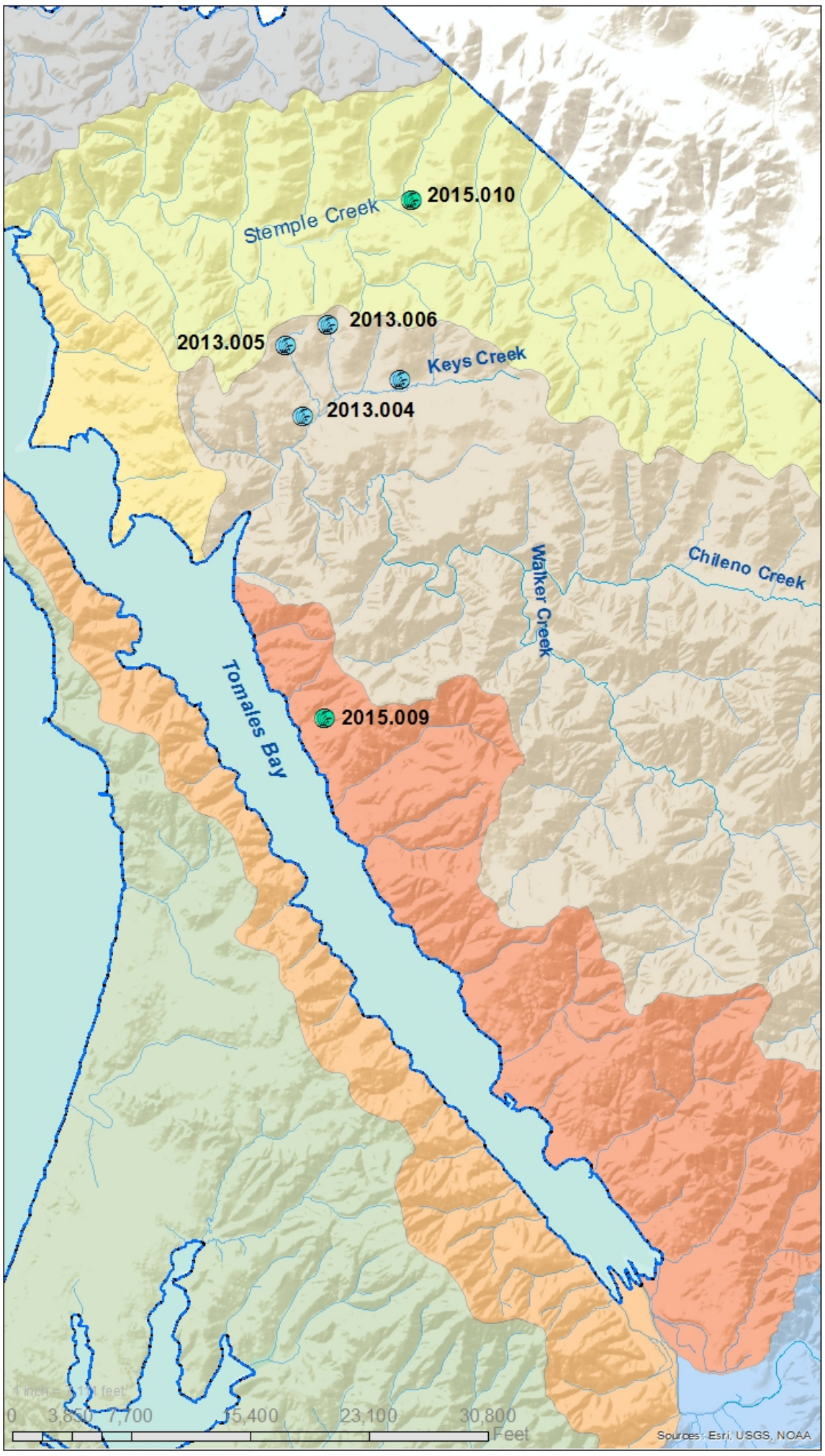
programmatic success by identifying the program goals and outcomes; and 2) the Riparian Zone Monitoring Plan. The success of the entire program is based on the cumulative impact of the implemented ranch projects. The Riparian Zone Monitoring Plan, developed by University of California Cooperative Extension and Marin RCD, and approved by Regional Water Quality Control Board, provides a suite of protocols that Marin RCD uses to measure performance of individual ranch projects. The information is summarized in the Performance Measures (Table 3) and in individual Project Profile reports (Exhibit A).

Table 3. The performance measures and notable achievements from the conservation practices installed through the Marin Coastal Watersheds Permit Coordination Program from 2015.

Performance Measures and Notable Achievements	Count	Unit
Projects Completed	5	Count
Best Management Practices Completed	24	Count
Stream Protected	20,649	Linear Feet
Streambank Restored	1,444	Linear Feet
Livestock Fence Installed	28,937	Linear Feet
Grade & Streambank Stabilization Structures Installed	7	Count
Spring & Water Developments Installed	5	Count
Native Trees & Shrubs Installed	1,042	Count
Species Planted	32	Count
Sediment Load Reduction	Over 135.05	Tons Per Year

In conclusion, the PCP program successfully supported agriculture and the environment by providing assistance to the ranching community and implementing 24 voluntary BMPs on agricultural lands in west Marin County, California. As the Marin RCD proceeds into the twelfth year of the program 15 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.

Marin Coastal Watersheds Permit Coordination Program



2013.004
Best ManagementPractices (BMP's)
1. Critical Area Planting: (1)
2. Fencing: (2)
3. Water Development: (2)
   - Pipeline (2)
   - Solar Pump (2)
   - Tank (2)
   - Troughs (6)
4. Streambank Stabilization (2)

2013.005
Best ManagementPractices (BMP's)
1. Fencing: (1)
2. Water Development: (3)
   - Sping Development (3)
   - Pipeline (1)
   - Tank (2)
   - Troughs (3)

2013.006
Best Management Practices (BMP's)
1. Critical Area Planting: (3)
2. Fencing: (1)
3. Grade Stabilization: (4)
4. Stream Crossing: (1)
5. Streambank Stabilization: (1)
6. Obstruction Removal: (1)

2015.009
Best Management Practices (BMP's)
1. Critical Area Planting: (1)

2015.010
Best Management Practices (BMP's)
1.Critical Area Planting (1)

TOMALES BAY WATERSHED: RANCHERS ASSISSTED 2015

Marin RCD District Boundary
Streams

PROJECT CODE
2013.004
2013.005
2013.006
2015.009
2015.010

WATERSHEDS
ESTERO AMERICANO
STEMPLE CREEK / ESTERO DE SAN ANTONIO
TOMALES BAY/ DILLON BEACH
TOMALES BAY WEST SHORE
TOMALES BAY EAST SHORE
WALKER CREEK
POINT REYES NATIONAL SEA SHORE
LAGUNITAS CREEK

MARIN RESOURCE CONSERVATION DISTRICT

Date: 6/9/2016 Author: Lynette K Niebrugge

Figure 1. Map of projects and best management practices implemented in 2015 through the Marin Coastal Watershed Permit Coordination Program.

PROJECT PROFILE: #2013-001

2,001 linear feet of riparian fence line

1,020 linear feet of streambank stablization

Project:	2013-001	
Watershed:	Walker Creek, Subwatershed: Chileno Creek	
Practices:	**Gully Repairs, Erosion Control, Revegetation and Fencing (8 total BMPs)**	
Project Cost and Partners:	**$98,867.00**	
	$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*).

Table 1. Project area dimensions.

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
  - 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, 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. 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:
Gully Repairs, Erosion Control, Revegetation and Fencing – completed January 2015

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 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.

Table 2. Completed project dimensions.

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

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
☒ §401 Water Quality Certification
☐ §404 US Army Corps Wetland
☐ County of Marin

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.

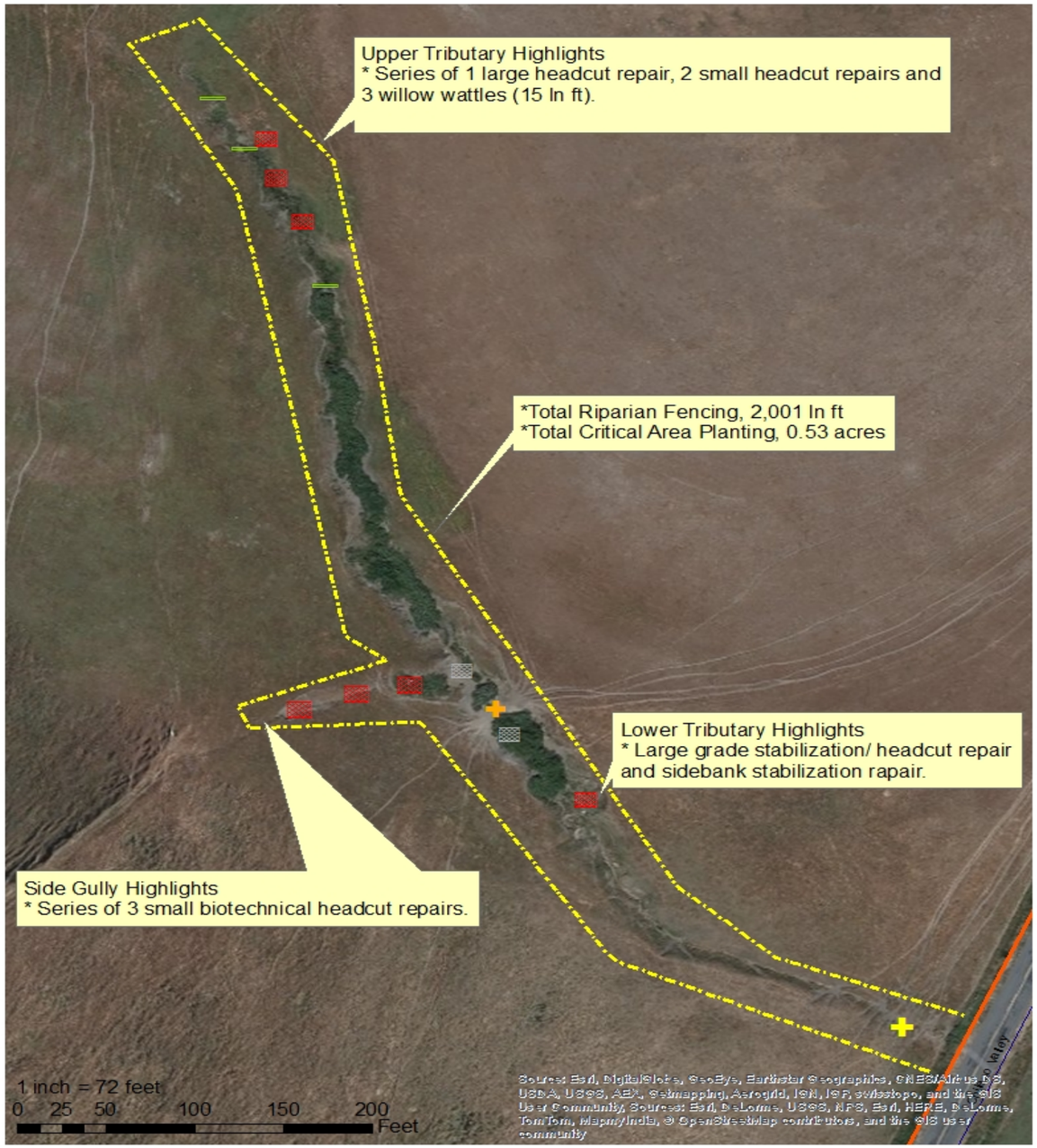
The stream grade stabilization headcut repairs however both rated 'fair' in effectiveness and stability and needed attention post-construction. The larger headcut repair below the culvert crossing and the side headcut upstream showed evidence of rock movement. The smaller rock washed out, exposing the 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

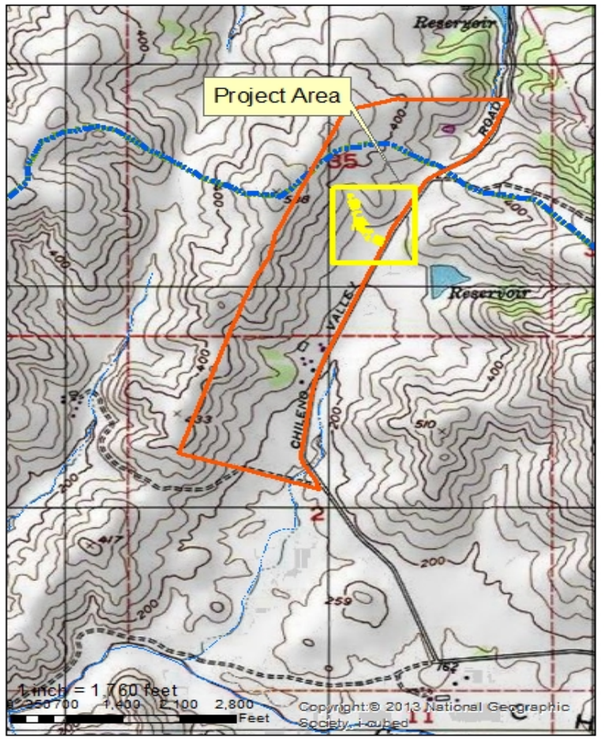
contractor. Repairs were made immediately following the post construction assessment and the project rating improved from 'fair' to 'good' in effectiveness and stability.

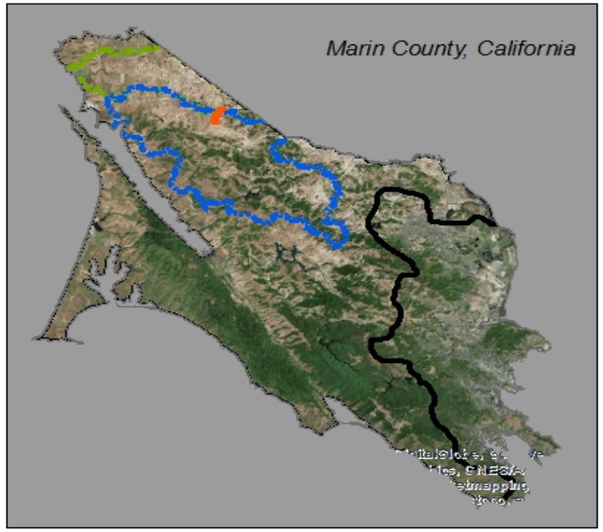
Livestock Fence Exclusion: Effectiveness Rating = Excellent
Post-Construction inspection: The riparian fence surrounding the entire project was rated 'excellent' after installation. The H-braces were sound, all fence clips were present, no evidence of cracked fence or livestock disturbance. The wire 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.

Revegetation : Effectiveness Rating = TBD
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.







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

Legend

- Parcel Boundary
- Marin RCD District Boundary

Ranch Infrastructure Implemented

- Riparian Fencing

Gully Repairs

- Headcut Repairs, 7 total
- Lined Waterway Inlet/Outlet, 1 total
- Willow Wattles, 3 Total

Livestock Crossing Repairs

- Structure for Water Control
- Stream Crossing

Watershed

Tomales Bay Sub Watersheds

- WALKER CREEK
- STEMPLE CREEK / ESTERO DE SAN ANTONIO

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MARIN RESOURCE CONSERVATION DISTRICT

Figure 1. Map of Project 2013-001 showing the location of completed conservation practices implemented January 2014-2015.

Pre-construction Photo 01/2012

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

Post-construction Photo 01/2015

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

Pre-construction Photo 02/2013

View of livestock culvert crossing and active side gully headcutting before construction.

Post-construction Photo 06/2015

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.

Pre-construction Photo 02/2013

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

Post-construction Photo 01/2015

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

Pre-construction Photo 02/2012

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

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.

PROJECT PROFILE: #2013-004

1.67 acres revegetated

2.57 miles stream fenced

Project:	2013-004	
Watershed:	Walker Creek, Subwatershed: Keys Creek	
Practices:	**Riparian Planting, Livestock Fencing and Water Development Project (6 total BMPs)**	
Project Cost:	$173,712.67	
and Partners:	$63,710.10	Marin Resource Conservation District, 319(h) State Water Resources Control Board
	$90,656.72	United States Department of Agriculture Natural Resources Conservation Service Environmental Quality Incentives Program
	$12,036.82	Marin Agricultural Land Trust
	$19,345.84	Landowner

Project Overview

The **Riparian Planting, Livestock Fencing and Water Development Enhancement Project, 2013-004,** was part of the Conserving Our Watersheds (COW) Program, Phase III: Grazing Waiver Implementation program, designed to assist ranchers with the planning and implementation of conservation practices that promote and support the advancement of water quality improvements. The goal of Project 2013-004 included reducing pathogens, improving habitat and restoring and stabilizing the streambanks of Keys Creek. The project was to be accomplished by establishing approximately 21,743 linear feet of livestock exclusionary fencing to protect over two miles of Keys Creek and to improve available livestock water sources at two locations of the ranch: the eastern parcels, Project Site 1 and the western parcels, Project Site 2.

Site 1 is located on the eastern side of the ranch at the upper reach of Keys Creek, which is adjacent to Tomales-Petaluma Road. Restoration work at Site 1 included the installation of riparian fencing and the stabilization of a section of streambank with native plantings. A livestock drinking water source was also enhanced. Site 2 is located on the western side of the property and at the lower reach of Keys Creek, adjacent to Highway 1. Practices installed at Site 2 included establishing permanent riparian fence along Keys Creek, a nearby tributary, an existing pond, in addition to establishing a watering facility.

The ranch completed six (6) best management practices listed below with the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) conservation practice name and number: two livestock riparian fencing (#328); one critical area planting (#342); one streambank stabilization (#580) and two water developments (#516/614). The conservation practices will improve water quality by reducing erosion and approximately 65.5 tons/year of sediment transport into Keys Creek before discharging into Walker Creek thence Tomales Bay.

Ranch Location:
The ranch is located approximately a half mile from Tomales, in northwest Marin County, California. The eastern parcels are located east of Highway 1 and north of Tomales-Petaluma while the western parcels are located west of Highway 1.

Project Location:
Project sites 1 and 2, are located adjacent to Keys Creek (Figure 1).

HUC 12: 180500050203
STREAM REACH CODE (S): 18050005001182
18050005000117
18050005001184

Environmental Conditions:

The ranch is located in coastal Marin County. Rangeland varies in elevation from 50 to 350 feet and supports a Highlander cattle livestock operation. The dominant soil mapped throughout Keys Creek and the surrounding floodplain is 105: Blucher- Cole Complex with a slope of 0 to 5%. The parent material is comprised of alluvium derived from sandstone and shale. The Blucher-Cole Complex has a restrictive depth of 60 inches or greater and is somewhat poorly drained. The soil has a moderate to high shrink swell potential and is susceptible to flooding.

The upland hills of the project location is comprised of Tomales loam (191, 192 and 193), with 0 to 50 % slopes and Sobega loam (173-174) with 9 to 30% 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 to 60 inch depth to the paralithic bedrock (coastal loamy claypan). The Sobega loam soils are well drained with restrictive paralithic bedrock ranging from 20 to 40 inches.

Rangeland vegetation consists of annual and perennial grasses, rushes and forbs with Cypress trees scattered across the landscape. The riparian corridor harbors patches of riparian tree stands, blackberry thickets, rushes, sedges and herbaceous wetland plants.

Table 1. Project area dimensions.

Project Information	Area	Unit
Ranch Area	499	Acres
Project Area: Site 1	215	Acres
Project Area, Site 2	265	Acres
Keys Creek Watershed Area	3,035	Acres
Keys Creek (mainstem)	3.5	Miles
Keys Creek Total Length on Ranch (mainstem)	2.06	Miles

Historical Partnership and Commitment:

The landowner has not engaged in past conservation projects with the Marin Resource Conservation District (Marin RCD). The ranch is participating in the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) program 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:

- 2013 – Present: Weed abatement, Cross fencing
  - NRCS, Environmental Quality Incentives Program (EQIP)

- Landowner has a Marin Agricultural Land Trust (MALT) easement

Phase I. Design and Implementation

Design:

In the spring of 2013, the landowner, a NRCS Rangeland Specialist, NRCS Engineer, Marin RCD Conservation Scientist and MALT Stewardship Project Manager developed a conservation plan to meet the goals and objectives of the program. The design involved dividing the project into two sites: the eastern parcels, Site 1 and the western parcels, Site 2. The Site 1 design consisted of installing permanent fence along nearly 1.33 miles of Keys Creek and an upland livestock water source. The riparian fence will prevent livestock from accessing their previous water source, Keys Creek. The NRCS Rangeland Specialist and a Rangeland Technical Service Provider (TSP), specializing in solar powered pump systems, co-designed the alternate water facility. In addition to installing the riparian fence and developing a water facility, a critical area planting was planned within the riparian corridor. Point Blue Conservation Science's Student and Teachers Restoring a Watershed (STRAW) developed a planting pallet using a variety of native woody plant species with assistance from Prunuske Chatham, Inc. (PCI). The planting design was designed to create habitat connectivity from the lower wetland reach to upland habitat. The project would thereby result in increased species and structural diversity within the corridor, while simultaneously considering climate change adaptation in the selection of the native plants. Revegetation was divided into two installations over a course of two years. The design strategically placed the plantings on the south bank to shade the creek. The planting design called for the area to be protected from livestock grazing and trampling for a three (3) year period by permanent or break-away cross-fence.

The design for the western parcels, Site 2, required a special meeting with all partnering organizations and the COW Program's Technical Advisory Committee to discuss multiple concerns around the project design and its ability to adequately address water quality issues on Keys Creek. The final design included replacing an electric fence along 1.2 miles of mainstem Keys Creek and a short tributary with permanent livestock fencing. The project incorporated the MALT Creek Conservation Management Plan creating a Targeted Grazing Plan designed specifically for this stream reach that experiences tidal influence. The design also included fencing around a pond and specifications regarding constructing near a historic railroad bed. The work at Site 2 was designed to improve livestock management by preventing calves from slipping through the electric fence and accessing the creek throughout the year. The NRCS Rangeland Specialist and TSP also designed a water source as a supporting practice to aid in the distribution of livestock throughout the ranch to reduce the amount of time cattle spend near or in bodies of water.

The designs consisted of a suite of USDA 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: 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: Manage land impacts caused by livestock activity. Prevent livestock from slipping through the electric fence and accessing Keys Creek throughout the year.

3. Streambank Stabilization (580)
Objective 3: Stabilize and protect side bank of stream against erosion to reduce sediment loads causing downstream damage. Improve fish and wildlife habitat and protect adjacent land from erosion damage.

4. Water Development: Solar Pump, Pipeline, Tank and Troughs (516/614)
Objective 4: Distribute water sources along ridge tops to aid in the distribution of cattle throughout the ranch. This will reduce the amount of time cattle spend near, or in, bodies of water.

Implementation:
Project Site 1 included the construction of a 11,528 linear foot riparian livestock fence on Keys Creek (Fig. 1). A watering facility was repaired at an existing well (location, based on past well logs) by installing a solar pump (Grundfos 6SQF3) set at a 200-foot depth with a 1.25 inch schedule 80 drop pipe, stainless steel couplers, torque and safety rope at the 5-inch diameter well. During installation of the pump, the contractor discovered the well depth to be insufficient. The well was then inspected by a hired professional to determine if enough water was available to supply the ranch with its water demand. Upon further investigation the pump was lowered an additional 80-100 feet to reach a reliable water source. The pump's solar grouping consisted of three 260 watt Q Cell series modules, an optional generator for foggy days and a battery operated timer. The solar pump supports a 5,000 gallon water tank leading to three 400 gallon water trough in the lower pasture. The water tank was fitted with a float switch used to regulate overflow. Additionally, NRCS funded 3,557 linear feet of pasture cross fencing which was installed to support a rotational grazing system and support the conservation practices funded through the COW III program.

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

The STRAW program funded three days of restoration activities at the ranch through an Integrated Regional Watershed Management Plan grant. Phase 1 implementation was completed January 2015. A total of 185 native trees and shrubs were planted across 1.67 acres (886 feet x 82 feet= 72,652 square feet). The riparian vegetation planting consisted of planting native woody plants at the top of bank and beyond (Table 3). Two critical area planting sites were planted with willow plugs to control bank erosion; the average dimensions for these plantings were 6 feet tall and 20 feet long. One headcut was repaired by installing a willow revetment (2.5 feet tall x 4.5 feet long).

Phase 2 will be planted in March 2016. The completion of this phase will include planting approximately 110 native shrubs and trees, and restoring two actively eroding side banks with willow plug plantings. Due to rain delay the installation has been delayed therefore final dimensions will be determined at the time of implementation.

At Project Site 2, the riparian livestock exclusionary fence totaled 10,215 linear feet, enclosing a fresh water pond, tributary and approximately 4,052 linear feet of the lower reach of Keys Creek (Fig. 1 & 2, Table 1&2). The five-strand wildlife friendly fence surrounding the pond measured 1,600 linear feet. During installation of the fence, the project came to a halt to avoid construction on the historic railroad grade. An alternate route was established and fencing commenced.

During the project, an alternative water source was developed for livestock. A solar pump (Grundfos 6SQF3), 40 feet of 8 inch N12 plastic culvert pipe were installed. A solar grouping consisting of four 260-watt Q Cell series solar modules, an optional use generator (foggy days) and a battery operated timer were installed. The pump at the pond is now the source used to convey water to the upland pasture. Water is piped and distributed to the newly installed 5,000-gallon tank and two 400-gallon troughs along the upper ridge. To enhance rangeland management practices for this site location NRCS funded nearly 3,165 linear feet of cross fencing and weed management.

Table 2. Final dimensions of Project 2013-004.

Site Location and Description	Conservation Practice		Measurement	Unit
Eastern Parcels, Project Site 1	Riparian Fence Exclusion		11,528	Linear foot
	Streambank Stabilization/Willow Wall		4.5	Linear foot
	Revegetation Area		1.67	Acres
	Water Development	Pipeline	4500	Linear foot
		Tank-1	5000	Gallon
		Troughs-3	400	Gallon
		Pump	2	Horsepower

Western Parcels, Project Site 2	Riparian Fence Exclusion, Mainstem		4500	Linear foot
	Riparian Fence Exclusion, Tributary		4115	Linear foot
	Livestock Pond Exclusion		1600	Linear foot
	Water Development	Pipeline	6500	Linear foot
		Tank-1	5000	Gallon
		Troughs- 3	400	Gallon
		Pump	3	Horsepower
Total Project Riparian Fencing			**21,743**	**Linear Foot**
Total Length of Stream Protected, Site 1 (fenced, mainstem only)			**1.33**	**Miles**
Total Length of Stream Protected, Site 2 (fenced, mainstem only)			**0.80**	**Miles**
Total Length of Streams Protected (mainstem & tributary)			**2.58**	**Miles**
Sediment Load Reduction (Region 5 Model)			**65.5**	**Tons/Year**

The following CEQA authorization and permits were obtained for this project:
This project, #2013-004, was authorized through Marin Resource Conservation District's Marin Coastal Watersheds Permit Coordination Program for CEQA compliance.

☒ No Permits Required
☐ §1600 CA Department of Fish and Wildlife
☐ §401 Water Quality Certification
☐ §404 US Army Corps of Engineers
☐ County of Marin

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:
As of February 2016, the landowner and range manager were satisfied with the outcome of the project. The range manager expressed interest in working with the Marin RCD again; he and the landowner are motivated to implement additional conservation practices on the ranch to improve both the management and health of the livestock and land. An official

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

Landowner Questionnaire will be conducted after the second phase of the revegetation planting is completed, March 2016

Project Assessment Checklist:
A total of three post project monitoring site visits have been conducted: November 2014, July 2015 and December 2015. All components of project met standards and specifications required by USDA NRCS. Overall, the project rated "Good" to "Excellent". This rating was determined by using the effectiveness rating matrix and Project Assessment Checklist, see details below.

The project effectiveness rating matrix summary for Project #2013-004:

- *Objectives:* **Excellent**
  - Reduced sedimentation delivery, improved wildlife habitat.
  - Reduced pathogens through the implementation of riparian livestock fence exclusion.
- *Target Values*: **Good**
  - Anticipate meeting all target values. Met all other intended target values: 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 BMP's which would create a negative effect to offset the objectives of the project.
- *Structural Condition:* **Excellent**
  - The project was good to excellent and has the intended functional value.

Individual practices were rated as follows:

Livestock Fence Exclusion: Effectiveness Rating = Excellent
Monitoring Assessments: Site 1 - November 2014, Site 2 - July and December 2015.
Post Construction: Upon inspection of Sites 1 & 2, there was no evidence of livestock pressure, all H-braces were sturdy, wire was taught and no posts were broken or missing. All gates were closed and there was no evidence of livestock present within the enclosure.

Water Development and Enhancement: Effectiveness Rating= Excellent
Monitoring Assessments: Site 1 - November, 2014 and May & June, 2015; Site 2 - December 2015.
All troughs and tanks contained adequate capacity to meet water requirements for livestock. The float valve and wildlife friendly ramps were installed and functioning properly.

Critical Area Planting: Effectiveness Rating = Good

Monitoring Assessments: Site 1/Phase 1 - conducted by STRAW August 2015.
Approximately eight months post-planting, STRAW conducted a maintenance and monitoring inspection to document the plant survival by species. Documentation of the 185 native plants survival and vigor is displayed in Table 3. STRAW reported 71.9% survival, specific cause of mortality was not reported. Of the surviving plants, 95% were categorized as having 'high vigor' which was determined by plant health and hardiness.

Table 3. Vegetation planting and survival from 2014 to 2015 of Phase 1 planting.

VEGETATION SURVIVAL								
Plant Establishment Data								
PROJECT #	2013.004							
Date Monitored:	8/27/2015							
Date(s) Planted:	01/ 08, 13 & 14/2015							
Species	**Common Name**	**Number Planted**	**Total Alive 2015**	**% Survival**	**<3ft, Low Vigor**	**<3ft, High Vigor**	**>3ft, Low Vigor**	**>3ft, High Vigor**
Acer negundo	box elder	17	17	100.0%		16		1
Alnus rubra	red alder*	13	6	46.2%				6
Calycanthus occidentalis	spice bush	5	5	100.0%		5		
Cornus sericea	creek dogwood	21	9	42.9%		9		
Corylus cornuta	hazelnut	5	5	100.0%	1	4		
Crataegus douglasii	hawthorn	10	10	100.0%	1	9		
Fraxinus latifolia	Oregon ash	10	7	70.0%	1	6		
Garrya elliptica	silk tassel bush	5	5	100.0%		1		4
Holodiscus discolor	ocean spray	5	5	100.0%		5		
Lonicera involurata	twinberry	5	2	40.0%		2		
Myrica californica	wax myrtle	15	13	86.7%		13		
Rhamnus californica	coffeeberry	5	3	60.0%		3		
Ribies sanguineum	flowering current	5	5	100.0%		5		
Rubus parviflorus	thimbleberry	5	5	100.0%	1	4		
Salix lucida ssp *lasiandra*	yellow willow	45	31	68.9%		15		16
Sambucus nigra spp cerulea	blue elderberry	7	4	57.1%	2	2		
Sambucus racemosa	red elderberry	7	1	14.3%				1
Overall Survival		**185**	**133**	**71.9%**	**6**	**99**	**0**	**28**
				Percent	***5%***	***74%***	***0%***	***21%***

Monitoring Assessments: Site 1/Phase 2
This planting is scheduled to occur in the Spring of 2016.

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

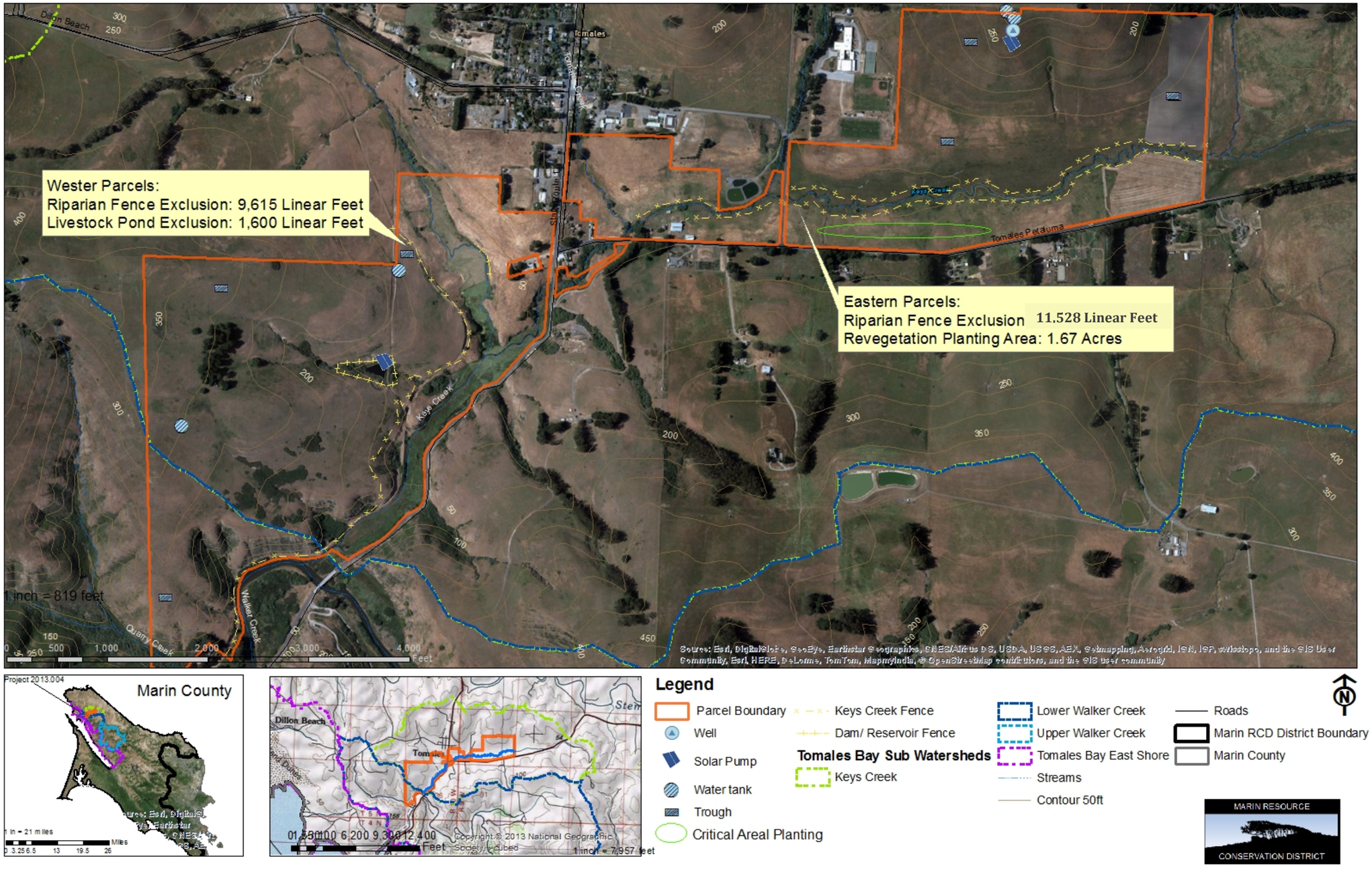


Figure 1. Map of Project 2012-003 showing the location of completed conservation practices.

Post-construction Photo 11/2014

Post-construction photo of exclusionary fencing at eastern parcel, Site 1.

Pre-construction Photo 05/2014

Pre-construction photo of eastern parcel, Site 1 pre exclusionary fencing and planting. View taken from Photo Point 1.

Post-construction Photo 05/2015

Post-construction photo riparian fencing encompassing the critical area planting.

Post-construction Photo 07/2015

Post-construstion photo of solar pump at well on eastern parcel, Site 1.

Figure2. Photo-monitoring documentation of installed conservation practices.

Project 2013-004

Riparian Planting, Livestock Fencing and Water Development

Pre-construction Photo 03/2013

Pre-construction photo of Site 1 (a landscape view).

Post-construction Photo 01/2015

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

Pre-construction Photo 07/2015

Pre-construction photo of Site 2 taken from the pond embankment.

Post-construction Photo 12/2015

Post-construction photo at Site 2. Photo displays exclusionary livestock fencing encompassing the face of the dam and solar pump.

Figure 3. Photo-monitoring documentation of installed conservation practice.

PROJECT PROFILE: #2013-005

5,440 linear feet of riparian fencing installed

2,844 linear feet of stream protected by fencing

Project:	2013-005	
Watershed:	Walker Creek, Subwatershed: Keys Creek	
Practices:	**Livestock Exclusion Fencing and Water Developments (4 total)**	
Project Cost and Partners:	**$60,893.18**	
	$17,544.53	Marin Resource Conservation District, 319(h) State Water Resources Control Board, State Coastal Conservancy
	$34,444.19	United States Department of Agriculture Natural Resources Conservation Service Environmental Quality Incentives Program 2013
	$ 1,904.96	Marin Agricultural Land Trust Stewardship Assistance Program
	In-Kind	Landowner

Project 2013-005
Livestock Exclusion Fencing and Water Developments

Project Overview

The **Livestock Pond Fence Exclusion and Water Development Project, 2013-005,** was part of a Marin Resource Conservation District (Marin RCD) program called 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 to Tomales Bay.

Project 2013-005 was designed to address the landowner's goal to implement conservation practices to address non-point source pollutants such as pathogens from entering into an unnamed tributary discharging into Keys Creek. To accomplish this goal, the project entailed constructing an exclusionary fence encompassing the unnamed tributary and an on-stream livestock pond, as well as, developing alternative water source for the livestock operation. The implemented conservation practices were established with the intent to improve pond habitat, reduce pond degradation, reduce sedimentation and eliminate pathogen transport into an unnamed stream discharging into Keys Creek a tributary to Walker Creek thence Tomales Bay (see Table 1 for stream measurements).

The ranch implemented a total of four (4) Best Management Practices consisting of the following United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) conservation practices and number: one regular terrain fence (#382); three water developments involving three spring developments (#574), livestock pipeline (#516) and watering facilities (#614) (concrete water troughs and water tanks). The conservation practices will improve water quality by reducing erosion and approximately 15.725 tons/year of sediment transport into Keys Creek

Ranch Location:
The ranch is located approximately 0.5 miles west of Tomales, in northwestern Marin County, California. It is accessible from Dillion Beach Road. The driveway is adjacent to the local cemetery and Middle Rd.

Project Location:
The project area is situated behind the homestead on a 283 acre ranch. The ranch has one unnamed intermittent tributary with an on-stream pond which discharges into Keys Creek thence Walker Creek then outlets into Tomales Bay and the Pacific Ocean (Fig. 1). The project area includes the length of the unnamed intermittent stream, the one pond on the parcel and the surrounding pastureland where the water developments were installed.

HUC: 180500050203
STREAM REACH CODE: 18050005001182

Environmental Conditions:
The site is located on coastal rangeland in Marin County, elevations ranging from 150 to 350 feet. The ranch is comprised of rangeland continually grazed year round by cattle livestock. The dominant soil type found throughout project location are the Tomales loam (191, 192 and 193) 0- 50% slopes and residuum weathered from sandstone. These soils are moderately well-drained with a restrictive depth of 40 - 60 inches.

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 Eucalyptus and low growing willows (*Salix lasiolepis*), toyon and patches of native and non-native wetland plants including: rushes (*Juncus sp.*) pennyroyal (*Mentha pulegium*), dock (*Rumex sp.*) and Himalayan blackberry (*Rubus armeniacus*), unidentified sedges and ferns.

Table 1. Project area dimensions.

Project Information	Area	Unit
Keys Creek Watershed	3,035	Acres
Ranch Area	286	Acres
Total Length of Tributary	7,658	Linear feet
Total Length of Tributary on Ranch	2,849	Linear feet

Historical Partnership and Commitment:
Project 2013.005 is the first time the landowner has participated in programs offered by Marin RCD and USDA NRCS. The landowner has a Marin Agricultural Land Trust (MALT) easement and has no past history of participating in MALT's Stewardship Assistance Program previous to this project.

Past and Current projects include:

- 2013-2015 Riparian Fencing, and Water Development
  - Marin RCD, MALT and NRCS Environmental Quality Incentives Program (EQIP).

Phase I. Design and Implementation

Design:
A conservation design plan was developed in the spring of 2013 through 2015 by a USDA NRCS Rangeland Specialist and Marin RCD Conservation Scientist. The plan was designed to meet the goals and objectives set by all partners and the landowner. The plan involved stabilizing the pond embankments, dam, spillway and streambanks of the unnamed

tributary to Keys Creek. To address site issues, the design was comprised of a riparian fence that would encompass the pond, spillway and unnamed tributary; three water developments; and one water facility enhancement. 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. Regular Terrain Fence (328)
Objective 1: Construct an exclusionary fence encompassing livestock pond, spillway, dam and intermittent stream which will eliminate land impacts caused by livestock activity (Fig. 2).

2. Spring Development and Piping (574/516)
Objective 2: The purpose of the piping system is to convey water up a steep slope to achieve the adequate capacity for livestock watering and distribution (Fig. 1).

3. Watering Facility (614)
Objective 3: 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 (Fig. 3).

Implementation:
The regular terrain fence and water developments: spring development, piping and watering facility were completed in November 2015. During summer and fall of 2015, the Marin RCD Conservation Scientist and the NRCS Rangeland Specialist inspected the completed fence exclusion and water development. The constructed fence measured 5,440 linear feet long and encompassed 2,512 linear feet of the unnamed intermittent stream (Table 1). The fence was constructed around the pond, spillway and extended downstream along the tributary to the front fields of the property (Fig.2).

Three water developments and one water source enhancement were established, two in the west fields and two in the east field. The west front field water development consisted of one spring development, one 5,000 gallon tank, one 342 gallon concrete trough and 470 linear feet of 1" polyvinyl chloride pipe. The spring was developed by placing a perforated pipe along the slope wrapped in gravel and fabric to capture water and convey water to a plastic culvert placed in a capture box, with a gravel base for clean water capture. An additional water source was installed on the west back field consisting of 970 linear feet of pipeline from an existing well to a 342 gallon concrete trough (Table 2).

The water development in the east field consisted of two spring developments, one centrally located 5,000 gallon tank, one 342 gallon concrete trough and 1,055 linear feet of pipeline. The springs were developed similarly to the west field spring. Each spring delivers water to the centrally located tank that fills the concrete trough (Fig.3).

All concrete troughs were designed to meet the water supply requirements of the livestock operation and wildlife specification. Adequate access for wildlife was also incorporated by adding an escape ramp per NRCS standards and specifications Both the tank and troughs were placed on durable firm foundations, ¾" road base with greater than 6" depth, to protect the surrounding areas from resource concerns, animal concentrations and unexpected overflow. After construction was completed, the area was seeded and mulched to reduce impacts from soil disturbance.

Table 2. Project 2013-005 final dimensions.

Project Information, Dimensions				
Conservation Practice	**Description**	**Quantity**	**Measurement**	**Unit**
Regular Terrain Fence	5-strand barb wire, livestock exclusion fence		5,440	Linear foot
Spring Developments		3		
Watering Facilities	Tank	1	5,000	Gallon
	Tank	1	2,500	Gallon
	Troughs	3	400	Gallon
Pipeline	East upper field	1	340	Linear foot
	East front field	1	715	Linear foot
	West front field	1	470	Linear foot
	West back field	1	970	Linear foot
Total Riparian Fence Exclusion			**5,400**	**Linear foot**
Total Length of Stream Protected, (fenced mainstem only)			**2,612**	**Linear foot**
Total Length of Stream Protected, (fenced mainstem & tributary)			**2,844**	**Linear foot**
Sediment Load Reduction (Region 5 Model)			**15.725**	**Tons/Year**

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
☐ §401 Water Quality Certification
☐ §404 US Army Corps Wetland

☐ County of Marin

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 Project 2013.005 met the intended goals of the landowner. The landowner foresees that the project will improve livestock management and land productivity with the ability to implement a rotational grazing system. Rotational grazing is now possible due to the construction of several water developments and the cross fencing of several fields. He also expects the project to reduce livestock stress upon the spillway thereby increasing ground cover and reducing sedimentation. During the entire process, the landowner was pleased with the Marin RCD's performance. The landowner is definitely interested in working with Marin RCD again.

Project Assessment Checklist:
One post-project monitoring visit was conducted on January, 2015
All components of the project met the standards and specifications of the USDA NRCS.
Overall, the project rated "Excellent"; which was determined by using the effectiveness rating matrix and Project Assessment Checklist; see details below.

The project effectiveness rating matrix for Project #2013.005

- *Objectives*: **Excellent**
  - Achieved all stated objectives.
- *Target Values*: **Excellent**
  - Met or exceeded targeted values.
- *Unintended Effects:* **Excellent**
  - No unforeseen consequences occurred from the implementation of the four Best Management Practices.
- *Structural Condition*: **Excellent**
  - The project was excellent to good and has the intended function and value.

Individual practices were rated as follows:

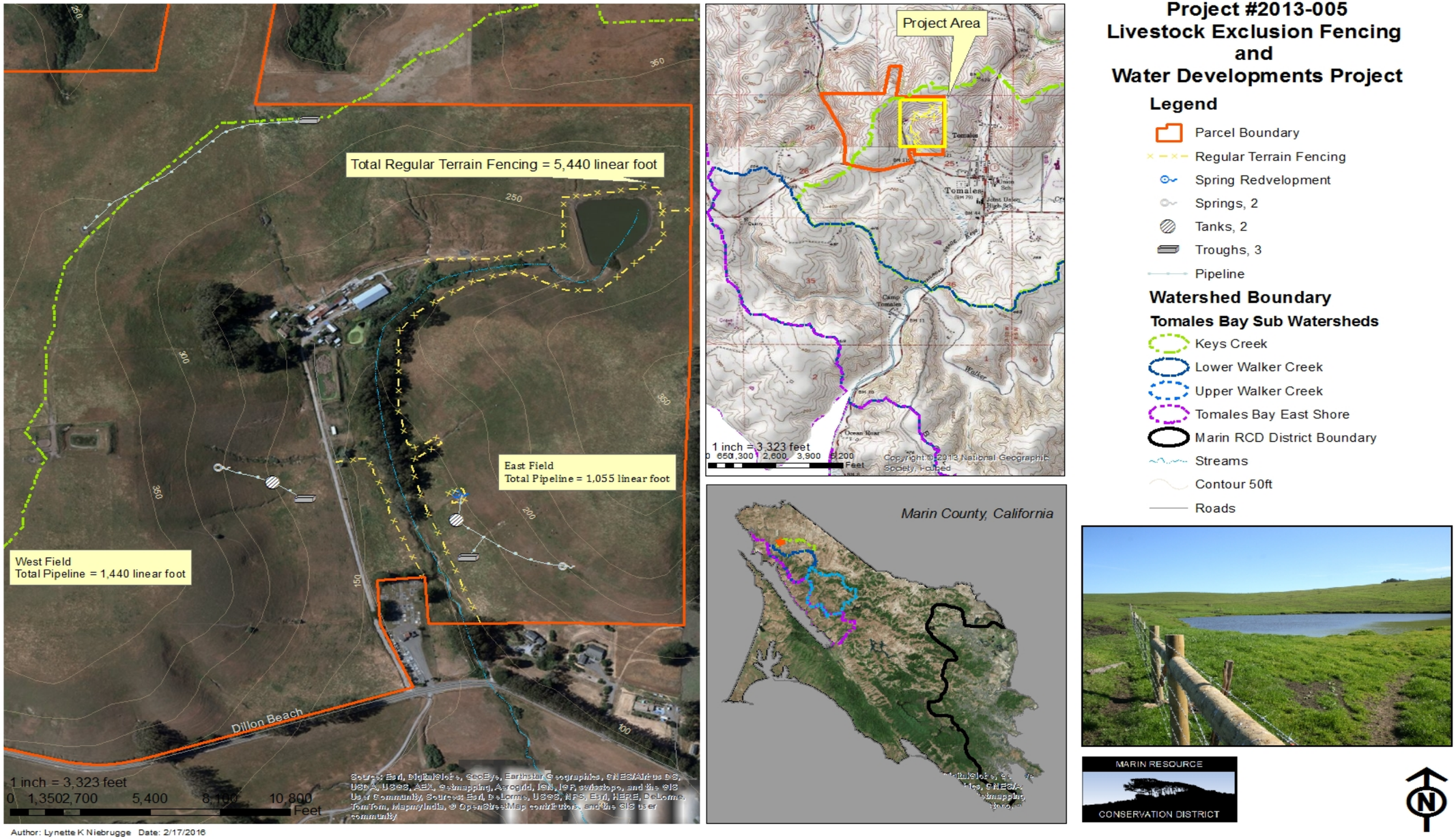
<u>Livestock Fence Exclusion: Effectiveness Rating = Excellent</u>

Post-construction inspection: No evidence of livestock pressure, all H- braces were sturdy, wire was taught and no posts were broken or missing. All gates were closed and no evidence of livestock activity was observed within the enclosure.

- *Objectives: Achieved*
    - Exclusionary fence constructed encompassing pond and tributary: Reduce sedimentation delivery to pond and tributary by fencing pond and riparian tributary.
- *Target Values: Achieved*
    - Exclusionary fencing will aid in stabilizing spillway, dam and streambanks as indicated by an increase in ground cover (herbaceous vegetation) around the pond embankment and streambanks.

<u>Water Development and Enhancement: Effectiveness Rating = Excellent</u>
Post-construction inspection: All areas surrounding the watering facilities were seeded and mulched to reduce impacts from soil disturbance. All troughs and tanks contained adequate capacity to meet water requirements for livestock. A float valve and wildlife escape ramp per NRCS standards and specifications were installed and functioning properly.

- *Objective: Achieved*
    - Improved water collection and storage;
    - Improved water facilities facilitated improved livestock distribution and farm viability.
- *Target Values: Achieved*
    - Enhanced water collection will improve on farm water use and allow ranch to conserve water during drought years.
    - Enhanced water distribution will assist in creating a grazing management plan for the producer, as requested. This will improve livestock distribution and erosion control.
    - Distribution will improve pasture health, productivity and health of livestock.



Author: Lynette K Niebrugge Date: 2/17/2016

Figure 1. Map of Project 2013-005 showing the location of completed conservation practices implemented January 2014-2015.

Pre-construction Photo 02/2013

View of pond before the livestock exclusion fencing was installed.

Post-construction Photo 01/2015

After construction of the livestock exclusion fencing encompassing the pond.

Pre-construction Photo 02/2013

View of livestock pond pre fence exclusion. Photo displaying side banks of pond and spillway.

Post-construction Photo 01/2015

Project site after construction showing the riparian fence encompassing the pond and spillway as well as increase in ground cover.

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

Project 2013-005

Livestock Exclusion Fencing and Water Developments

Post-construction Photo 01/2015

Post-construction photo of project viewing east field water development; 5,000 gallon water tank and spring development in the background.

Post-construction Photo 01/2015

After construction of one of the three 342 gallon water. The photo displays the protection pad and wildlife escape ramp.

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

PROJECT PROFILE: #2013-006

1,754 linear feet of riparian fence line

0.19 acres of planting of streambank stablization

Project:	2013-006	
Watershed:	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 Quality 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

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.

Table 1. Project area dimensions.

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

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.

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.

☐ No Permit Required
☒ §1600 CA Department of Fish and Wildlife
☒ §401 Water Quality Certification
☐ §404 US Army Corps Wetland
☐ County of Marin

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 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**
  - 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:

Livestock Fence Exclusion: Effectiveness Rating = Good
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.

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

At the time of the assessment, STRAW completed the planting only two weeks prior; therefore, plant survival will be re-evaluated later.

All repairs will continued to be monitored throughout the next five to ten rain seasons to ensure the success of the project.

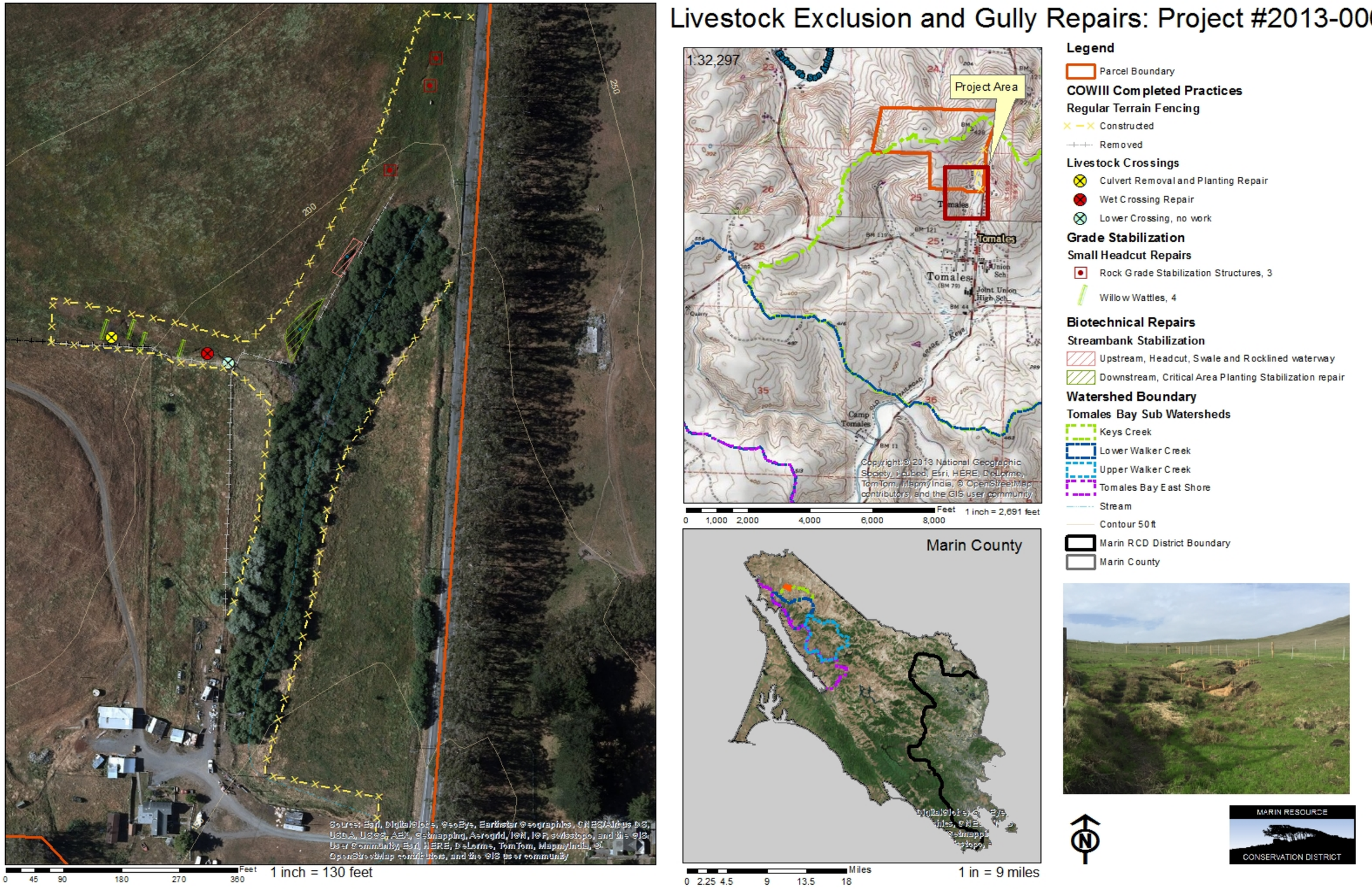


Figure 1. Map of Project 2013-006 showing the location of completed conservation practices implemented November 2015.

Pre-construction Photo 11/2012

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

Post-construction Photo 11/2015

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

Pre-construction Photo 08/2015

View of Tomales Creek before photo of streambank stbilization critical area planting .

Post-construction Photo 12/2015

Project site after revegetation of streambank stabilization critical area plating above Tomalas, 3350 sq feet.

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

Pre-construction Photo 08/2015

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

Post-construction Photo 12/2015

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

Pre-construction Photo 08/2015

Project site before construction displaying view from the berm sinkhole looking down into Tomales Creek.

Post-construction Photo 12/2015

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

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

PROJECT PROFILE: #2013-007

234 linear feet of fencing encompassing restored area

56 students planted 55 trees and shrubs

Project:	2013-007	
Watershed:	Tomales Bay	
Practices:	**Vegetated Field Buffer, Hedgerow and Fencing (3 total)**	
Project Cost	**$10,918.54**	
and Partners:	$4,051.92	Marin Resource Conservation District, 319(h) State Water Resources Control Board
	$1,407.35	USDA Natural Resources Conservation Service Environmental Quality Incentives Program (EQIP) 2013
	$5,459.27	Marin Agricultural Land Trust, Stewardship Assistance Program and Landowner

Project 2013-007
Vegetative Buffer Installation

Project Overview

The **Vegetative Buffer Installation Project, 2013-007,** was part of an extensive regional effort, Conserving Our Watersheds (COW) Program, to promote and support the advancement of water quality improvements by focusing on pathogen reduction. The implementation of this project aims to improve water quality on an immediate tributary to Tomales Bay. The tributary is located directly behind a homestead at the headwaters of an intermittent stream just below a silage field (Fig. 1). Three conservation practices were implemented to improve 0.15 acres of a drainage area of the unnamed tributary.

Ranch Location:
The ranch is located approximately 12 miles north of Point Reyes Station, in northwestern Marin County, California. The ranch is accessible from State Highway 1 just south of Nick's Cove. The 170-acre ranch currently supports a 25 - 50 organic dairy heifer herd. The herd grazes the property including a one-time seasonal rotation through the silage field, post-harvest. In addition to the livestock operation, the ranch promotes agritourist by renting the historical home, which was recently converted to a bed and breakfast.

***Project Location*:**
The project site is located within the Tomales Bay watershed on approximately 170 acres of rangeland. The restoration project site is positioned behind the historical homestead, adjacent to an unnamed intermittent stream that discharges directly into Tomales Bay (Fig. 1).

HUC 12: 180500050304

***Environmental Conditions*:**
The ranch is situated on the coastal terrace along the east shore of Tomales Bay with elevations ranging from 150 - 350 feet. The dominant soil type throughout the project location is Olompali loam (149), with 9 -30% slopes. The parent material is comprised of alluvium derived from various kinds of rock. These soils are characterized as deep and somewhat poorly drained with a depth of less than 40 inches to the claypan/bedrock. The permeability in the upper 13 inches of the soil is moderate, and below is very slow. The available water holding capacity is moderate to high. The lower portion of project is composed of Yorkville (205) clay loam, with 9 - 15 % slopes. The Yorkville loam is formed in material derived from shale. These soils are also deep and moderately well drained with a depth ≥ 40 - 60 inches to bedrock. Permeability is moderately slow from the surface to 14 inches deep; permeability becomes very slow below 14 inches deep. The available water holding capacity is high to very high.

Rangeland vegetation consists of annual and perennial grasses and forbs throughout the property. Above the project location, the silage field is seasonally planted with an annual

silage seed mix. Downstream from the project, vegetation consists of herbaceous plants such as sedges and rushes, blackberry thickets, willows, Eucalyptus trees and saplings from a 2012 Point Blue Conservation Science, Students and Teachers Restoring a Watershed (STRAW) planting.

Table 1. Project area dimensions.

Project Information	Area	Unit
Ranch Area	170	Acres
Project Area	0.15	Acres
Total Length of Intermittent Stream on Property (approx.)	600	Linear Feet

Historical Partnership and Commitment:
The ranch has undertaken numerous projects in cooperation with the Marin Resource Conservation District (Marin RCD), United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS), Marin Agricultural Land Trust (MALT) and STRAW to improve and enhance the ecological value of the land (Fig. 1).

Past and Current projects include:

- 2014 Riparian Fencing, in the planning phase
  - MALT and NRCS Environmental Quality Incentives Program (EQIP)
- 2014 COWIII: Vegetated Buffer Installation
  - SWRCB
- 2012 COWII: Riparian Restoration: One willow wall and critical area planting along two lower tributaries.
  - MALT/SWRCB/STRAW
- 2009 ARRA: Livestock crossing and water development.
  - NRCS-EQIP

Phase I. Design and Implementation

Design:
In 2013, Marin RCD and USDA NRCS developed a conservation design plan to meet the goals and objectives set by the landowner and Marin RCD. The overall plan consisted of several components including installing a vegetative field buffer, which was made possible with funding from COW and partnering organizations: NRCS and MALT. The installation of the vegetated field buffer was planned and designed to enhance a degraded sediment catchment basin below the silage field, which drains under an existing ranch road and culvert then onward to an intermittent stream. The plan consisted of several USDA NRCS conservation practices including: Fence (#382); Hedgerow/Windbreak (#422/380); Critical Area Planting (#342); and Mulch (#484). The practices were intended to be installed in stages in order to meet the funding requirements for the NRCS' EQIP.

Project 2013-007
Vegetative Buffer Installation

The compilation of planned USDA NRCS' conservation practices included:

1. Construction of an exclusionary fence (234 linear feet) to encompass the vegetative field buffer intended to protect and allow new vegetation and planted saplings to establish, as well as, decrease livestock impacts on the land (Fig. 1 & 2).

2. Establishment of a hedgerow/windbreak below the silage field, designed to reduce wind/soil erosion, improve water quality, reduce wind speeds, mitigate odor and increase infiltration. Hedgerow/windbreak species composition will improve wildlife habitat and aesthetics—shrubs/trees will blossom throughout the year.

3. Installation of a buffer strip/critical area planting (215 linear feet) consisting of an application of a seed mix and mulch. This practice will improve water quality, reduce runoff and increase infiltration.

Implementation:
The regular terrain fence was completed in January 2014. The USDA NRCS Rangeland Specialist designed and inspected the construction of the fence exclusion, which measured 234 linear feet of the planned 300 linear feet of 5-strand regular terrain fence (Table 3). The final construction of the fence was slightly altered from the original plan and was built to tie in with an existing gate allowing access into the silage field above the project site. This modification decreased the total amount of fencing necessary (Fig. 1 & 2).
The hedgerow/windbreak and critical area planting was completed in February 2014. A Registered Professional Forester and Certified Professional Soil Erosion and Sediment Control Specialist from Prunuske Chatham, Inc. (PCI) and STRAW designed the vegetative field buffer components: hedgerow/windbreak, biotechnical erosion control plans, plant species list and seed mix for the critical planting area (Table 2 & 3). All of the planning was conducted under the guidance of the USDA NRCS Rangeland Specialist/Planner using the required USDA standards and specifications for conservation practices. A total of 56 students, 3 teachers and 18 parents installed the restoration project: a vegetative buffer strip and a hedgerow/windbreak consisting restoring 0.15 acres with native species. The hedgerow final specifications were 215 feet x 28 feet equaling 0.14 acres (6,020 feet squared). A total of 55 native shrub and trees species were planted site specific to the area and conditions (Table 2 & 4). At maturity the average growth for the native shrubs will range from 4 - 10 meters and the average height of the trees will range from 20 - 25 meters. After the installation of the native plants, a low-nitrogen, organic compost was applied to the base of each plant for fertility and individually fenced to prevent wildlife disturbance (Fig. 3).

Table 2. Project 2013-007 final measurements of implemented conservation practices.

Project Information	Measurements and Dimensions		Unit
Total Exclusionary Fencing		234	Linear feet
Total Area Restored (fenced)		0.15	Acre
Hedgerow/Windbreak	215 ft x 28 ft (6020 ft^2)	0.14	Acre
Buffer Strip	60 ft x 10 ft (600 ft^2)	0.01	Acre
Sediment Reduction Load	Region 5 Model	9.7	Tons/ Year

In February 2014, a buffer strip/biotechnical erosion control mat was installed just above an existing culvert and below the silage field to restore the existing buffer/sediment basin. The dimensions of the buffer strip were 60 feet by 10 feet, totaling 0.01 acre (600 feet squared) (Table 2). The participating STRAW members prepared the area by scraping the bare ground to break up the top layer of soil and then spreading one-half inch thick layer of screened organic, low-nitrogen compost. Native grass seed (Table 3) was spread at a rate of 1.2 pounds per 1,000 feet squared. Per specifications, a layer of straw/coir erosion control blanket was installed over the seed mix using 12 inch and 18 inch "fabric pins" (Fig. 4). The establishment of a vegetated grass buffer strip below the silage field and above the culvert and will aid in improving the sediment trapping capacities on site.

Table 3. Buffer Strip Seed Mix.

Scientific Name	Common Name	Quantity (%)
Festuca rubra	Molate Red Fescue	50%
Leymus triticoides	Creeping Wildrye	50%

The following CEQA authorization and permits were obtained for this project:
CEQA authorization for this project, #2013.007, was provided by Marin RCD's Permit Coordination Program.

☒ No Permit Required
☐ §1600 CA Department of Fish and Wildlife
☐ §401 Water Quality Certification
☐ §404 US Army Corps Wetland
☐ County of Marin

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 successfully met the intended goals of the landowner. The landowner expects the project to reduce stress upon the property's natural resources by reducing sedimentation, increasing vegetation and improving wildlife. She indicated the project will also improve pasture management for the lessee by restricting the livestock from riparian areas. During the entire process, the landowner was very pleased with the Marin RCD's performance, although she did state the funding process was confusing at times and could be simplified. The landowner is definitely interested in working with Marin RCD again and has started making a list of future projects.

Project Assessment Checklist:
Two post-project monitoring visits have been conducted: March 2014 and January 2015. All components of project meet the standards and specifications required by USDA NRCS. Overall, the project rating is "Excellent to Good", which was determined by using the effectiveness rating matrix and Project Assessment Checklist, see details below.

The project effectiveness rating matrix summary for Project #2013.007

- *Objectives*: **Excellent**
  - Reduced sedimentation delivery, improved wildlife habitat.
  - Reduced pathogens through the implementation of riparian livestock fence exclusion.
- *Target Values:* **Good**
  - Anticipated to meet target values.
  - Met all other intended target values set: 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 BMP's which would create a negative effect to offset the objectives of the project.
- *Structural condition:* **Excellent**
  - The project was excellent to good and has the intended function and value.

Individual practices were rated as follows:

Livestock Fence Exclusion: Effectiveness Rating = Excellent
Monitoring Assessment: 2014 and 2015
Post Construction: No evidence of livestock pressure, all H- braces were sound, wire was taught, no posts were broken missing or cracked. Gate closed and no evidence of livestock within enclosure.

Project 2013-007
Vegetative Buffer Installation

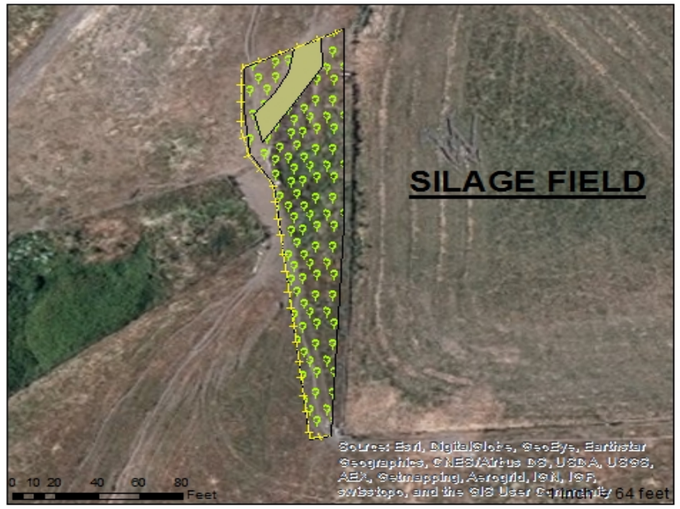
Buffer Strip: Effectiveness Rating = Excellent
Monitoring Assessment: 2014 and 2015
Post Construction: No evidence of rilling or erosion present and no visibility of biotechnical fabric. Percent vegetative cover exceeded 85%.

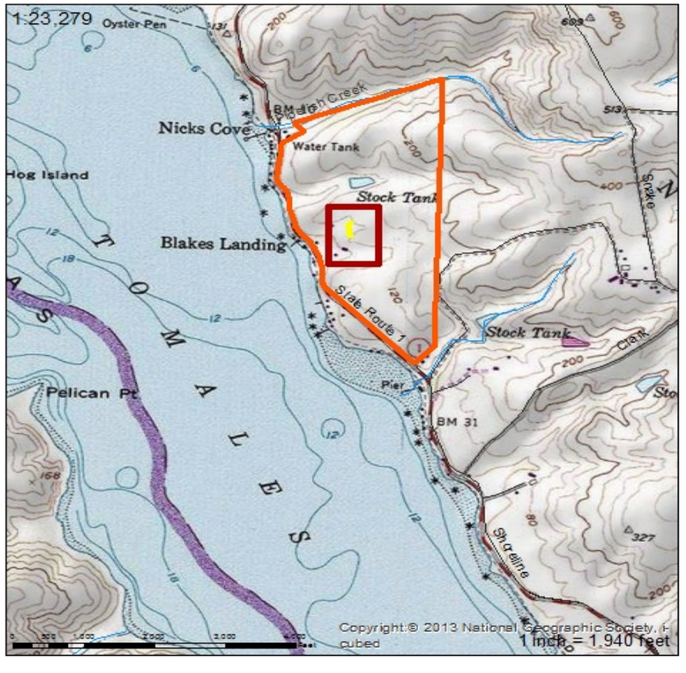
Hedgerow/Windbreak : Effectiveness Rating = Good-Fair
STRAW conducts the maintenance and monitoring inspection to document the plant survival counts. Over the lifespan of the project maintenance occurs twice a month in the summer (May through October) this includes watering, weeding and fixing plant protective cages. The survival counts are conducted every fall and have been conducted twice; 8/20/2014 and one year later 8/25/15. Table 4 displays a detailed list of the 55 native trees and shrubs survival. STRAW reported approximately 56.4% survival one year post planting. The majority of the mortality occurred within the first six month of the planting. The loss of 17 plants was attributed to gophers, girdling and deer browsing. In 2015, a loss of seven plants (3 elderberry, 1 buckeye, 2 silk tassel, 1 live oak) was documented as lost to gopher (10%), rodent (10%) and nursery stock/soil type (80%) mortalities. Over the last year 31 surviving plants all were exhibiting high vigor. Due to the drought conditions over the past years STRAW has seen reduced survival across several projects over the last few years. Aside from any site specific challenges to survival, regional climate trends may have the greatest effect on plant establishment. Specifically, the characteristic conditions of the prolonged drought (mainly reduced winter precipitation, but also potentially reduced coastal summer fog and cloud cover, reduced groundwater recharge, and lowered water table) have contributed to lower establishment rates for revegetation projects. Observations in the field indicate that soils have been dryer at the beginning of the planting season and throughout most of the establishment period than in previous years, which would affect both vigor and survival of the recent plantings. Additional effects of the drought can be seen in surviving plants exhibiting reduced rates of growth, increased evapotranspiration and water demand, and increased pressure from wildlife browse, causing girdling and disruption of irrigation systems.
The Marin RCD is and will continue to monitoring the hedgerow closely. The hedgerow was densely planted for the area and displays no signs of future gaps. At this time, it is in good condition no additional planting is needed.

Table 4. The hedgerow/windbreak species list (scientific and common names) and quantities planted for Project 2013-007.

VEGETATION SURVIVAL										
STRAW: Plant Establishment Data										
PROJECT # 2013.007										
Date Monitored:	8/20/2014 and 8/25/2015									
Date(s) Planted:	2/11/2014									
Species	Common Name	Total Planted (2/2014)	Total Alive (8/2014)	Percent Survival (8/2014)	Total Alive (8/2015)	Percent Survival (8/2015)	<3ft Low Vigor	<3ft High Vigor	>3ft Low Vigor	>3ft High Vigor
Aesculus californica	CA buckeye	7	7	100.00%	6	85.7%	0	4	0	2
Corylus cornut	Hazelnut	5	5	100.00%	5	100.0%	0	4	0	1
Garrya eliptica var. james roof	Silktassle	8	2	25.00%	0	0.0%	0	0	0	0
Heteromeles arbutifolia	Toyon	7	2	28.60%	2	28.6%	0	0	0	2
Myrica californica	Waxmyrtle	4	3	75.00%	3	75.0%	0	0	0	3
Quercus agrifolia	Coast Live Oak	7	7	100.00%	6	85.7%	0	2	0	4
Rhamnus (Frangula) californica	Coffeeberry	7	7	100.00%	7	100.0%	0	7	0	0
Ribies sanguineum	Flowering current	5	1	20.00%	1	20.0%	0	1	0	0
Sambucus mexicana (nigra)	Elderberry	5	4	80.00%	1	20.0%	0	1	0	0
Totals		**55**	**38**	**69.10%**	**31**	**56.4%**	**0**	**19**	**0**	**12**
						Percent	**0%**	**61%**	**0%**	**39%**

Project 2013-007
Vegetative Buffer Installation





Author: Lynette K Niebrugge
Date: 2/17/2016
Coordinate System: NAD 1983 StatePlane California III FIPS 0403 Feet

Figure 1. Maps of Project 2013.007. Left: Past and current conservation practices implemented at the ranch. Top right: Close-up of current project. Bottom right: A USGS topography map with the ranch boundary highlighted in orange and a red box identifying the general location of the project.

Project 2013-007
Vegetative Buffer Installation

Before Photos
- Pre-Construction 02/11/2012

After Photos
- Post-Construction 03/06/2013

Figure 2. Left photos: Pre-construction photos taken from photo monitoring point bearing 184°. The photos display the overall condition of the project site 1-year pre-project. Right photos: Post-construction photos document the completed project. Top right: Photo shows an entire view of the fence exclusion, buffer strip and hedgerow planting. Bottom right: Photo displays the detail and placement of the plantings.

Project 2013-007
Vegetative Buffer Installation

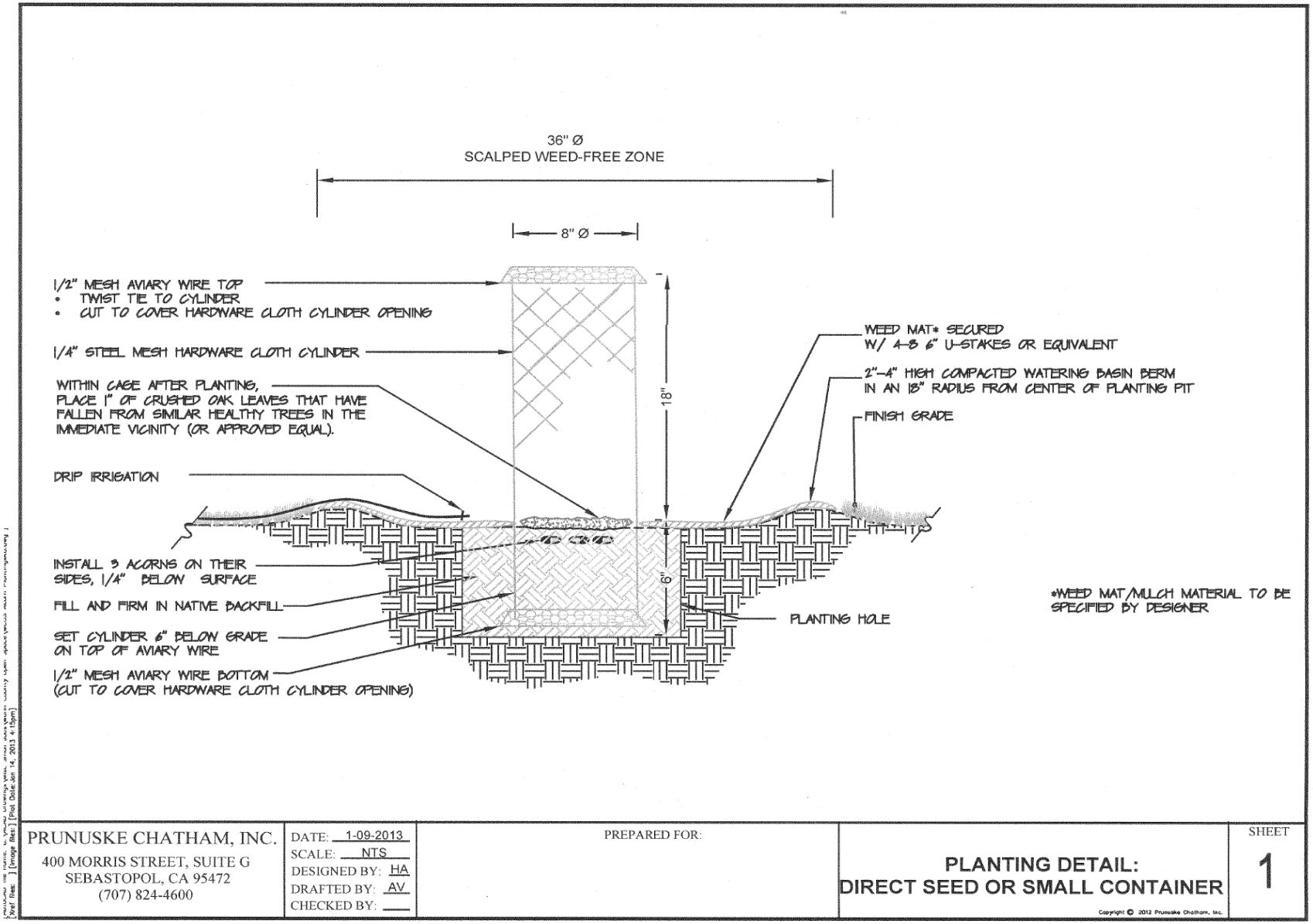
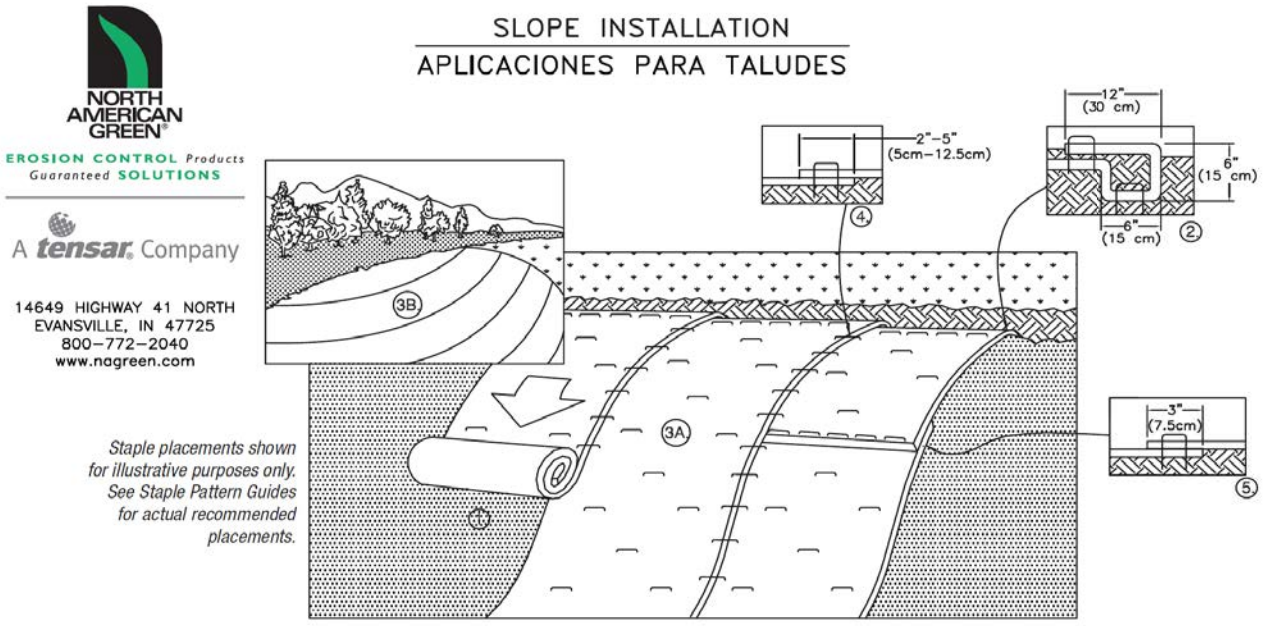


Figure 3. Shrub and tree planting specification design produce by Prunuske Chatham and Point Blue Conservation Science's STRAW.



1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP's IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF RECP's EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP's WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30 CM) PORTION OF RECP's BACK OVER SEED AND COMPACTED SOIL. SECURE RECP's OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30 CM) APART ACROSS THE WIDTH OF THE RECP's.
3. ROLL THE RECP's (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. RECP's WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP's MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM™ , STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL RECP's MUST BE STAPLED WITH APPROXIMATELY 2" – 5" (5 CM – 12.5 CM) OVERLAP DEPENDING ON RECP's TYPE.
5. CONSECUTIVE RECP's SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5 CM) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30 CM) APART ACROSS ENTIRE RECP's WIDTH.

NOTE:
*IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECP's.

---

1. PREPARE EL TERRENO ANTES DE INSTALAR LAS MANTAS, INCLUYENDO LA APLICACION DE CAL, FERTILIZANTE Y SEMILLA.
2. COMIENCE EN LA CABECERA DEL TALUD SUJETANDO LA MANTA EN UNA ZANJA DE 6" (15 CM) DE PROFUNDIDAD FOR 6" (15 CM) DE ANCHO CON APROXIMADAMENTE 12" (30 CM) DE LA MANTA EXTENDIDA MAS ALLA DE LA PENDIENTE ALTA DE LA ZANJA. SUJETE LA MANTA AL FONDO DE LA ZANJA CON UNA LINEA DE GRAPAS O ESTACAS APROXIMADAMENTE 12" (30 CM) UNA DE LA OTRA. RELLENE Y COMPACTE LA ZANJA DESPUES DEL ENGRAPE. RIEGE LA SEMILLA EN EL SUELO COMPACTADO Y DOBLE LAS 12" (30 CM) REMANENTES DE MANTA SOBRE LA SEMILLA EL SUELO COMPACTADO. ASEGURE LA MANTA SOBRE EL SUELO CON UNA LINEA DE GRAPAS O ESTACAS APROXIMADAMENTE 12" (30 CM) UNA DE LA OTRA A TRAVES DEL ANCHO DE LA MANTA.
3. DESENROLLE LAS MANTAS (3A) HACIA ABAJO U (3B) HORIZONTALMENTE A TRAVES DEL TALUD CON EL LADO APROPIADO HACIA LA SUPERFICIE DEL SUELO. TODAS LAS MANTAS DEBERAN ASEGURARSE A LA SUPERFICIE DEL SUELO POR MEDIO DE GRAPAS O ESTACAS EN LUGARES APROPIADOS TAL Y COMO SE INDICA EN EL PATRON GUIA DE ENGRAPADO. CUANDO ESTE USANDO EL DOT SYSTEM.™ LAS GRAPAS O ESTACAS DEBEN COLOCARSE A TRAVES DE CADU UNDO DE LOS PUNTOS CON COLOR CORRESPONDIENTES AL PATRON DE ENGRAPADO APROPIADO.
4. LOS BORDES DE LAS MANTAS PARALELAS TIENEN QUE ENGRAPARSE CON UN TRASLAPE DE APROXIMADAMENTE 2" – 5" (5 CM – 12.5 CM) DEPENDIENDO DEL TIPO DE MANTA.
5. MANTAS CONSECUTIVAS UNIDAS EN LA BAJADA DE LOS TALUDES, DEBEN COLOCARSE ORILLA SOBRE ORILLA (TIPO EXCALONADO) CON UN TRASLAPE DE APROXIMADAMENTE 3" (7.5 CM). ENGRAPE EL AREA TRASLAPADA CON UNA SEPARACION DE APROXIMADAMENTE 12" (30 CM) A TRAVES DE TODO EL ANCHO DE LA MANTA.

NOTA:
* EN CONDICIONES DE SUELTO, PUEDE QUE SE NECESITEN GRAPAS O ESTACAS DE MAS DE 6" (15 CM) DE LARGO PARA ASEGURAR LAS MANTAS CORRECTAMENTE.

REV. 4/07

Figure 4. Erosion control matting installation design for the buffer strip.

Project 2013-007
Vegetative Buffer Installation

PROJECT PROFILE: #2015-009

350 trees and shrubs planted

0.76 acres of planting

Project: 2015-009
Watershed: Tomales Bay
Practice: **Critical Area Planting (1 total)**
Project Partners: Marin Resource Conservation District, State Coastal Conservancy's Climate Ready Program, United States Department of Agriculture Natural Resources Conservation Service's Environmental Quality Incentives Program, and Marin Agricultural Land Trust

Project Overview

The **Tomales Bay Critical Area Planting, 2015-009,** was part of a Marin Resource Conservation District (Marin RCD) countywide agricultural carbon sequestration program entitled the Marin Carbon Project Carbon Farming Program. The intent of the program is to enhance rangeland and rancher resiliency to climate change with producer outreach, technical infrastructure, and economic support, to serve as a model for other California regions. The Carbon Farming process is designed to maximize agriculture's potential for contributing to the removal of excess greenhouse gases from the earth's atmosphere into the soil and vegetation building fertility, productivity and resiliency. Carbon Farming is a whole-farm approach to the implementation of on-farm practices that increase the rate at which plants transfer carbon dioxide (CO_2) from the atmosphere to the soil, a process which increases water infiltration, water-holding capacity, soil organic matter and promotes long-term carbon sequestration. A variety of conservation practices are known to increase plant biomass and build soil organic matter; Carbon Farm Plans propose a suite of carbon-beneficial practices to be implemented on an entire property to yield a net impact that is significantly greater than the implementation of one practice.

The intention of Project 2015-009 was to implement one carbon beneficial practice from the various conservation practices identified in the ranch's Carbon Farm Plan: the conservation practice implemented was a Critical Area Planting (Hedgerow/ Windbreak), a United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) conservation practice. To achieve this goal, the project planted a hedgerow and a windbreak consisting of 350 native trees and shrubs. By implementing the above conservation practices on the ranch, the Landowner will increase the ranch's ability to sequester carbon in biomass, thus reducing greenhouse gases (Figure 1).

Ranch Location:
The ranch is located approximately 10 miles north of Point Reyes Station in northwestern Marin County, California. The Ranch is accessible from State Route 1 and Clark Road.

Project Location:
The project site is located along the northwest border of the 493-acre ranch. The project location is near an unnamed intermittent stream that is a direct tributary to Tomales Bay and ultimately the Pacific Ocean (Figure 1).

Environmental Conditions:
Project 2015-009 was installed on a dairy with 493 certified organic acres of rolling hills intersected by riparian meadows and ephemeral streams. While the majority of the dairy topography falls west to Tomales Bay, the eastern edge of the dairy drains east to Walker Creek, a major tributary to Tomales Bay.

The soils are generally deep loams, interrupted by shallow rocky outcrops. Soils on steeper south slopes tend to be shallow and sparsely vegetated. The dominant soils throughout project location Olompali loam, 9-30% slopes. Over half (279.5 acres) of the Dairy soils are classified as Olompali Loam, 9-15% slopes, or Olompali Loam, 15-30% slopes, (USDA NRCS Range Site and Ecological Site classification, coastal loamy claypan). These soils formed from alluvium derived from igneous, metamorphic and sedimentary rock. They are deep and somewhat poorly drained and subject to improvement through management, including compost applications and improved grazing management to increase soil organic carbon content. The restrictive depth is 40-60 inches to the root restrictive layer consisting of paralithic bedrock. These areas are moderately well-drained soils, while water movement in the most restrictive layer is low

The dairy is dominated by grassland vegetation, but includes brush and some woodland vegetation, predominantly coyote bush (*Baccharis pilularis*), arroyo willow (*Salix lasiolepis*) and coast live oak (*Quercus agrifolia*), along unnamed tributaries to Tomales Bay.

Historical Partnership and Commitment:
Prior to Project 2015-009, the landowner has engaged in cooperation with the Marin RCD and USDA NRCS to implement conservation practices.

Past and Current projects include:

- 2000-2015: Cross Fencing, Water Facilities and Nutrient Management.
  - USDA NRCS, Environmental Quality Incentives Program (EQIP)
  - Marin Agricultural Land Trust (MALT)

Phase I. Design and Implementation

Design:
A conservation design plan was developed in the summer of 2015 with the landowner, Marin RCD Staff, Marin Carbon Project Implementation Task Force, USDA NRCS Rangeland Specialist, Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW) and Carbon Cycle Institute to determine the location of the critical area planting and other carbon-beneficial practices to create the Carbon Farm Plan. The plan was designed to meet the goals and objectives set by all partners and the landowner. The design consisted of the USDA NRCS conservation practice and specifications prescribed to meet the match funding requirements of USDA NRCS' EQIP.

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

1. Critical Area Planting (Windbreak and Hedgerow 342, 422/380)

Objective 1: Increase soil and biomass carbon, stabilize soils, improve water capture, water quality and habitat structural and species diversity, and reduce water demand in pasture areas through improved microclimate and climate resilience. This practice reduces sedimentation into downstream areas and improves wildlife habitat and visual appeal.

Implementation:

The installation of the planting began in December and was completed in January 2016. Five local schools participated in plantings: Mary Collins, McNear, Manor, Two Rock and Liberty Elementary schools, representing grades 2-6 (240 students and adults). STRAW installed a total of 350 native trees and shrubs over three work days: two of those work days were with a young adult work crews from Conservation Corps North Bay, and a half work day was with STRAW staff. A low-medium height windbreak consisted of 156 plants, spaced five feet on center, aligned in two rows in an area 797-feet long by 15-20 feet wide (11,955-15,940 foot square or 0.27- 0.36 acre). A low hedgerow consisted of planting 194 shrubs and trees in an area 875-feet long by 15-20 feet wide (13,125- 17,500 square foot = 0.30 -0.401 acre). Plant holes were dug no deeper than the root mass of the container plant and at least twice as wide as the container width. Backfill was compacted by hand. No soil amendment or pieces of organic matter larger than three-quarter inch diameter was mixed with the backfill. Cardboard and weed-suppressing mulch was installed around the trees along with a four-foot tall browse protection cage. Elderberry and oak species were installed with underground gopher caging and bay tree nuts were installed directly in a similar buried cage. Drip irrigation was installed to water plants for at least three summers and weeds directly around the plants will be removed by hand.

The approximate carbon sequestration and greenhouse gas emission reductions estimated for both windbreak and hedgerow plantings, according to the USDA NRCS COMET-Planner tool, equates to a total of 0.7 tonnes CO2e per year (Table 1).

Table 1. Project 2013-006 completed dimensions.

Carbon Farm Practices	Number of Trees & Shrubs Planted	Dimension of Practice	Average Annual CO_2e Reduction (tonnes)	20 yr CO_2e Reduction (tonnes)	CO_2e Reduction at Maturity, 40 yr later (tonnes)
Critical Area Planting					
Hedgerow	197	875ft X 20ft = 17,500 ft^2 (.401 ac.)	0.3 Mg	6 Mg	12 Mg
Windbreak	156	797x20 = 15,940 ft^2 (.36 ac.)	0.4 Mg	8 Mg	16 Mg
Totals	**350**	**33,440 ft^2 (.761 ac.)**	**.7 Mg CO_2e**	**14 Mg CO_2e**	**28 Mg CO_2e**

The following CEQA authorization and permits were obtained for this project:
CEQA authorization for the project was provided by the Marin RCD's Marin Coastal Watersheds Permit Coordination Program.

☒ No Permit Required
☐ §1600 CA Department of Fish and Wildlife
☐ §401 Water Quality Certification
☐ §404 US Army Corps Wetland
☐ County of Marin

Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Management Zone Plan 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 the the Riparian Management Zone Plan's Landowner Questionnaire form and evaluating the functionality of the implemented project using a Project Assessment Checklist from the Riparian Management Zone Plan.

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

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 "Excellent" which is determined by using the effectiveness rating matrix and Project Assessment Checklist, see details below:

The project effectiveness rating matrix summary for Project #2015-009:

- *Objectives:* **Excellent**
  - Improved sedimentation delivery.
- *Target Values*: **Excellent**
  - 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*: **Excellent**
  - 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*: **Excellent**
  - The project was excellent to fair and has the intended functional value.

Individual practices were rated as follows:

Revegetation
At the time of the assessment, STRAW completed the planting only one month prior; therefore, plant survival will be re-evaluated later.

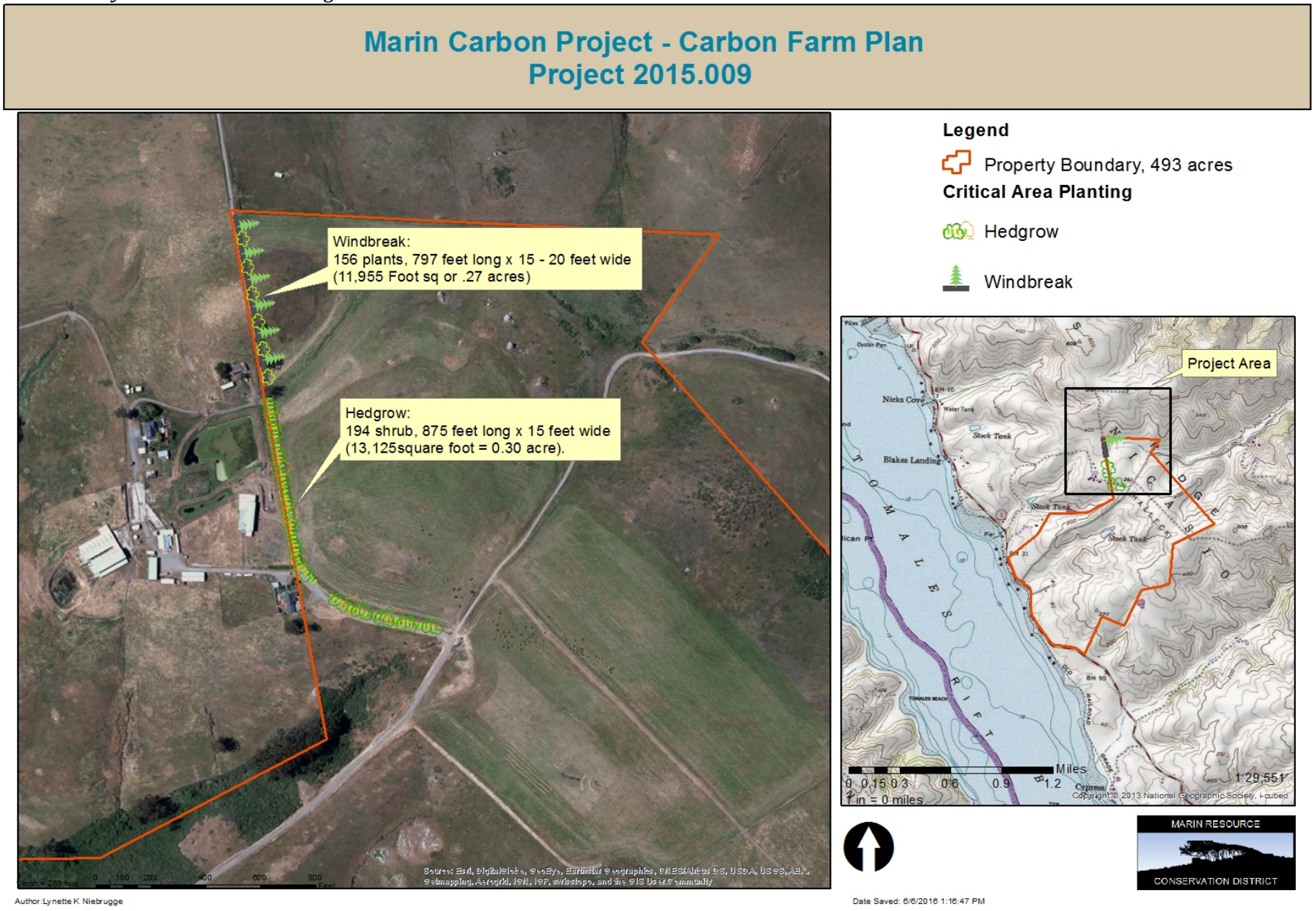


Figure 1. Map of Project 2015-009 showing the location of completed conservation practices implemented November 2015.

Pre-construction Photo 10/2015

Project Site displaying flagged locations for individual plant installation.

Post-construction Photo 01/2016

Project site, looking south displaying the installation 350 trees and shrubs.

Post-construction Photo 11/2015

Close up view of individul planting displaying tree staking and wire protection.

Post-construction Photo 11/2015

Photo displaying the variety of trees and shrubs for planting.

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

PROJECT PROFILE: #2015-010

179 trees and shrubs planted

1.5 acres of planting

Project: 2015-010
Watershed: Stemple Creek
Practice: **Critical Area Planting (1 total)**
Project Partners: Marin Resource Conservation District, State Coastal Conservancy's Climate Ready Program, United States Department of Agriculture Natural Resources Conservation Service's Environmental Quality Incentives Program, and Marin Agricultural Land Trust

Project Overview

The **Stemple Creek Critical Area Planting, 2015-010,** was part of a Marin Resource Conservation District (Marin RCD) countywide agricultural carbon sequestration program entitled the Marin Carbon Project Carbon Farming Program. The intent of the program is to enhance rangeland and rancher resiliency to climate change with producer outreach, technical infrastructure, and economic support, to serve as a model for other California regions. The Carbon Farming process is designed to maximize agriculture's potential in contributing to the removal of excess greenhouse gases from the earth's atmosphere into soils and vegetation by building fertility, productivity and resiliency. Carbon Farming is a whole-farm approach to the implementation of on-farm practices that increase the rate at which plants transfer carbon dioxide (CO_2) from the atmosphere to the soil, a process that increases water infiltration, water-holding capacity, soil organic matter and promotes long-term carbon sequestration. A variety of conservation practices are known to increase plant biomass and build soil organic matter; Carbon Farm Plans propose a suite of carbon-beneficial practices to be implemented on an entire property to yield a net impact that is significantly greater than the implementation of one practice.

The intention of Project 2015-010 was to implement one carbon beneficial conservation practice from the various conservation practices identified in the ranch's Carbon Farm Plan: the conservation practice implemented was a Critical Area Planting (Riparian Forest Buffer), a United States Department of Agriculture Natural Resources Conservation Service (USDA NRCS) conservation practice. The riparian forest buffer consisted of 179 native trees and shrubs along 895 linear feet of an intermittent stream within the Stemple Creek Watershed. By implementing the above conservation practices on the ranch, the Landowner will increase the ranch's ability to sequester carbon in biomass, thus reducing greenhouse gases (Figure 1).

Ranch Location:
The ranch is located approximately 5 miles north of Tomales in northwestern Marin County, California. The Ranch is accessible from Fallon-Two Rock Road and Gericke Road.

Project Location:
The project site is located adjacent to an unnamed intermittent stream that discharges into Estero De San Antonio, a direct tributary to Stemple Creek (Figure 1).

Environmental Conditions:
Project 2015-010 is on a ranch with about 650-acres of rolling hills intersected by riparian meadows and ephemeral streams located in the Stemple Creek Watershed. Currently the ranch is a beef and sheep operation. The entire operation is pasture based with conserved forage produced on the Ranch, from excess pasture growth when available.

The vast majority (about 426 acres) of the ranch soils are classified as Tomales-Steinbeck Loam, 5-15% slopes, or Tomales-Steinbeck Loam, 15-30% slopes, (USDA NRCS Range Site and Ecological Site classification, coastal loamy claypan), while the project site 2015-010 is located on Blucher-Cole complex. These soils have 2-5% slopes, occur on some 143 acres of alluvial flats and backslopes throughout the ranch. The Blucher soil occurs near drainage ways and the Cole soil is on basin rims and in depressions. These soils are so intricately mixed they are not mapped separately. This soil unit is suited to livestock grazing but grazing should be delayed until soils have dried enough to withstand livestock impacts. This soil is subject to flooding, and the high water table can limit plant selection.

The ranch is dominated by grassland vegetation, but includes some woodland vegetation; predominantly arroyo willow along the unnamed tributary to Stemple Creek and eucalyptus (*Eucalyptus globulus*) on field borders and in a few small, dense stands scattered near the ranch boundaries. There is a small stand of black locust (*Robinia pseudocacia*) between highway 1 and the adjacent unnamed tributary to Stemple Creek in the northwesterly portion of the property.

Historical Partnership and Commitment:

Prior to Project 2015-010, the landowner has been engaged with the Marin RCD and USDA NRCS to implement conservation practices.

Past and Current projects include:

- 2000-2015: Riparian Planting, Cross Fencing, Water Facilities and Nutrient Management.
  - USDA NRCS, Environmental Quality Incentives Program (EQIP)
  - Marin Agricultural Land Trust (MALT)
  - United States Fish and Wildlife Service
  - Point Blue Conservation Science Students and Teachers Restoring a Watershed
- 2013: Compost Application and Carbon Farm Plan

Phase I. Design and Implementation

Design:
A coordinated conservation design plan was developed in the summer of 2015 with the landowner, Marin RCD Staff, Marin Carbon Project Implementation Task Force, USDA NRCS Rangeland Specialist, Point Blue Conservation Science's Students and Teachers Restoring a Watershed (STRAW) and Carbon Cycle Institute to determine the location of the critical area planting and other carbon-beneficial practices to create the Carbon Farm Plan. The plan was designed to meet the goals and objectives set by all partners and the landowner.

The design consisted of the USDA NRCS conservation practice and specifications prescribed to meet the match funding requirements of USDA NRCS' EQIP.

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

1. Critical Area Planting (Riparian Forest Buffer 342, 391)

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.

Implementation:

The implementation of the planting began in November 2015 in partnership with STRAW, Conservation Corps North Bay program and volunteers from the National Civilian Community Corps. The Critical Area Planting (Riparian Forest Buffer) practice was completed in early December 2015 by 247 volunteers from Dunham, Grant, McDowell Elementary Schools and Tahoe Expeditionary Academy, representing grades 1-10.

To complete the planting, STRAW worked with six classes over three working days. This involved planting 1.5 acres of an 895 linear foot intermittent stream corridor with 179 site-adaptive shrub and tree species. Plant holes were no deeper than the root mass of the container plant and at least twice as wide as the container width. Backfill was compacted by hand and watered after inspected. No soil amendment or pieces of organic matter larger than three-quarter inch diameter was mixed with the backfill. DriWater irrigation supplement tubes and gels were installed at planting. Cardboard and weed-suppressing mulch was installed around the trees along with a browse protection cage. Browse protection was either light duty deer browse protector (light gauge wire and two u-posts) or heavy duty cattle browse protector (heavy gauge wire and two t-posts) and was installed on species as noted in the number and type of planting table below. Less than one cubic yard of Himalayan blackberry was removed from the creek bank and channel.

Table 1. Project 2015-010 completed dimensions.

Carbon Farm Practice	Number of Trees & Shrubs Planted	Dimension of Practice	Average Annual CO_2e Reduction (tonnes)	20 yr CO_2e Reduction (tonnes)	CO_2e Reduction at Plant Maturity 40 years later (tonnes)
Critical Area Planting (Riparian Forest Buffer*)*	**179**	**1.5 acres**	**21.29 Mg**	**425.8 Mg**	**851.6 Mg**

The approximate carbon sequestration and greenhouse gas emission reductions estimated for 1.5 acres of Riparian Forest Buffer Planting, according to the USDA NRCS COMET-Planner tool, equates to a total of 2.1 tonnes CO_2e per year. This estimate varies considerably with University of California Cooperative Extension's recent Creek Carbon study of 21.29 tonnes CO_2e per year (Table 1).

The following CEQA authorization and permits were obtained for this project:
CEQA authorization for the project was provided by the Marin RCD's Marin Coastal Watersheds Permit Coordination Program.

☒ No Permit Required
☐ §1600 CA Department of Fish and Wildlife
☐ §401 Water Quality Certification
☐ §404 US Army Corps Wetland
☐ County of Marin

Phase II. Monitoring

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

Landowner Questionnaire:
The landowner questionnaire will be conducted nine to twelve months post-project.

Project Assessment Checklist:
A post-project monitoring visit occured on January 2016. All components of project met standards and specifications required by USDA NRCS. Overall, the project rating is "Excellent" which is determined by using the effectiveness rating matrix and Project Assessment Checklist, See details below:

The project effectiveness rating matrix summary for Project #2015-010:

- *Objectives:* **Excellent**
  - Improved sedimentation delivery.
- *Target Values*: **Excellent**
  - 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*: **Excellent**

  - 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*: **Excellent**
  - The project was excellent to fair and has the intended functional value.

Individual practice was rated as follows:

Revegetation

At the time of the assessment, STRAW completed the planting only one month prior; therefore, plant survival will be re-evaluated later.

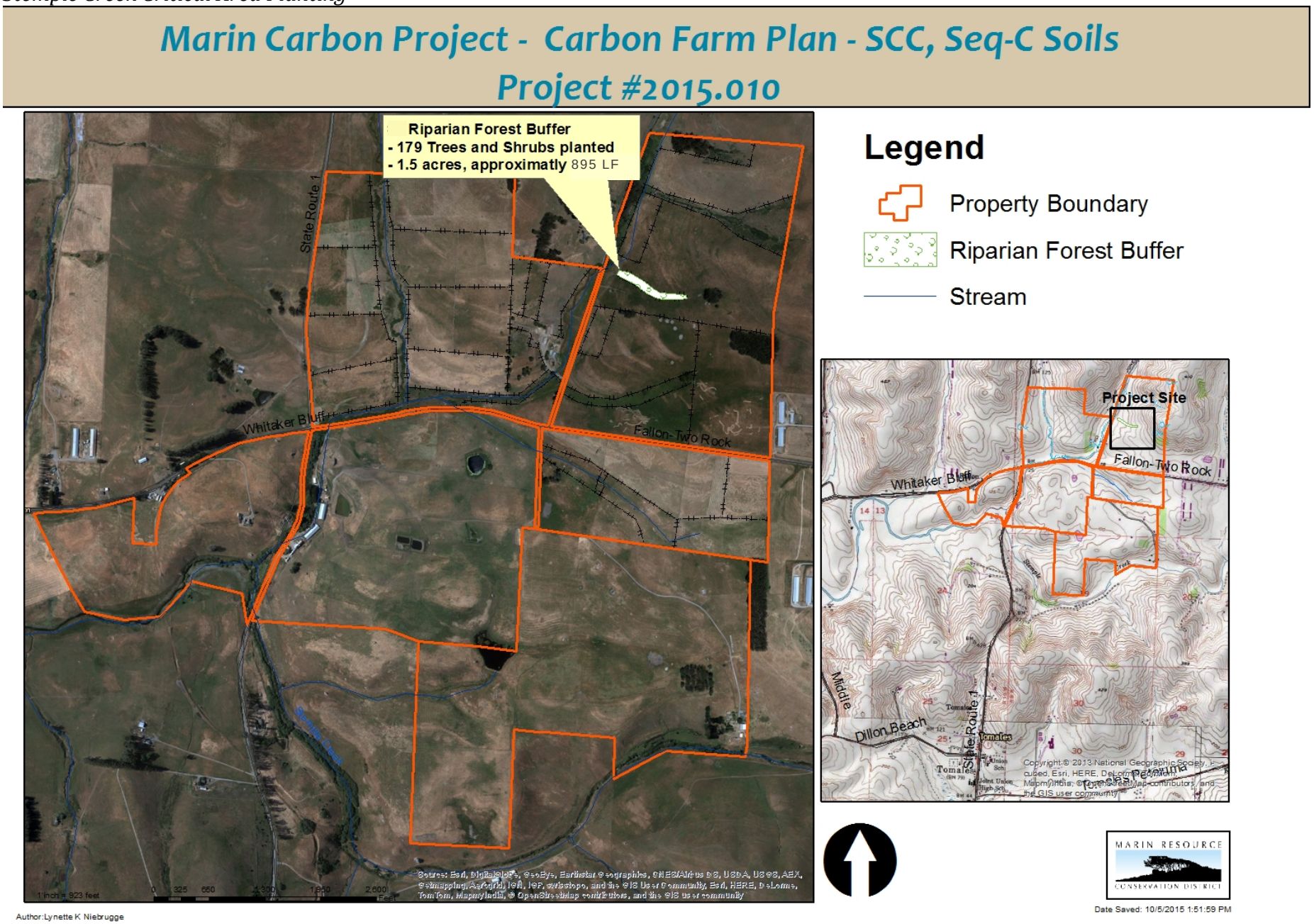


Figure 1. Map of Project 2015-010 showing the location of completed conservation practices implemented November 2015.

Pre-construction Photo 10/2015

Project Site displaying intermittent stream before individual plant installation.

Post-construction Photo 01/2016

Project site, looking west displaying the installation 179 trees and shrubs.

Post-construction Photo 11/2015

Close up view of individul planting displaying dri water and muclching before installation of staking and protaction.

Post-construction Photo 11/2015

Photo displaying the variety of trees and shrubs for planting.

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

PROJECT PROFILE: #2015-011

1,919 linear feet of fencing constructed

1,706 linear foot of stream fenced

Project:	2015-011	
Watershed:	Lagunitas Creek	
Practices:	Livestock Fencing and Water Development Development Project (2 total)	
Project Cost:	$37,036.86	
Partners:	$18,197.98	Marin Resource Conservation District, 319(h) State Water Resources Control Board
	$ 4,978.88	United States Department of Agriculture Natural Resources Conservation Service, Environmental Quality Incentives Program 2013
	$13,860.00	Lessee, in kind

Project 2015-011
Livestock Fencing and Water Development

Project Overview

The Livestock Exclusion Project, 2015-011, 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 Tomales Bay watershed.

The intention of Project 2015.011 was to implement conservation practices to address non-point source pollutants, specifically sediment and pathogens, from entering a tributary to Lagunitas Creek thence Tomales Bay Watershed. The goal of the project was to reduce livestock access to a tributary of Lagunitas Creek by installing a barb-wire fence to complement another project providing livestock alternative water sources. The Point Reyes National Seashore (PRNS)/ (landowner), lessee and United States Department of Agriculture (USDA) Natural Resources Conservation Services (NRCS) partnered together on an extensive water development project to distribute the livestock throughout the property, which will reduce pathogen loading into the local creeks and streams. By implementing conservation practices on the ranch, the landowner and lessee will be addressing non-point source loading into a salmonid bearing creek, Lagunitas Creek and the Tomales Bay.

Project 2015.011 included the implementation of one Best Management Practice (BMP) classified by NRCS as riparian livestock fence exclusion (#328). The landowner, in partnership with NRCS, implemented an additional BMP, (#516) livestock pipeline.

Ranch Location:
The ranch is part of the PRNS located in West Marin, California. The project is located in between the Platform Bridge and Tocaloma, which is northwest of Olema, California.

Project Location:
The project site is located along the southeastern border of the ranch along the riparian corridor of Zanardi Gulch an intermittent tributary to Lagunitas Creek, which drains into the Tomales Bay (Figure 1).

HUC 12: 180500050103
STREAM REACH CODE: 18050005000740

Environmental Conditions:
The ranch is located in coastal Marin County consisting of rangeland varying in elevation from 100 - 750 feet. The 573 acre ranch is utilized by 45 head of cattle year round under a rotational grazing regime.

The dominate soil throughout the project location are the Tocaloma-Saurin Association (184) cover approximately, 277.1 acres, 50.3% of the property. This soil association is composed of 40% Tocaloma, characterized as a loam to a very gravelly loam and 30% Saurin, characterized as a clay loam. This soil is weathered from sandstone and shale, containing a restrictive depth 20 - 40 inches to paralithic bedrock. It is well-drained, and occurs on very steep slopes ranging 30 - 50%. The depth to water table is more than 80 inches.

The riparian corridor of the tributary to Lagunitas Creek supports a relatively dense forest dominated by bay, alder, buckeye oaks, big leaf maple, boxelder, and willow. The understory layer is dominated by tree saplings with shrubs such dogwood, blackberry and poison oak. The herbaceous layer is composed of ferns, nettle, and scattered pockets of sedge. The rangeland vegetation is composed mainly of non-native grassland species, grasses and forbs throughout the property.

Table 1. Project area dimensions.

Project Information	Area	Unit
Ranch Area	573	Acres
Zanardi Gulch Watershed Area, Estimate	195.65	Acres
Watershed Project Area, Estimate (Zanardi Gulch Riparian Fencing)	67	Acres
Total Length of Zanardi Gulch	4,685	Linear feet

Historical Partnership and Commitment:

Prior to Project 2015-011, PRNS and lessee had not undertaken projects in cooperation with the Marin Resource Conservation District (Marin RCD). However, they have engaged in project with the USDA NRCS to implement conservation practices over the last five year to enhance the ecological value of the land.

Past and current projects include:

- 2016 – Present: Conserving Our Watersheds. MRCD
  - NRCS, Environmental Quality Incentives Program (EQIP)
- 2011-2016: East Spring Stockwater System.
  - NRCS, Environmental Quality Incentives Program

Phase I. Design and Implementation

Design:

A conservation design plan was developed by the NRCS Rangeland Specialist and the PRNS Ecologist. 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 practices including the following: livestock watering facilities across the ranch and riparian fencing.

The design consisted of a suite of NRCS conservation practices and specifications prescribed to meet NRCS' EQIP requirements. MRCD planned to provide cost-share for the riparian fence, while the lessee and NRCS completed the water developments together. The planned USDA NRCS' conservation practices, practice number, and associated practice objectives included:

Regular/Difficult Terrain Fence (328)
Objective 1: Manage land impacts caused by livestock activity.

Spring Development and Piping (574/516)
Objective 2: The purpose of the piping system is to convey water up a steep slope to achieve the adequate capacity for livestock watering and distribution (Fig. 1).

Watering Facility (614)
Objective 3: 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 (Fig. 3).

Implementation:
The Marin RCD staff, PRNS Staff and NRCS Partner Biologist inspected the completed riparian fence, February 2016. The riparian fence measured 1,919 linear feet excluding nearly 1,249 linear feet of Zanardi Gulch and 457 linear feet of a side tributary (Table 1). A regular and difficult terrain fence was constructed starting at the front east corner of property boundary near Platform Bridge. The fence (1,472 linear feet) was installed along the edge of the riparian corridor traveling upstream along the tree line, through the riparian vegetation along an ATV trail and ended near another fence adjacent to Zanardi Gulch. The side tributary riparian fence (447 linear feet) connected to the main fence at the intersection where the main fence linked in with the ATV trail and first side tributary. At the intersection, a gate was installed along with the beginning of the side tributary riparian fence, which traveled uphill along the tree line of the tributary and connected into an existing fence line along the ridge.

Table 2. Final dimensions of Project 2015-011.

Project Dimensions	Area	Unit
Riparian Fencing , Regular And Difficult Terrain Fencing (Zanardi Gulch)	1,472	Linear feet
Riparian Fencing, Difficult Terrain (Intermittent Side Tributary)	447	Linear feet
Total Riparian Fencing	1,919	Linear feet
Total Length of Intermittent Side Tributary Protected	457	Linear feet
Total Length of Zanardi Gulch Protected by Riparian Fencing	1,249	Linear feet

Project 2015-011
Livestock Fencing and Water Development

The following CEQA authorization and permits were obtained for this project:
Project #2015.011, the installation of a fence, was Categorically Exempt under California Environment Quality Act.

☒ No Permits Required
☐ §1600 CA Department of Fish and Wildlife
☐ §401 Water Quality Certification
☐ §404 US Army Corps of Engineers
☐ County of Marin

Phase II. Monitoring

Marin RCD's monitoring protocol is derived from the Riparian Management Zone Plan 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 Riparian Management Zone Plan and evaluating the functionality of the implemented project using a Project Assessment Checklist from the Riparian Management Zone Plan.

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

Project Assessment Checklist:
A post-project monitoring visit was conducted on March 2016. 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 #2015.011:

- *Objectives:* **Excellent**
    - Reduced sedimentation delivery to side tributary and Zanardi Gulch by fencing riparian corridors.
    - Reduced pathogens through the implementation of riparian livestock fence exclusion.
- *Target Values*: **Excellent**
    - 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*: **Excellent**

    - 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 good and has the intended functional value.

The practice was rated as follows:
Livestock Fence Exclusion: Effectiveness Rating = Good
Monitoring Assessment: March 2016
Post-construction inspection: The riparian fence surrounding the entire project was rated 'good' after installation. The H-braces were sound, a few fence clips were missing, the contractor was notified. The wire was taut throughout the majority of the fence line. Documentation was made noting the loose top strand of wire throughout one small section of fencing the fence crossed over the wooden bridge, contractor was notified. All gates were placed along the fence line according to the ranchers liking. All gates were closed although during monitoring inspection there was no evidence of livestock within the enclosure.

Project 2015-011
Livestock Fencing and Water Development

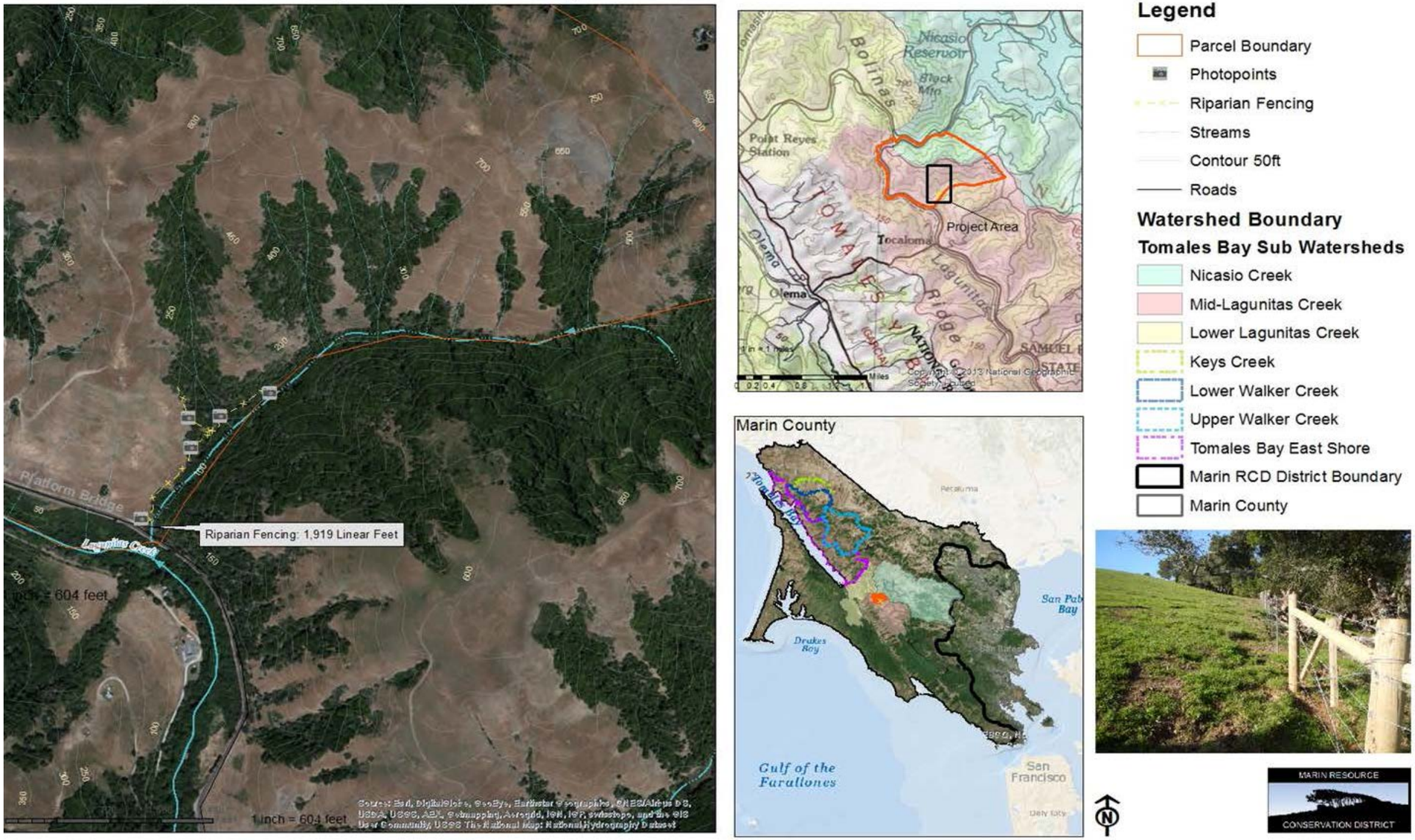


Figure 1. Map of Project 2015-011 showing the location of completed conservation practices.

Project 2015-011
Livestock Fencing and Water Development

Pre-construction Photo 12/2015

View of riparian cooridor before fencing installation.

Post-construction Photo 03/2016

Riparian fencing after construction excluding riparian cooridor of Zanardi Gulch.

Pre-construction Photo 12/2015

Before photo of ATV trail above Zanardi Gulch and wooden crossing a side tributarty.

Post-construction Photo 03/2016

View of riparian fencing constructed along the ATV trail above Zanardi Gulch, and wooden crossing over a side tributary .

Figure 2. Photo-monitoring documentation of installed conservation practice.

Project 2015-011
Livestock Fencing and Water Development

Pre-construction Photo 08/2015

Pre-construction photo of old degraded fence above Zanardi Gulch.

Post-construction Photo 12/2015

Post-construction project photo displaying constructed fence adjacent to old degraded fence above Zanardi Gulch.

Pre-construction Photo 08/2015

Pre- construction displaying riparian cooridor of side tributary before fence installation.

Post-construction Photo 12/2015

Post- construction photo of constructed fence along the tree line of the side tributary riparian cooridor.

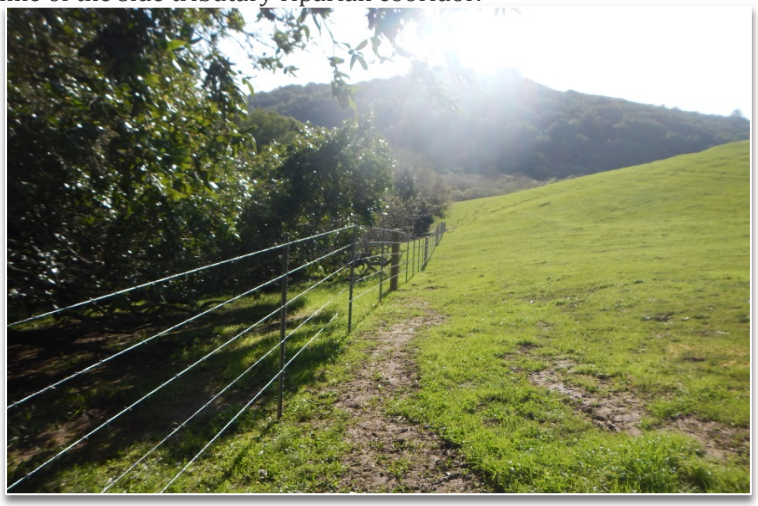


Figure 3. Photo-monitoring documentation of installed conservation practice.