

James V. Fitzgerald Pollution Reduction Program Upland Best Management Practices Project Final Report



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Watershed: James V. Fitzgerald ASBS, San Mateo County

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Note: Attachments can be viewed on the web at: <http://www.sanmateorcd.org/fpr-report/>



Executive Summary

This report summarizes efforts to reduce nonpoint source pollution to the James V. Fitzgerald Area of Special Biological Significance (ASBS) by educating and recruiting local residents to implement targeted best management practices (BMPs) in the ASBS watershed. The Fitzgerald Pollution Reduction (FPR) Upland BMPs Project was led by the San Mateo County Resource Conservation District (RCD). The RCD is a non-regulatory technical assistance agency that works with public and private landowners to achieve resource conservation goals. Through the project, the RCD conducted outreach and education to private residents living in the unincorporated communities of Montara and Moss Beach, located within the ASBS watershed. Funding for the project was provided by San Mateo County through a Proposition 84 ASBS grant from the State Water Resources Control Board (State Board).

During the project, the RCD identified multi-faceted approaches to address water quality problems in the ASBS watershed stemming from dog waste, livestock and horse manure, rural roads and trails, and residential properties. The RCD successfully engaged nearly 500 residents of Montara and Moss Beach through outreach activities, plus those reached through social media, the web, and fliers posted at community businesses and gathering places which we estimate at 1,000. To recruit participation in the program, we completed 22 site visits to private properties and equestrian facilities to assess ways to reduce stormwater runoff and reduce potential sources of pollution. We implemented 25 BMPs on seven residential properties during the course of the project, plus one outreach and education BMP working with the community's elementary school to increase awareness about water quality issues in creeks that flow to the ASBS. The BMPs on the residential properties included installing roof drainage controls including rainwater collection systems, replacing impervious surface with permeable surface, and infiltrating and storing stormwater runoff using rain gardens and drainage swales.



Background and Rationale

Introduction

The San Mateo County Resource Conservation District (RCD) was selected to design and implement no less than 10 targeted BMPs on private lands in the upland watershed of the James V. Fitzgerald Area of Special Biological Significance (ASBS) to help reduce pollutant loading to the ASBS. This project is part of a comprehensive effort led by County of San Mateo (County) Department of Public Works known as the James V. Fitzgerald ASBS Pollution Reduction (FPR) Program which is designed to reduce nonpoint source pollution to protect beneficial uses of the ASBS such as wildlife habitat, water contact and non-contact recreation such as swimming, surfing, tide pooling, or wildlife viewing. Funding for the project was provided by San Mateo County through a Proposition 84 ASBS grant from the State Water Resources Control Board (State Board). This final report summarizes work completed to reduce pollution runoff into the ASBS from upland areas of the watershed.

About the RCD

The RCD serves as a local hub for conservation, connecting people with the technical, financial and educational assistance they need to conserve and manage natural resources. A defining characteristic of the RCD is that we provide non-regulatory, confidential, and typically free assistance. RCDs are established under California law to be locally governed with independent boards of directors that are accountable to our communities. Relationships built on trust between the RCD with the communities we serve are critical to how we accomplish our work. The district covers over 157,000 acres in the western, coastal half of San Mateo County, including all watersheds in the County that drain into the Monterey Bay National Marine Sanctuary, and is enabled to work in areas outside of district boundaries as appropriate.

Project Purpose

The State Board entered into a grant agreement with San Mateo County to support the FPR Program using Proposition 84 ASBS bond funds. The purpose of the grant was to implement targeted Best Management Practices (BMPs) and conduct an education and outreach campaign about water quality issues in the James V. Fitzgerald Marine Reserve (Reserve) and ASBS. The County subsequently subcontracted with the RCD to implement no less than 10 targeted BMPs on private lands upland of the ASBS. The RCD's work included identifying and prioritizing opportunities to implement BMPs within the project area, conducting outreach to recruit willing participants, managing a selection process, designing BMPs, and overseeing installation of BMPs.

Problem and Need Addressed

The Pacific Ocean at the Reserve and San Vicente Creek are on the 303(d) List of Impaired Water Bodies due to elevated coliform bacteria. The County conducted a microbial source tracking (MST) study in 2012 due to the 303 (d) listing, numerous exceedances of water quality objectives, and postings about risk of contact with the water of creeks at and near the Reserve. Microbial source tracking provides information about sources of fecal contamination within a watershed and helps with the selection of appropriate BMPs to reduce fecal pollution. A copy of the study can be found here: http://smchealth.org/sites/default/files/docs/EHS/Fitzgerald_MST_final.pdf.

All work to identify, prioritize, recruit, select, design, and implement BMPs through this project was informed by the problems and needs identified in the MST study, and characterization monitoring which identified other



pollutants of concerns such as pyrethroids and metals, pollutants often found on residential properties, which became the focus of the BMPs implemented. A Technical Advisory Committee (TAC) also provided guidance throughout the project. TAC members included representatives from San Mateo County Department of Public Works, County Environmental Health, County Water Pollution Prevention Program, State Department of Transportation (CalTrans), State Water Resources Control Board, Regional Water Quality Control Board, University of California at Davis, the Natural Resources Conservation Service, Monterey Bay National Marine Sanctuary, and the San Francisco Estuary Institute as well as the RCD.

Project Description

Project Area

The ASBS is located north of the City of Half Moon Bay and extends from 4th Street in Montara south to the Pillar Point Harbor breakwater. Three main creeks drain to the Reserve – Montara, Dean, and San Vicente Creeks. Kanoff, Daffodil, and Martini Creeks are located immediately north of the ASBS boundary.

Montara and Moss Beach are unincorporated communities, containing approximately 1,850 privately owned parcels, the majority of which are in very low to medium density areas along Highway 1. Larger parcels east of Highway 1 have a more rural ranchette type development, often with livestock and horses present. The upper reaches of the watershed are federally-owned by the Golden Gate National Recreation Area (GGNRA), part of the National Park Service.

Project Goals

Goals for the FPR Upland BMP project were:

- Identify and prioritize BMP implementation opportunities on private properties upland from the ASBS
- Recruit and select BMP projects
- Design and implement BMPs
- Project assessment and future planning

Project Timeline

The County entered into a Memorandum of Understanding with the RCD to implement the project in May 2011. Initial work focused on project planning, permitting, and developing a draft Monitoring Plan (MP) and Quality Assurance Program Plan (QAPP) in collaboration with the County and the San Francisco Estuary Institute. Limited work was completed during 2012 while waiting for the results of the MST study and an agreement on an approach to monitoring. In January 2013, the RCD began identifying and prioritizing BMPs for implementation, working with the TAC, and seeking approval from the County and State Board. In February and March 2013, the RCD began outreach to potential participants to recruit and select project sites and began conceptual design work. This included work on a rural road project to



Map 1. James V. Fitzgerald ASBS



improve runoff structures on Second Street in Montara, and planning/design for low impact development (LID) work on residential sites, which we also called “sustainable gardening and landscaping” sites.

In August 2013, the State Board raised concerns about the previously-approved priority BMP list based on their interpretation of allowable project types under Proposition 84, which focused on structural BMPs that could demonstrate a 20-year useful life. This was contrary to program guidelines for the ASBS grant program that also put priority on education and outreach activities, which were included in the approved grant proposal. The RCD coordinated with the County Grant Manager, State Board Grant Manager, the Selection Committee, and other TAC members to address these concerns and to increase transparency about objectives, types of approved BMPs, and approval process. The RCD subsequently dropped BMPs deemed to be “non-structural,” primarily those pertaining to outreach, education, and community clean ups. The Second Street project was also rejected by the State Board in fall 2013 and dropped from further work.

Ultimately, designs for nine LID sites were submitted by the RCD and approved by the TAC, Selection Committee, County and State Board. The RCD moved ahead with pre-construction implementation steps including identifying and hiring contractors in accordance with labor compliance requirements, obtaining landowner agreements to maintain BMPs for 20 years, securing permits and permit exemptions, completing engineered project designs and cost estimates, all while communicating and coordinating with the TAC, Selection Committee, County, and State Board Grant Manager. Strategies to evaluate effectiveness of the BMPs were also vetted to these entities and load reduction modeling was eventually determined to be the most appropriate strategy rather than water quality monitoring.

On September 22, 2014, a stop work notice was issued by the State Board for the LID projects due to concerns about work being in accordance with the terms and conditions of the grant agreement and monitoring of BMPs. After further coordination between the RCD, County, and State Board, the project was re-initiated in spring 2015, and work on designs, permitting, and implementation continued. LID construction commenced in September 2015 on seven residential properties and was completed in February 2016. A demonstration tour of several sites was conducted in January 2016, along with various surveys to assess effectiveness.

Although many of the priority BMPs were dropped in response to the State Board’s interpretation of the Proposition 84 requirements, this final report summarizes all BMPs considered as the RCD believes they have promise for reducing pollutant loads from the upland watershed to nearby creeks, beaches, and ocean.



Rain garden installed for biofiltration of runoff in the ASBS watershed



Project Activities

Initial List of BMPs for Implementation

Working with the County, TAC, and a Site Selection Committee, the RCD identified priority BMPs to meet the overall goals of the FPR program. Members of the Selection Committee included: James Howard of the Natural Resources Conservation Service, Julie Casagrande of County Public Works, and Neil Kramer, private consultant and board member of the RCD. Later, Keith Lichten and Farhad Ghodrati of the San Francisco Bay Regional Water Quality Control Board (RQWCB) joined the committee. Identification and prioritization of BMPs was also informed by emerging MST study data and characterization monitoring done in 2012 that identified pollutants of concern including pyrethroids, polycyclic aromatic hydrocarbons (PAHs), and metals. Based on this work, an initial list of BMPs was proposed to address nonpoint source pollution and water quality in the upper ASBS watershed. The RCD envisioned a multi-faceted approach to addressing nonpoint source pollution in this area through a combination of construction projects at selected sites intended to serve a demonstration purpose, outreach efforts to educate and provide technical assistance to the broader community, and community-based clean-up efforts. BMPs were proposed based on potential for demonstration of concepts and opportunities to create broader behavioral change within the upland communities of Montara and Moss Beach.

Prioritized List of BMPs

After initial review of potential BMPs by the County, TAC, and State Board, a prioritized list was developed and refined (Attachment A). This prioritized list included addressing nonpoint source pollution in four ways:

Dog Waste

Results of the MST indicated that fecal bacteria from dog waste was a contributing factor in all waterways in the watershed. The following practices were prioritized as best opportunities to reduce fecal bacteria levels:

- Outreach and education to dog-walking groups or other organized dog-related organizations to increase awareness of the impact of dog waste on water quality
- Organize one or more community work days to pick up dog waste in community dog walking areas
- Identify and install dog waste bags, trash bins, and “drains to ocean” type signage in frequented dog walking areas
- Communicate with the general public through a variety of means to increase awareness of the impact of dog waste on water quality, including site visits to residential properties as part of sustainable landscaping assessments/ technical assistance
- Conduct outreach at the local elementary school to educate students and their families about the importance of dog waste cleanup and proper disposal

Confined Animal Facilities

The MST study detected horse markers in all sampling sites, with highest concentrations in Dean and San Vicente creeks. Bovine-associated markers were found in Kanoff and San Vicente creeks. The RCD identified opportunities to demonstrate the efficacy of improvements to livestock facilities located on public and private lands within the watershed to address erosion, sedimentation, and reduction of nutrients, pathogens, and bacteria into the waterways. Proposed BMPs included: waste storage, including removal of aged manure loads,



manure composting, filter strips, and other BMPs used by the RCD’s Livestock and Land Program and recommended by the NRCS. We also looked at innovative solutions that would better serve smaller facilities.

Rural Roads and Trails

This opportunity addressed sedimentation and heavy metal runoff from rural roads and trails in the watershed, especially unpaved, non-County maintained roadways adjacent to waterways. BMPs proposed included regrading and resurfacing, installing culverts, and installing filter strips, vegetated swales, and sediment basins alongside roadways.

Residential Yards and Landscaping

The ASBS watershed is made up of two unincorporated communities (Montara and Moss Beach) with small commercial areas, residential homes on the ocean bluffs, and rural land uses and ranchette properties in the upper watershed. Residential properties can contribute sediment, nutrients and pesticides as well as dog waste into the waterways. The RCD identified opportunities to demonstrate the efficacy of various types of sustainable gardening and landscaping practices to reduce runoff and improve water quality. These included:

- Providing assessments to homeowners to help them better understand opportunities to improve water quality runoff from their yards, gardens, and landscaping
- Providing awareness and education to homeowners to encourage picking up dog waste more frequently and/or targeted before storm events
- Providing awareness and education to reduce use of pesticides in backyards
- Installing sustainable gardening and landscaping practices that incorporate various LID features to reduce runoff and improve water quality, and reduce the need for pesticides. Examples of LID features include:
 - converting lawns to native plantings
 - installing rain gardens and/or bioswales to slow and filter runoff
 - rain catchment/harvesting
 - converting impervious surfaces to pervious surfaces
 - installing appropriate drainage control structures



Completed rainwater harvesting and rain garden system, Moss Beach

Initial Outreach

Program materials were developed to support initial outreach and recruiting. Materials included an application package, site selection criteria and a flier (Attachment B). The flier was distributed around the community to generate interest and to identify potentially interested participants. Program information was also distributed through attendance at community workshops, website updates, RCD social media (Facebook), and inserts into various County newsletters.



Program Design

The RCD considered multiple approaches to addressing pollutants running off from private properties into the creeks and ocean of the ASBS. The approaches were a combination of education, outreach, and implementation activities.

Proposed Program to Address Dog Waste

The program design to address dog waste was proposed to include several specific BMPs including education and outreach, community clean-up days, and social media alerts to clean up dog waste in backyards before rain events. One BMP was completed during the grant period and is described below, other BMPs were proposed

Farallone View Elementary School Oceans Week Dog Waste Outreach BMP

The RCD conducted an outreach event at the Farallone View Elementary School, located in Montara, to support education about the issue of dog waste and its impact on water quality in the ASBS. The school and its Friends of Farallone Parent Teacher Organization organize special programs for Oceans Week every year to teach students about the ocean and relevant issues and to provide community service. The RCD proposed this BMP to get the word out about known sources of fecal bacteria to the ASBS, educate students and parents about the connection between backyard dog waste and high bacteria levels in creeks and ASBS in wet weather, and build connections with the school community that could help identify and recruit participants for other aspects of the FPR program.



Students learn about pollution, dog waste, and water runoff issues during Oceans Week, Montara

Through this outreach activity, we reached 385 students and 35 parent-volunteers. We also reached an unknown number of parents who received fliers and other project materials. The event consisted of a multi-day program during Oceans Week held in May 2013 that engaged all 15 classes at the school in the following hands-on activities:

- Walk from school to creek with discussion on potential pollution sources to the creek
- Creekside lesson using 3D Enviroscape model on what a watershed is and on potential local sources of pollution
- Creek sampling and in the field water quality analysis of a tributary to Kanoff creek
- Processing samples for bacteria by RCD following collection
- In class follow-up activities to look at bacteria samples and discuss ways to reduce pollution, with a focus on the need to pick up dog waste

Dog Waste Clean Ups Proposed BMP

This proposed design for this BMP involved trying to change behavior of residents in the ASBS communities in regard to picking up dog waste in backyards and at informal dog walking areas within the communities. We began by working with the Montara Dog Group, a group of dog owners in the community who advocate for access and work on clean up issues. We also contacted one landowner of an informal dog walking areas regarding whether they would want to participate in a community clean up days to remove dog waste from thei



property. This landowner was not interested in doing anything that would be perceived as encouraging dog walking on the property. We also looked at potential locations for waste bins near informal dog walking areas and determined with the Montara Dog Group that most locations already had bins that needed them.

Another option we researched was the viability of dog waste composting bins that could be used by home owners.

The RCD did regularly issue alerts effort via web and social media to notify residents of Montara and Moss Beach before rain events to encourage them to pick up dog waste in the backyard to prevent runoff into nearby creeks or ocean.

Although these proposed BMPs seemed promising as potential approaches to addressing the widespread issue of polluted runoff from dog waste in the ASBS watershed, all further work on dog waste BMPs was rejected by the State Board due to their interpretation of the non-structural nature of these BMPs and concerns about whether the BMPs could provide long-term water quality benefits for a period of 20 years.

Proposed Program to Address Manure Waste

In designing a program that would address pollution from manure waste in the watershed, the RCD considered several potential BMPs related to confined animal facilities, including facilities that house livestock and horses. Larger, commercial stables are permitted through the County's Confined Animal Ordinance, which requires a waste management plan. Smaller facilities, of which there are many in this area, are exempt from the Confined Animal Permit and have fewer options for properly managing manure.

The FPR Upland BMPs project followed a three-year effort (also funded through the State Board Proposition 84 ASBS Grant Program), known as the Livestock and Land Program, that constructed improvements on five larger equestrian facilities located within this watershed. Building on these efforts, the RCD did outreach to an additional five horse facilities regarding the potential to install manure management and composting systems or other features to reduce or filter runoff from these properties. Due to constraints of grant funds, timing, and perceived threats of regulation, we were not able to move any potential manure waste BMP projects forward during this grant period. Given the outreach and education conducted through both Livestock and Land and the FPR Upland BMP Project, however, we believe a similar cost-assistance program in the future, with fewer constraints, would be a good option for reducing runoff of nutrients, pathogens, and sediments from horse and livestock properties, including both larger stables and smaller home sites.

At the same time, the RCD realized that a different approach would be needed by the smaller equestrian and livestock properties that are found in the watershed. In looking at how we could help these smaller properties better manage manure, some obstacles became apparent:

- Smaller-sized parcels are less likely to be able to successfully compost manure (i.e., no space for composting bins, no paddock or pasture for spreading finished manure, etc.)



Example of social media announcements about cleaning up dog waste



- The commercial hauler for these communities, Recology, does not allow manure to be disposed in yard waste bins and has no other program for picking up manure
- Only one private hauler currently serves this part of the coast (due to distance traveling from the Bayside and economies of scale) and has very strict requirements about the type of stall bedding used and can only serve sites with easy access to major roads
- While material exchange programs exist, they do not seem to work well connecting smaller livestock properties with local gardeners who might want finished compost



Example of aged manure in upland area

To address these obstacles and reduce/manage manure from smaller properties located in the ASBS watershed, we proposed two BMPs that were ultimately not accepted by the State Board. These proposed BMPs included:

“Get out of Manure Free” Proposed BMP

This proposed BMP involved a one-time removal of aged manure from small horse and livestock facilities located in the upland watershed by contracting for bin service from Recology, tied to technical assistance to landowners for better manure management practices going forward. Technical assistance would have included a site visit from the RCD to educate the landowner about water quality impacts from manure and to provide a long-term manure management plan. This BMP was rejected by the State Board in October 2013, as it was not seen as contributing to a long-term improvement in water quality.

Half Moon Bay High School and FFA Manure Composting Proposed BMP

This proposed BMP was to support the development of a centralized manure composting facility to be located at the Half Moon Bay High School and to be run by the school’s Future Farmers of America (FFA) program. The purpose of this program was to serve smaller horse and livestock properties in the ASBS watershed and elsewhere on the coast by providing a centralized location where manure could be composted. Finished compost would then be sold at the Half Moon Bay Feed and Fuel store and help to raise funds to sustain the effort. This BMP would have consisted of installation of a compost bunker and development of a composting plan. With separate funds, the FFA program would have purchased a truck and organized students to haul and compost the manure. This BMP was rejected by the State Board in March 2014 because the high school was located outside the ASBS. A future partnership, using less restrictive funding, may make this a viable option to reduce manure loads in coastal watersheds.

Proposed Program to Address Rural Roads and Trails

To address erosion and sediment delivery from rural roads and trails, the RCD proposed BMPs that involved regrading and resurfacing and installing culverts, filter strips, vegetated swales, and sediment basins. Two proposed BMP locations included a road located on a ranch property and repairs to Second Street, a non-County maintained road in Montara.



Horse Ranch Rural Road/Creek Crossing Proposed BMP

This proposed BMP would have addressed runoff from a ranch road and horse paddocks into San Vicente Creek on a 50-acre horse boarding facility located on lands leased by the GGNRA. Proposed BMPs included removing eucalyptus from the riparian area and replacing it with a critical planting area and filter strip to capture runoff and repairing the ranch road where it crosses the creek. Due to barriers associated with GGNRA lease terms and time required to receive approvals from federal, state and local officials, this BMP was not recommended for implementation.



Ranch Road over San Vicente Creek

Second Street Rural Road Repair Proposed BMP

This proposed BMP involved solving flooding issues on a non-County maintained dirt road caused by the steepness of the watershed, overflow from upland roadways, and undersized private culverts. During flooding events (across properties and through garages), there is a likely increase in delivery of pollutants and sediment to a nearby creek flowing to the ASBS. The project proposed re-grading the road, installing dips or water bars, and replacing some culverts. Upon initial approval of the proposed BMP by the Selection Committee and TAC, the RCD established key relationships and obtained participation commitments, created draft designs and project plans that included site information, goals/objectives, timelines, outcomes, cost estimates, permitting information, evaluation methods, maps and conceptual site plans. Concerns were expressed from the State Board about this BMP being a flood control and water quantity project, rather than a water quality project. The TAC also provided input that this project was not a priority, especially given time constraints associated with permitting and eventual construction project costs. No further work on this BMP was completed.



Stormwater Runoff on Second Street, Montara

Proposed Program to Address Backyards and Landscaping

To reduce runoff of heavy metals, sediment, nutrients and pesticides from private residence yards and landscaping, the RCD proposed a program to conduct backyard site assessments to recommend solutions to reduce runoff and improve water quality. Assessments (Attachment C) included recommendations for BMPs/LID features that could be implemented to better manage stormwater runoff and improve water quality on the property such as converting impervious surfaces to permeable surfaces, collecting roof runoff into rain barrels or cisterns, installing drainage control structures, and adding rain gardens and bioswales to reduce and filter runoff.

A total of 16 assessments were completed. These sites were then prioritized based on potential to better manage stormwater runoff and improve water quality. Nine were selected to receive design assistance based on the site selection criteria, estimated costs of BMPs, BMP effectiveness in terms of percentage of stormwater treated, and implementation constraints. Ultimately BMPs were installed at seven sites with cost-share



assistance through the grant funds. A total of 25 LID BMPs were installed at the seven sites during the grant period.

Construction of LID BMPs

Pre-Construction Activities

From the 16 site assessments, nine properties were selected to move forward into the design phase, based on site selection criteria and input from the TAC, Selection Committee, County and State Board. After concept designs were approved, the RCD subcontracted with Bruce Jones Engineering to complete final designs and cost estimates, working closely with the landowners to develop approaches that served both to reduce pollutant loads and meet landowner goals for management of their properties.

The following pre-construction tasks were also completed:

- Finalized engineered project designs, specifications and landscaping plans for approvals by the County and State Board
- Obtained signed participation agreements from landowners to maintain the constructed portions of the projects for 20 years
- Entered into a contract with a third-party labor compliance company, Contractor Compliance and Monitoring Inc. (CCMI), to monitor selected construction contractor(s)
- Identified potential contractors with experience installing LID features and working with State labor compliance laws
- Complied with County permitting requirements and obtained necessary permits and exemptions
- Selected a construction company, Ecological Concerns Incorporated (ECI), to implement the project
- Modified project scope to stay within budget and still meet project objectives

The RCD was in the process of finalizing project designs and contract terms with the construction contractor when the State Board sent a stop work order. After a lag period and a discussion about various ways to evaluate project performance and BMP effectiveness, the State Board decided to reinstate the project with an increased budget. Final pre-construction activities were completed between April 2015 and August 2015, and construction commenced in September 2015 on seven sites with construction completed in February 2016. It should be noted that one of the nine original landowners decided to use previous designs to implement LID features with her own funds during the lag period, while the other landowner was no longer interested in further participation in the project.

Implemented BMPs

Multiple LID features were constructed at seven sites to capture



Rain garden during construction, Montara



and treat stormwater runoff and reduce pollutant loading to the ASBS. A map of the seven sites is shown on the next page, and a table summarizing the implemented BMPs follows. With multiple BMPs at each site, 25 BMPs were installed in total. Project summaries, designs, and plans are provided for each site in Attachments D - J. Pre, during and post construction photo documentation is shown in Attachment K.

Map 2. BMP Sites, Implemented 2015-2016

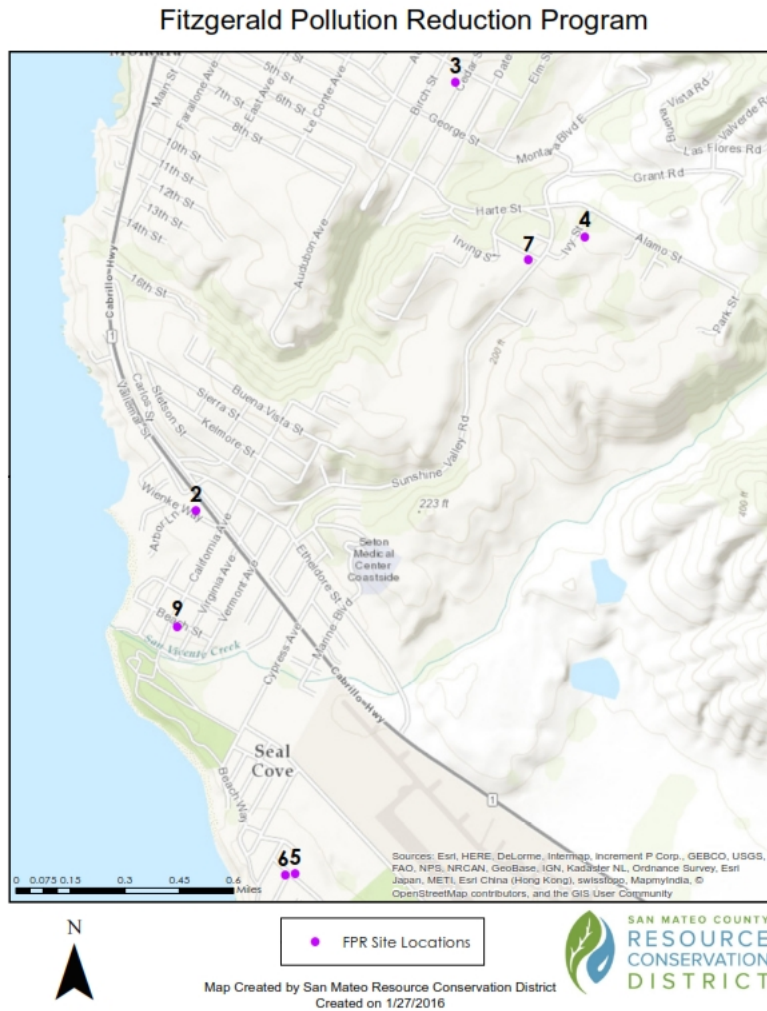


Table 1. Sites, BMPs, and Treatments Description

Site	Site Description	BMPs	Treatments Description
#2	Property near Dean Creek, on the west side of Hwy 1, just north of the Reserve. This is a large property with two residential structures, and water flows through the property directly to a roadside ditch that drains to the ASBS. This property is downslope of Hwy 1, and runoff from the highway flows onto the backyard and runs from the back of the property to the front.	<ul style="list-style-type: none"> • Install a 100 foot long berm/swale feature along the backyard fence to collect filter and infiltrate highway runoff (5,700 square feet). • Construct a 3-tiered rain garden system to further filter and clean highway runoff from the hedgerow swale/feature and runoff from property • Install a 13x8 foot rain garden in the front of the property to capture runoff from front of west structure roof. • Install a 19x6 foot rain garden on east side of property to capture runoff from property roof and roof of second structure • Install a 60 foot long vegetated swale that is connected to the east rain garden for further filtration 	Roof runoff on the back half of the eastern building is directed through the existing gutters to a downspout that drains directly to a rain garden. The rain garden provides infiltration as primary treatment and will overflow into a treatment swale that flows to the public road. Roof runoff on the front half of the western building is directed through the existing gutters to a downspout that drains directly to a rain garden. The rain garden provides infiltration as primary treatment and will overflow through a rock weir to the public road. A treatment swale across the back of the property collects runoff from the adjacent public highway and directs it to a rain garden system. The rain garden system consists of three separate rain gardens that drain in series through a set of rock weirs. The overflow from these rain gardens flows into a drainage pipe that then outlets to the rain garden in front of the western building.
#3	Property is in Montara and drains to Montara Creek. Residence is on less than 1 acre and structures include a house and small, uncovered chicken coop. There are large amounts of impervious surface on the property and runoff discharges to a nearby drainage ditch. Water from an uphill neighbor also runs off onto this property.	<ul style="list-style-type: none"> • Add clear roof (50 square feet) to chicken coop to keep feces separated from stormwater • Remove concrete patio and replace with earthen swale (350 square foot area) and brick pavers (230 square feet) to increase infiltration • Remove concrete driveway, asphalt paving and a tree stump. Replace with permeable asphalt (480 square feet) and traditional asphalt (380) square feet and a vegetated slope to narrow the driveway, increase infiltration and keep runoff on the property • Install a battery of three 205 gallon storage tanks to capture roof runoff (1,570 square feet) and direct overflow to existing French drain which will be routed to a rain garden • Construct a 12x22 foot rain garden to capture and filter runoff from existing and proposed drains and water from roof 	Roof runoff is directed through the existing gutters to a downspout that attaches to a set of rainwater storage tanks. Overflow from these tanks is outlet into an existing perforated pipe drain which will be redirected to a rain garden. The concrete patio in the backyard is replaced with pervious pavers and earth to reduce runoff. A new perforated pipe drain collects water from this area and the north side yard and directs it to the rain garden. The rain garden provides infiltration as primary treatment and will overflow into a drainage pipe that outlets to the public road. The existing driveway and asphalt paving in the right of way is removed and replaced with a traditional asphalt driveway in the right of way and a permeable asphalt driveway on the property. The permeable asphalt provides infiltration as primary treatment and will overflow into an underdrain that outlets to the public road.
#4	This one acre property contains a house and garage that drain to Dean Creek (aka Sunshine Valley Creek)	<ul style="list-style-type: none"> • Install two batteries of three 205 gallon storage tanks to capture and store rainwater from asphalt garage 	Roof runoff is directed through new gutters and downspouts to two separate sets of rainwater storage



Site	Site Description	BMPs	Treatments Description
	near the drainage divide with Montara Creek. This property has a long gravel driveway and stormwater erodes the driveway and runs across the road and into the downhill neighbor's property.	roof (1,720 square feet) <ul style="list-style-type: none"> Construct a 13 x 40 foot rain garden to filter and infiltrate water from storage tanks Conduct earthwork to direct flow away from driveway to an underground drain leading to a vegetated swale Construct a 150 foot long vegetated swale to capture stormwater from the property and driveway and to reduce erosion Install two concrete masonry block baffle walls and a concrete overflow weir at the end of the vegetated swale to sufficiently spread water before it enters the roadside ditch in order to avoid erosion of the ditch bank 	tanks. Overflow from these two tank sets is outlet into a rain garden. The rain garden provides infiltration as primary treatment and will overflow into a drain pipe in the case of a large storm event. The drain pipe collects water from the driveway and outlets to a treatment swale. Treatment swale outlets at property line over a concrete weir spreader beam to reduce concentrated flow and reduce erosion. Irrigation risers allow the tanks to be drained manually or for the stored water to be used for irrigation.
#5	The property is located west of Highway 1 in Moss Beach on the bluffs above the Reserve. The property is less than 1 acre and the residence is the only structure. Stormwater currently flows to a roadside ditch that directly discharges to the ASBS. The property has poor drainage in the backyard and stormwater flows to the drainage ditch during storm events. There is erosion in the front yard, along the earth driveway and from the gutter downspouts.	<ul style="list-style-type: none"> Install two 900 gallon storage tanks to capture and store water from asphalt roof (460 square feet) and to reduce erosion from gutter downspouts Install a 20x12 foot rain garden with a 50 foot upstream vegetated swale and a 30 foot downstream vegetated swale to create a treatment system to filter and infiltrate stormwater on the property and from roof Increase height of garden wall by two brick courses to decrease earth slope behind wall and minimize loss of soil 	Roof runoff is directed through the existing gutters to new downspouts that attach to a set of rainwater storage tanks. Overflow from these tanks is outlet into a treatment swale which leads to a rain garden. The rain garden provides infiltration as primary treatment and will overflow into a treatment swale in the case of a large storm event. This treatment swale is outlet by a pipeline that drains to the front of the property. Irrigation risers allow the tanks to be drained manually or for the stored water to be used for irrigation.
#6	This property is west of Highway 1 in Moss Beach in the community on the bluffs above the Reserve. Residence is on a ~7000 square foot parcel and runoff is straight into a drainage ditch that discharges into the ASBS. The property has a variety of hardscape features, receives runoff from the street, and contributes runoff to an adjacent neighbor's property.	<ul style="list-style-type: none"> Install a 8x15 foot rain garden and a 35 foot vegetated swale to capture and filter runoff from asphalt roof (420 square feet), roadway and other areas of property Replace concrete driveway with permeable asphalt (425 square feet) to improve infiltration 	Roof runoff is directed through the existing gutters and downspouts to a rain garden. The rain garden provides infiltration as primary treatment and will overflow into a treatment swale that outlets to the public road. The existing driveway is replaced with a permeable asphalt driveway. The permeable asphalt provides infiltration as primary treatment and will overflow into an underdrain that outlets to the public road.
#7	Property is near the northern boundary of Dean Creek (aka Sunshine Valley Creek) near the drainage divide with Montara Creek. The property contains a residence, shed, an uncovered chicken coop area, and adjacent compost pile. Stormwater runs off the property onto neighbors land and then into a	<ul style="list-style-type: none"> Install a permanent roof structure over the chicken coop area to keep feces separated from stormwater. The compost pile will also be moved under this roof Construct a 22 x10 foot rain garden to infiltrate runoff from the chicken coop roof (350 square feet), asphalt shed roof (210 square feet), and 	A new roof structure over the chicken coop area isolates rain water from chicken feces. Roof runoff from this new roof and the adjacent storage shed is directed to a rain garden through downspouts and drainage pipes. The rain garden provides infiltration as primary treatment and will overflow into a drainage pipe that



Site	Site Description	BMPs	Treatments Description
	roadside ditch.	property.	outlets to the public road.
#9	Property is on ~6000 square foot parcel up the street from the Reserve and includes a residential structure and storage unit. Runoff is through neighboring properties to a drainage ditch that discharges into the ASBS. Stormwater from street above the house drains onto property and stormwater from the roof structures infiltrates poorly on the property. The landowner is highly active in the environmental community and improvements would be close to the Reserve and visible.	<ul style="list-style-type: none"> • Install two batteries of three 205 gallon rainwater storage tanks to capture and store runoff from house and storage unit roof (1,080 square feet) • Construct 5x14 foot rain garden on north side of property to capture and filter runoff from property and house roof • Construct 8x24 foot rain garden on south side of property to capture and filter runoff from the property and house roof 	Roof runoff is directed through the existing gutters to new downspouts that attach to two separate groups of rainwater storage tank. Overflow from these tanks is outlet into two separate rain gardens. The rain gardens provide infiltration only and will overflow overland in the case of a large storm event. Irrigation risers allow the tanks to be drained manually or for the stored water to be used for irrigation.

Project Performance

FPR Performance Assessment and Evaluation Plan

The County and San Francisco Estuary Institute developed a Performance Assessment and Evaluation Plan (PAEP) for the overall FPR program as required by the funder. From reviewing the PAEP, the RCD identified that the Upland BMPs Project contributed to the following goals, measurement tools, methods, and targets that were established in that PAEP:

Goal 2. Prevent introduction of wastes into storm water runoff

Goal 3. Intercept and filter nonpoint source waste during wet weather as adjunct to prevention

Goal 4. Education and outreach to communicate significance and values of ASBS to increase enjoyment of resources, and to provide the community with technology and tools for protecting resources

Measurement Tool and Method 4: Workshop attendance and private landowner participation in BMP program.

Target 3: A minimum of five landowners in ASBS drainage area have signed up for BMP implementation by end of project

PAEP Results Narrative

The RCD’s work contributed to the results of the overall Fitzgerald Pollution Reduction Program led by the County in the following ways:

- *Education and Outreach:* The Farallone Elementary School Oceans Week outreach event involved 420 people, including 35 adults and 385 children. An unknown number of parents also received information about the project from their children or receiving fliers from the school.
- *Private Landowner Participation:* Completed site assessments for 16 residential private landowners, six equestrian property landowners or tenants, and two site visits pertaining to rural roads, one with a



tenant and one with a homeowners' association. A total of seven landowners in the ASBS drainage area implemented BMPs by the end of the project. An eighth property completed recommended BMPs at the landowners' own expense.

- *Workshop Attendance:* 19 people attended the January 23, 2016 Demonstration Tour.
- *Total numbers reached:* Nearly 500 people participated in some fashion in the FPR Upland BMP project. In addition, the RCD conducted its own extensive outreach through web, social media, and fliers posted in the community which is estimated to have reached over 1,000 people.

BMP Effectiveness

To estimate the effectiveness of BMPs on potential load reduction to the ASBS, an initial monitoring plan was proposed that would have involved upstream and downstream monitoring of creeks near proposed BMP sites during storm events. The BMPs that were ultimately approved for implementation – LID features on residential properties - were not conducive to the monitoring approach originally proposed. The State Board grant manager then recommended the RCD explore a modeling approach instead of water quality monitoring. The RCD researched a variety of modeling options and contacted experts in academia, the TAC, and the consulting industry to identify suitable models, cost estimates and a contractor. As part of this work, the Project Engineer modeled the percent of water captured and treated for each BMP to gauge BMP effectiveness. That information is described below. However, when the project was re-initiated in 2015, the State Board agreed to a plan to assess BMP effectiveness through a demonstration tour, photo monitoring, and community and landowner opinion surveys. Initial work on modeling is described below, as are the results of the demonstration tour, photo monitoring and surveys.

BMP Modeling

To gauge BMP effectiveness using a modeling approach, the Project Engineer determined BMP treatment percentages using hydrologic data and other information to estimate the percent of water captured and treated for each BMP. This process involves using hydrology calculations based on rational method with separate hydrology for treatment analysis based on regularly occurring storms and hydraulic design based on large storm events. Drainage area delineation was performed through on-site investigation and topographic survey. Runoff coefficients for treatment analysis were based on small storm coefficients from [C.3 Stormwater Technical Guidance](#), Table 5.2. Runoff coefficients for system hydraulic design were based on Soil Conservation Service/Natural Resources Conservation Service runoff coefficient tables with soil type determined from on-site soil boring samples. Storm intensity for treatment analysis was based on C.3 [Stormwater Technical Guidance](#), Table 5.2, Region 3. Storm intensity for hydraulic design was based on NOAA Particularly Dangerous Situations (PDS) Based Precipitation Frequency using the 10 year 5 minute storm.

Water quality benefits were quantified into percent of stormwater/runoff captured or treated by the LID BMPs on each property. The STORM (Storage Treatment Overflow and Runoff Model) was used along with hydrological data from NCDC station 43714 for years 2006 through 2012. The percentage represents the volume of water that receives treatment from bio-filtration, infiltration, or evapotranspiration compared to the total volume of runoff produced by the watershed over the 6 year period. Small storms generally have 100 percent treatment while larger storms may require water be passed through the overflow system before treatment. This



percentage represents the efficiency of the system for its given watershed and does not provide information on types of pollution reduced or total pollution reduction.

Applying this analysis method, the Project Engineer calculated treatment area, storage volume, treatment rate per day, and capture and treatment rates as shown in Table 2.

Table 2. LID BMPs Pollutant Load Reduction Modeling Results

Site	Treatment Area	Storage Volume	Treatment Rate	Capture & Treatment Rate
#2	10,100 square feet	350 cubic feet	280 cubic feet per day	<ul style="list-style-type: none"> East Rain Garden/Swale System: 80% Highway Rain Garden/Swale System and West Rain Garden/Swale System: 41%
#3	4,700 square feet	500 cubic feet	790 cubic feet per day	<ul style="list-style-type: none"> Rain Garden/Tank System: 81% Permeable Asphalt: 82%
#4	14,900 square feet	540 cubic feet	960 cubic feet per day	<ul style="list-style-type: none"> Rain Garden/Tank/Swale System: 84%
#5	3,000 square feet	530 cubic feet	160 cubic feet per day	<ul style="list-style-type: none"> Rain Garden/Tank System: 81%
#6	2,000 square feet	70 cubic feet	390 cubic feet per day	<ul style="list-style-type: none"> Rain Garden/Swale System: 71% Permeable Asphalt: 82%
#7	1,300 square feet	70 cubic feet	240 cubic feet per day	<ul style="list-style-type: none"> Rain Garden System: 92%
#9	2,700 square feet	330 cubic feet	60 cubic feet per day	<ul style="list-style-type: none"> North Rain Garden/Tank System: 43% South Rain Garden/Tank System: 47%

Demonstration Tour

A demonstration tour was held on January 23, 2016 to showcase implemented BMPs and to provide resources to the community. A guided tour took place at one of the properties with a detailed walk through and presentation explaining the BMPs and connection to water quality and the Reserve. The property owner described the issues she had with drainage and stormwater runoff prior to the project, and how the project helped solve these issues as well as improve water quality to the Reserve. There were 19 enthusiastic participants that attended the guided tour. After the guided tour, three other sites were open to the public with RCD staff at each site as guides. Most of those attending were local property owners, some with pressing needs for solutions to issues on their property.



Tour participants learning about native plantings filtering stormwater runoff



Photo Monitoring

Photo monitoring was conducted before, during and after construction as recommended by the FPR TAC and the State Board as a method for demonstrating the performance of the implemented BMPs (Attachment K).

Surveys

The RCD conducted three online surveys to help gauge community awareness and willingness to change behaviors or implement BMPs to improve water quality in the ASBS. The three surveys were conducted in late January and February 2016 and include:

- A “community” survey for members of the community at large, which also served as the “pre” survey for demonstration tour attendees
- A “post” survey sent to demonstration tour attendees
- A satisfaction survey sent to participating landowners

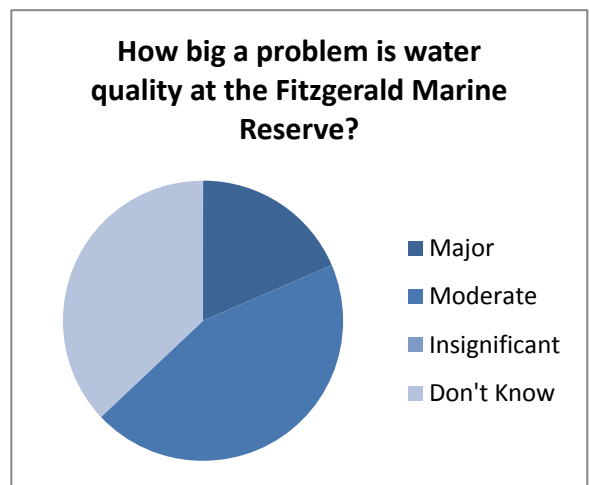
Community Survey

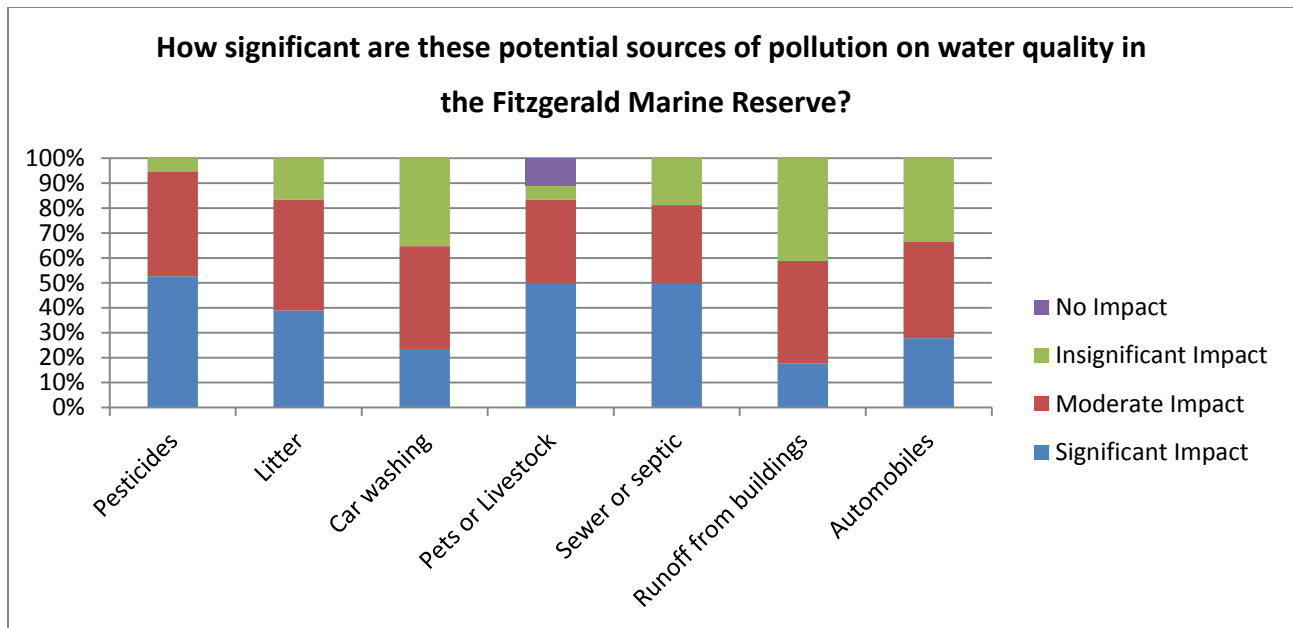
An online community survey was available for a period of 10 days before the January 23, 2016 demonstration tour. The availability of the survey and promotion of the tour occurred at the same time and included outreach via RCD and County web and social media. Copies were also made available to people attending the demonstration tour. The survey asked questions about awareness of the Reserve, water quality issues in the Reserve, what things they currently do to reduce their impact to the Reserve and what things they might be willing to do. A total of 27 people responded to the survey during the 10 day period.

Most respondents were from a coastal community with 65% of respondents living in Montara, Moss Beach, and the neighboring community of El Granada. Over three-quarters (78%) of respondents had visited the Reserve to explore the tidepools, enjoy the beach and scenery, or to see wildlife.

Most respondents (63%) thought water quality was a problem at the Reserve with 45% ranking it a moderate problem and 18% ranking it a major problem. None responded that they thought the issue was insignificant, however, 37% respondents did not know enough to say whether water quality was a major, moderate or insignificant issue in the Reserve.

When asked how significant various potential sources of pollution were for the Reserve, pesticides and fertilizers followed by pets and/or livestock, and broken or leaky sewer/septic systems were seen as having the most significant impacts as shown in the chart below. Respondents perceived the least significant impacts came from runoff from buildings’ roofs (41%) and automobiles (33%). Ten percent of respondents thought pets or livestock had no impact on water quality in the Reserve.



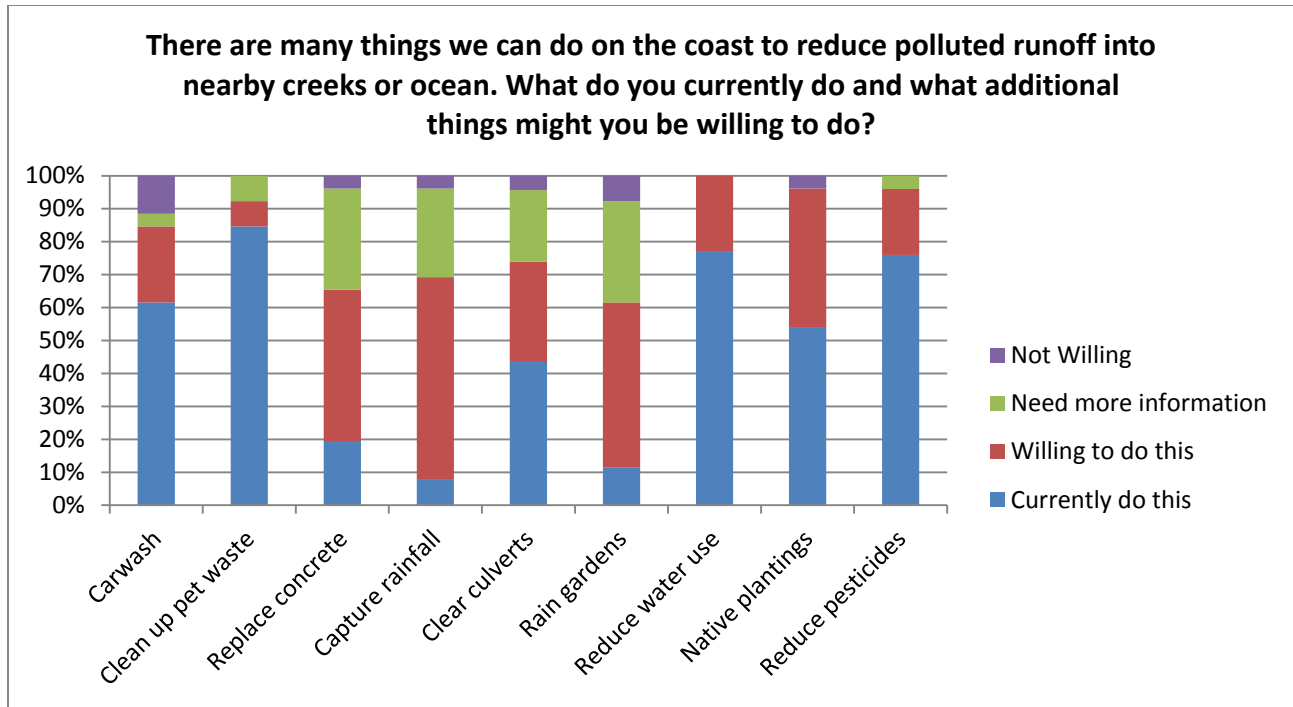


When asked what they were currently doing or willing to do to protect water quality in the Reserve, most respondents reported that they were cleaning up after their pets or livestock (88%), reducing water use in their yard (77%), and working to reduce use of pesticides and fertilizers (73%). Only two respondents were currently capturing rainfall, and three had added rain gardens or bioswales to their properties.

In terms of things people were not currently doing, but might be willing to do, respondents were interested in adding LID features such as those demonstrated through the project, such as capturing rainfall (62%), adding rain gardens or bioswales (50%), planting native plants (42%), or replacing concrete with permeable alternatives (46%), and participating in clean ups (42%).

As for topics people needed more information about before they could implement: replacing impervious surfaces and adding rain gardens and bioswales were tied with 31% of respondents interested in more information. This was followed closely by capturing rainfall (27%) and keeping road culverts clear (22%). Three people were not willing to take their cars to the carwash (and provided comments as to how they wash their car so as to prevent pollution), and three were unwilling to add bioswales or rain gardens.





Post-Tour Survey

A “post” survey was distributed to tour participants in order to get their feedback on the projects they saw during the tour and to compare their willingness to implement new practices to reduce pollution in the Reserve. We received six responses to this survey in the week after the demonstration tour.

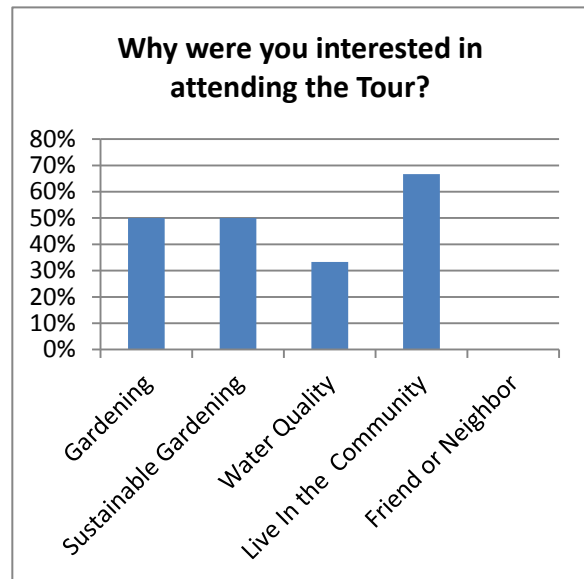
Respondents had a range of interests in attending the demonstration tour:

When asked how the tour met their expectations, most commented that it met or exceeded their expectations:

- “Exceeded expectations! It was very interesting work.”
- “Yes and no - the tour did provide good examples of rain gardens and water management. I was disappointed that the homeowners did not “clean up” their yards so as to give the projects the best presentation possible.”
- “Exceeded expectations.”

When asked what they learned from the tour, respondents answered:

- “I learned the names of several native plant species, the benefits of permeable asphalt, and some uses for collected rainwater among other things.”
- “The importance of managing the runoff. I had never seen it demonstrated so obviously in a residential setting. I still have a gigantic question mark about the feasibility of capturing rain water for reuse. Not sure it makes sense in our climate.”
- “Permeable driveways.”



- *“We live on a sloped property in El Granada. We had a little creek going down the side when we moved here. Mulching made it better, but I still need to put in some kind of dry creek.”*
- *“Need a grant to help protect the Reserve”*
- *“I hadn't seen water gardens before. And although I knew about rain barrels, I'd never seen them, so that was helpful. I also hadn't thought specifically before about how to slow down the movement of water.”*

In addition to the comment about landowners cleaning up their property, the only other comment about how the tour and the FPR program could be improved would be to focus more on the properties that are doing the most damage to the Reserve.

Landowner Survey

Finally, a confidential survey was given to the seven participating landowners to gauge their awareness of water pollution issues, satisfaction with the BMPs installed, and willingness to add new BMPs to their property in the future. We also asked participants to tell us if they had reached out to others in the community, what responses they received, and feedback for future programs. As of the end of February, all of the seven landowners had responded to the survey.

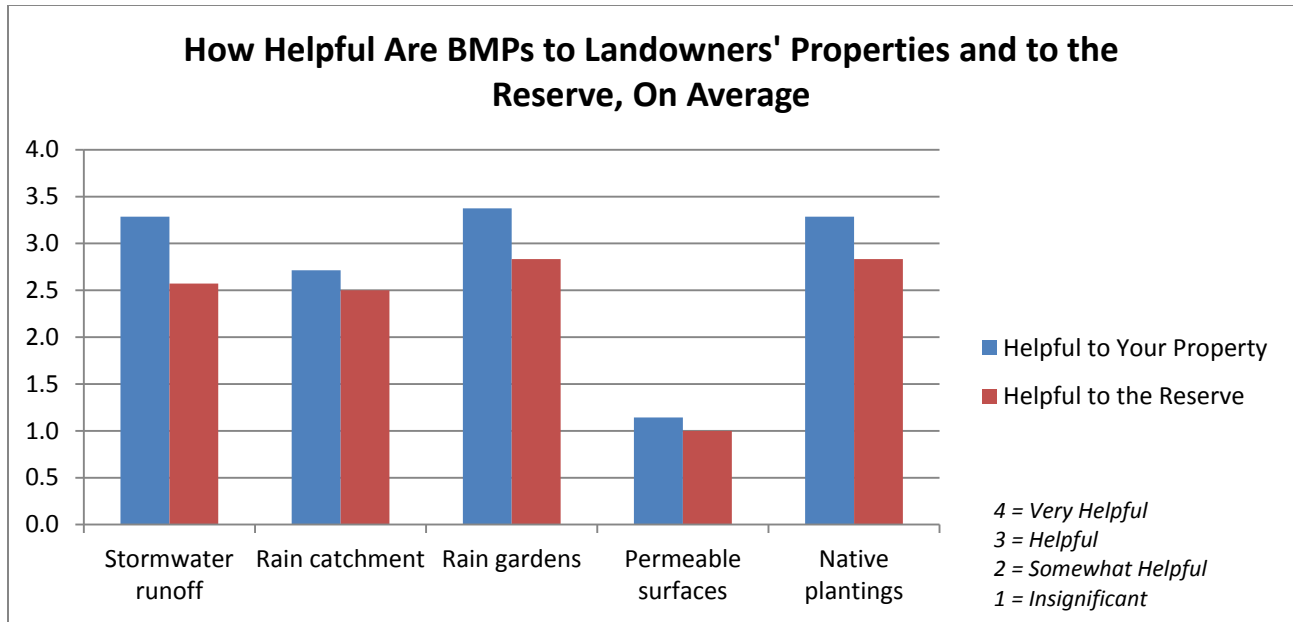
Landowners had a variety of reasons for deciding to participate, a concern about water quality in nearby creeks and the Fitzgerald Marine Reserve being one all landowners indicated. Availability of cost-share funding was also cited by all respondents as a reason for participation. Five landowners (71%) wanted the help with addressing stormwater runoff issues on their properties, while only one (14%) indicated wanting to show leadership in the community on this issue. Comments included:

- *“Nice to participate in the community's effort to preserve our reserve.”*
- *“Wanted to recharge groundwater, have some water available to water my native plant garden occasionally. Wanted the benefit of native plants on my property to help native wildlife.”*

Understandably, participating landowners thought water quality issues in the Reserve were major (57%) or moderate (28%) problems, with only one (14%) indicating not knowing enough to say. In comparison, respondents to the community survey who thought water quality was a major problem (18%), moderate problem (45%), and 37% did not know enough to say. The landowners involved were more informed and thought the problem was more significant.

Comparing how helpful the landowners thought the implemented BMPs would be to their property against how helpful to the Reserve, all thought the BMPs would be more helpful to their property. On average most landowners rated the BMPs between very helpful (4) and helpful (3) to their properties, except for replacing impervious surfaces with permeable ones which was seen as between somewhat helpful and insignificant.





When asked about their satisfaction with the project, five landowners were very satisfied (71%) with the improvements made to date, with two landowners somewhat unsatisfied (28%). Comments about the work completed:

- *“The stuff that works is beautiful and looks helpful. The stuff that doesn't is causing problems.”*
- *“I'm very satisfied with where I think it is going; it's still a work in progress. The amount of ground-space taken up by some elements of the project is larger than I'd anticipated from looking at the printed plans.”*
- *“I'm eager to see the plants in another year.”*

Some of this satisfaction can be attributed to the installations being new and plantings not yet grown in, so performance wasn't yet clear. Another point of dissatisfaction was the desire for additional landscaping to be done at the same time as the grant-funded improvements, and frustration about the pace of the work.

We were also interested in knowing about the experience of the landowners talking with neighbors and others in the community about the work. More than three-quarters of the landowners indicated they had talked with someone else in the community (87%) and with neighbors (57%) about the work being done. Only one landowner (14%) indicated they had not talked about the work with others. Four landowners (66%) indicated they received supportive comments when talking with others about the work and four (66%) indicated hearing people say they wanted to learn more about it, with two (28%) having received mixed or concerned responses (Note: landowners were able to check all options that applied in the survey which is why the numbers total more than 100%). Comments included:

- *Neighbors initially were concerned that the project might damage their property. RCD stepped in to let them know more about the benefits of the design.*



- *Some neighbors expressed interest in participating in future projects if possible, one thought he might be adversely impacted (though I don't think he really understood how the rain garden would keep water OFF of his property).*

Although landowners all wanted to help improve the water quality of nearby creeks and oceans, the survey indicated that none would have been able to proceed with the project without the cost sharing assistance available through this participation in this project. When asked about obstacles to getting similar practices installed by others in the community, these were the reasons shared:

- *"Money"*
- *"Communication...view it as a win-win involved with a practice bigger than your own home and how water conservation/filtering directly affects our community."*
- *"People need more information on how to do it. Or access to qualified designers and contractors. Second is the cost, though some may do it themselves."*
- *"Lack of understanding of the importance of preventing runoff and lack of understanding of the impact on the Marine Reserve."*
- *"Certainly permits from the County are an issue where that is relevant. Also, some things like the rain gardens really require heavy equipment to implement, which is costly."*

When asked about their experience working with the RCD, 100% of the landowners said they would recommend working with the RCD to others. Final comments included:

- *"Absolutely grateful to the people involved in the project. They were a pleasure to work with, and without them would not have been able to pursue this solution."*
- *"Very good people to work with. Supportive and enthusiastic. The drainage problems are still being addressed and it looks like they are wrapping up."*
- *"The RCD representatives, the contractor, everyone involved in this project, really, were very committed, very responsive and very professional and gracious."*
- *"I think all new construction in the watershed should require this sort of installation. More support and information should be available to property owners. Great project, Thank you!"*
- *"From the beginning, I stressed that the RCD project had to support the concept of "aging in place" with awareness of the importance of mobility in the landscape. My husband and I are elderly and wanted to create a safe and beautiful space. I don't think our concerns were heard or understood."*
- *"We appreciated the RCD's concern with making sure we were satisfied with the end result of the project. Thanks for making the whole process so painless for us. "*

Lessons Learned

Out of many proposed approaches to achieving pollution load reduction in the ASBS watershed, all but one type of BMP – low impact development features - were rejected by the State Board due to various constraints and challenges. Implementing this type of BMP on seven sites also posed several challenges, from which lessons can be learned and creative solutions could be found in the future to work towards improved water quality in the ASBS. We identified lessons in four areas: approval processes and restrictions from Proposition 84 bond funds, labor compliance, threats of regulation, and permitting. The RCD is also reviewing project performance internally for lessons that can be applied to future outreach and construction projects.



Approval Process and Proposition 84

As described above, the RCD relied on monitoring that showed a variety of nonpoint source pollutants from residential priorities in the ASBS watershed to propose BMPs. A variety of BMPs were identified that involved education, outreach, and implementation projects to engage the communities of Moss Beach and Montara in physical and behavioral changes that would result in reductions to pollutant loads to the ASBS. Unfortunately, many of these BMPs were ultimately rejected as not meeting Proposition 84 requirements to fund only structural BMPs that could demonstrate a 20-year useful life. In addition to this interpretation coming midway through the project, and despite language in Proposition 84 pertaining to the ASBS grant program that supported education and outreach efforts, the RCD was still able to successfully complete 25 BMPs on seven residential sites that will serve to demonstrate concepts of LID to residents. It should also be noted that while we worked with the participating landowners to ensure the 20-year useful life was met, this requirement limited the ability of residents to participate and was perceived to be akin to a deed restriction for fairly minor improvements (gutters, rain barrels, landscaping).

Labor Compliance

For all public works projects worth over \$1,000 financed from Proposition 84, construction contractors must comply with state Labor Compliance Program (LCP) requirements. LCP requirements for such small projects and in a relatively difficult to access area of the coast made it more difficult to implement the BMPs as well as substantially increased the cost of construction. The RCD determined it was only able to utilize contractors with previous LCP experience, which meant that a list of 20 potential contractors was reduced to two potential firms, and only one had the experience to complete all the types of work called for in the designs. Standard job classifications used for prevailing wage obligations, training, and certified payroll reports that are typical of larger scale public works projects did not easily fit the type of work needed to install relatively small scale LID BMPs on private properties. Contractor cost estimates were therefore much higher than estimated by the Project Engineer, which then required redesigning projects and reducing scopes of work to get construction costs within available budget. Redesigns at these later stages were costly and involved the additional challenges of maintaining or re-doing permit submittals, and ensuring landowner satisfaction while maintaining water quality benefits.

Threats from Regulation

RCDs were created in the State Public Resource Code as non-regulatory entities to work with landowners on a voluntary basis. Non-regulatory, confidential technical assistance is how the RCD accomplishes resource conservation and is why we are invited onto private properties to help landowners, where regulatory agencies would not normally be welcomed. This makes the RCD uniquely positioned to educate local residents and help address nonpoint source pollution from private properties into the ASBS. With grant funding coming from a regulatory agency, the State Board, some potential participants declined to move ahead with the project as they did not want property information provided to the state or have property information made public. Although we were able to overcome this perception through personal relationship building, several potential participants decided to forego participation to avoid revealing private information to regulatory agencies and the public.

Involvement of both non-regulatory and regulatory agencies brought up another challenge of some promising BMP ideas that may have had the potential to invite regulatory action or would have compromised the RCD's



non-regulatory integrity. For example, when the RCD proposed the Get Out of Manure Free Day BMP, the State Board suggested it be replaced with enforcement action by the Regional Water Quality Control Board, even though the manure management practices being used were either permitted under the County's Confined Animal Ordinance or were exempt. Other examples arose from County permitting processes, described below. When these issues arose, the RCD felt it could not conscientiously move forward with BMPs that would trigger regulatory actions and either dropped potential BMPs from further action or revised project designs to minimize actual or potential regulatory actions. Maintaining the confidence of the community is paramount to accomplishing water quality goals and objectives at a landscape or watershed level. Threats of regulatory action are powerful disincentives to participation in these voluntary conservation programs or for private property owners to move ahead with such BMPs on their own. If the County and regulatory agencies want to see more voluntary implementation of BMPs such as those proposed and implemented through this project, removing threats of regulation must be part of the program approach.

County Permitting

During the project several issues arose both in pre-construction and construction phases with permitting requirements with the County's Planning and Building Department (Planning and Building). These issues raised the threat of regulation (discussed above) and added to the complexity and uncertainty of the project at certain points. From early on, Planning and Building was provided copies of all designs and was involved in reviewing them to determine what permitting requirements would be appropriate. Initially, Planning and Building sought for all plans to be reviewed by staff, even projects that did not require building permits. For example, the County maintained that adding rain catchment systems even to existing gutters had the potential to trigger requirements to bring the existing structure up to code, including buildings that pre-dated current codes and were not being upgraded. As a result of the potential risk of additional regulation, some promising LID BMPs were dropped from further consideration because either the RCD or the landowners were concerned about triggering the need for securing more extensive building permits.

Four of the seven LID sites required the RCD to obtain County Encroachment Permits since work was located within the County's right-of-way. The Encroachment Permit review process took much longer than expected. Designs were approved by County staff and permits were pending when the approvals were retracted by other County staff. Some redesign was then required after the RCD had already entered into contract for construction, including re-doing cost estimates for various project elements.

The County's right-of-way encroachment permit requirements also limit the ability of homeowners in this area to use pervious concrete within the right-of-way. If the County wants to see more use of such materials in these communities, this issue will need to be addressed in the future, although there remains a challenge of finding contractors to do small pervious concrete and asphalt jobs on the coastside. The subcontractor we eventually found to do this work would only agree to do the job if there were two or more sites scheduled the same day, which would be impractical for private homeowners working independently.

Additional Lessons Learned

Some additional lessons were learned related to the construction process itself:



- When a project includes construction at multiple sites, work at one site may not be completed before work at another site begins. The contractor's work flow may be based on type of work, for example completing all earth work, then all paving, then all revegetation. The result is that landowners live in a construction site for a longer period of time. In future projects, it will be important for the RCD: to ensure that landowners know this in advance, and work with contractors to minimize impositions to landowners where feasible.
- Neighbors' curiosity is an education opportunity. In future projects, we may consider how to capitalize on it, potentially including signage or handouts or neighborhood meetings
- With projects that combine structural solutions for water quality and landscaping such as rain gardens and bioswales, managing landowners' expectations about how plants will look after installation, what portion of the yard would be re-landscaped using project funds, and how the water quality project could be integrated with other landscaping plans is important for landowner satisfaction with the end results in future projects.

Potential Follow-Up Activities

During the project, the RCD, working with the TAC, identified several options for reducing nonpoint source pollution in the ASBS watershed. While some proposed BMPs were not implemented for a variety of reasons described above, many still are promising approaches to reducing pollution and may be able to be pursued through other funding opportunities. The most promising activities include:

- Educate the community to encourage residents to pick up dog waste from backyards, especially before expected rain events
- Install signage and waste bins to encourage dog walkers to pick up and properly dispose of pet waste in informal dog walking areas; conducting community clean up days for such areas
- Work with commercial haulers to make it easier for owners and managers of smaller livestock and equestrian properties to haul off manure
- Support fledging manure composting efforts through establishing a community materials exchange to get finished compost to home gardeners or help establish centralized composting facilities on the coast
- Work with rural road associations and the Golden Gate National Recreation Area to address erosion from rural roads and trails into creek drainages
- Educate the community regarding reducing use of pesticides and fertilizers in backyard landscaping
- Facilitate implementation of LID features by private owners of residential and commercial properties through a combination of education, technical assistance, rebates or financial assistance, and streamlining or expediting permits

The RCD would be glad to partner with the County and other organizations to help implement these potential follow-up activities in the future. For manure management and composting, the RCD is currently engaged in a climate mitigation program on the south coast that is looking to use manure and/or finished compost as part of a carbon farming approach. A similar approach might be useful to the northern parts of the County as well.



Conclusion

Thanks to the support and partnership of the County and Proposition 84 ASBS grant funds from the State Board, the RCD engaged approximately 500 residents in the communities of Montara and Moss Beach to stimulate cultural change for improving water quality in the Reserve and ASBS. Approximately 25 BMPs were successfully implemented on seven properties that serve as demonstration of concepts of how sustainable landscaping can help reduce polluted runoff. The RCD also identified many promising multi-faceted approaches to reducing pollution in the ASBS watershed which could be implemented through future projects.

