CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
SAN DIEGO REGION

REVISED PROJECT APPLICATION FORM

Name of Project: The Conservation Plans and Nutrient Reduction Best Management Practices Implementation Program

Project Applicant: Mission Resource Conservation District

Applicant Contact Person: Courtney Provo

Applicant Phone Number: (760) 728-1332

Applicant E-mail Address: courtney@missionrcd.org

Eligibility Requirements:

The Conservation Plans and Nutrient Reduction Best Management Practices Implementation Program will address the priority of implementing or furthering recovery of streams, wetlands, and riparian systems. The project will accomplish the furthering of recovery of streams, wetlands and riparian systems, by reducing the amount of nutrients, including Total Nitrogen and Total Phosphorus, which are entering the San Luis Rey River and negatively impacting water quality.

Problem Statement:

The water quality in the San Luis Rey Watershed, in San Diego County, has been negatively impacted by bacteria (in the lower segment and mouth of the river) and nutrients, including Nitrogen, Phosphorus, and TDS, in the lower and upper segments of the river. The upper and lower river segments have been placed on the 303(d) list for Nitrogen and Phosphorus. Prioritization, potential sources, and potential strategies to address these Priority Water Quality Conditions (PWQCs) can be found in the San Luis Rey River Watershed Management Area Water Quality Improvement Plan (WQIP) (revised March 2016). The SLR WQIP can be found at the Project Clean Water website at http://www.projectcleanwater.org/images/stories/Docs/San-Luis-Rey/WQIP/00%20SLR%20WQIP.March%202016.pdf (~77 MB).

The potential sources of the nutrients (PWQCs) listed in the WQIP include residential properties. Residential land uses have also been identified as a potential source for bacteria and nutrients into the waterways. Suggested strategies, in the SLR WQIP, for addressing the bacteria and nutrient sources on residential properties includes both structural and non-structural strategies. One of the recognized, existing development management strategies utilized by the County of San Diego is the development and implementation of targeted programs to address issues in residential areas. These programs are utilized to address PWQCs including, nutrients and TDS. The Conservation Plans and Nutrient Reduction Best Management Practices Implementation Program would accomplish the same goals.

The Project Attributes that are applicable to this Program are as follows as the following Project Attributes can be answered in the affirmative:

Does the project propose measureable environmental outcomes? Yes, this project will be able to estimate the load reductions of several water quality parameters, including Total Nitrogen and Total Phosphorus, which are listed in the SLR River WQIP.

Does the project improve conditions for a 303(d) limited segment or preserve conditions in a high quality water body? Yes, this project will be able improve conditions in the upper and lower San Luis Rey River by reducing the amount of Total Nitrogen that would otherwise be entering the system. The upper and lower segments of the SLR River are listed on the 303(d) list for Total Nitrogen as N.

Does the project improve a designated priority listed in a Water Quality Improvement Plan? Yes, this project will improve the designated priorities of Nitrogen, Phosphorus, and TDS that are listed in the SLR WQIP.

Does the project prove a cost-effective means of attaining water quality goals? Yes, as a Not-For-Enterprise District of the State, MRCD provides its services at a very cost-effective rate, as compared to private, for-profit businesses.

Does the project integrate outreach and education to targeted audiences? Yes, each Conservation Plan will be used to not only inform the participating property owners of how to manage their properties and control the water quality related resource concerns, but the Conservation Plans and site visits are extremely effective educational tools.

Work Plan containing tasks and deliverables compartmentalized into partial funding opportunities, if applicable.

Mission Resource Conservation District (MRCD) will complete the Conservation Plans and Nutrient Reduction Best Management Practices Implementation Program using the following methods:

Task 1.1 Program Publicity

The publicity campaign for the program will include press releases and advertisements in local newspapers and mailings to properties in targeted areas.

Deliverables: Copies of all advertisements, press releases and the postcards mailed to targeted areas.

Task 1.2 Assessment Materials Development

Assessment materials, in the form on data intake sheets used during the site visit will be developed. These intake sheets will include questions regarding how the property owner addresses property maintenance on his/her property (such as how they managed pest animals, who can increase the erosion potential on the property). A list of resource concerns will also be included in the intake sheets, as will a list of recommended Best Management Practices (BMPs) that will be included in the

Conservation Plan. An example of initial site visit intake sheets can be found in Appendix B of the attached *Residential Property Evaluation Program Summary Report* (April 2016).

Deliverables: Completed intake sheets for each initial site visit.

Task 1.3 Participating Properties Identification and Access Coordination

Participation in the Program will be generated via the Program's publicity efforts. Each participating property will be at least 2 acres in size and is being impacted by resource concerns that are potentially impacting downstream water quality (e. g. erosion and pest animals). Access coordination will include having a property owner for each participating property sign a MRCD Cooperative Agreement, which assures each party of his or her responsibility in completing the Program.

Deliverables: Signed Cooperative Agreements with each property owner to participate in the Program.

Task 1.4 Initial Site Visits

Initial site visits will occur on a total of 15 properties, at least 2 acres in size, in the San Luis Rey River Watershed. The initial site visits will be performed to gather the necessary information to identify the resource concerns on the property that may be affecting downstream water quality and to ascertain the appropriate BMPs that would eliminate or control the identified resource concerns. Photodocumentation will occur during the initial site visits. An example of what photographs would be taken at the initial site visit can be found in Appendix F of the attached *Residential Property Evaluation Program Summary Report* (April 2016).

Deliverables: Photos of the site taken during each initial site visit.

Task 1.5 Initial Conservation Plans

A Conservation Plan will be completed and submitted to the property owner or manager. The reports will include an overview of the property, including a map of the site conditions at the time of the initial site visit, soil map and report, topography map and a map of the nearby waterbodies and streams. A map of the recommended BMPs, written summary of the BMPs, and supporting spreadsheet will also be included in the report. Supporting documentation for each recommended BMP will be included in the report, as well. An example of an Initial Evaluation Plan (which is very similar to a Conservation Plan) can be found in Appendix C of the attached *Residential Property Evaluation Program Summary Report* (April 2016).

Deliverables: A completed Conservation Plan for each property.

Task 1.6 Initial Conservation Plans Returned to Property Owners

Each Conservation Plan will be returned to and reviewed with the property owner to ensure that the participant understands the report and is given an opportunity to receive clarification in person. The timeline of BMP installation will also be discussed and decided upon during the report return.

Deliverables: Timeline for implementation of recommended BMPs for each participating property.

Task 1.7 Technical Assistance and BMP Implementation

The Program will need to complete a CEQA review prior to any BMP implementation activities. Each property owner will decide how each BMP listed in their respective Conservation Plan is to be implemented. During the course of the implementation stage, any requested technical assistance will be provided by MRCD. Reimbursement for the implemented BMPs (up to $10,000 per property) will be distributed after the BMPs have been correctly implemented (which will be determined by MRCD). An example of list of recommended and implemented BMPs can be found in Appendix E of the attached *Residential Property Evaluation Program Summary Report* (April 2016).

Deliverables: A list of the implemented BMPs for each property.

Task 1.8 Follow-Up Site Visits

Follow-Up site visits will occur after the recommended BMPs are implemented on each property. Photodocumentation will occur during each follow-up site visit. A map of the site conditions at the time of the follow-up site visit will be developed. Data that was collected at the initial and follow-up site visit will be entered into the Dry and Wet Weather Pollutant Load Reduction Calculator (Calculator). The Calculator is used to estimate the load reductions of nutrients, including Total Nitrogen, Total Phosphorus, TSS, and Fecal Coliform, with the implementation of BMPs. An example of what photographs would be taken at the follow-up site visits can be found in Appendix F of the attached *Residential Property Evaluation Program Summary Report* (April 2016).

Deliverables: Photos of the site taken during the follow-up site visit.

Task 1.9 Program Summary Report

A Program Summary Report, in the form of a summary table of the BMPs that were recommended for each property and as well as the recommended area/length/quantity of each BMP, will be developed at the end of the program. The table will also include which BMPs were implemented by the property owners and the implemented area/length/quantity of each BMP. The results of the Pollutant Load Reduction Calculator will also be summarized for all of the participating properties. An example of a successfully completed Program Summary Report for a previous MRCD program can be found attached to this application as the *Residential Property Evaluation Program Summary Report* (April 2016). An example of the load reduction calculations based on data on property conditions at the initial and follow-up site visits can be found in Appendix G of the attached *Residential Property Evaluation Program Summary Report* (April 2016).

Deliverables: Final Program Summary Report

Timeline (from funding approval) with milestones and end dates.

Task No.	Task	Program Year 1	Program Year 2
1.1	Program Publicity		
1.2	Assessment Materials Development		
1.3	Participating Properties Identification and Access Coordination		
1.4	Initial Site Visits		
1.5	Initial Conservation Plans		
1.6	Initial Conservation Plans Returned to Property Owners		
1.7	Technical Assistance and BMP Implementation		
1.8	Follow-Up Site Visits		
1.9	Program Reporting		

Budget broken down into tasks.

					Program Budget	$252,350.00
Task No.	**Task**	**Hours/Plan or Amount**	**No. of Plans**	**Total Hours or Amount**	**Total or Salary**	
1.1	Conduct Publicity Campaign for Program				*Sub-Total*	***$8,100.00***
	Mission RCD Representative	N/A	N/A	80	$45.00	$3,600.00
	Materials	N/A	N/A	N/A	$4,500.00	$4,500.00
1.2	Develop Property Assessment Materials				*Sub-Total*	***$3,600.00***
	Mission RCD Representative	N/A	N/A	80	$45.00	$3,600.00
1.3	Identify Properties and Coordinate Access				*Sub-Total*	***$3,375.00***
	Mission RCD Representative	5	15	75	$45.00	$3,375.00
1.4	Initial site visits (Prep and Site Visit)				*Sub-Total*	***$16,200.00***
	Mission RCD Representative	24	15	360	$45.00	$16,200.00
1.5	Complete Initial Conservation Plan				*Sub-Total*	***$16,800.00***
	Mission RCD Representative	24	15	360	$45.00	$16,200.00
	Materials	N/A	N/A	N/A	$600.00	$600.00
1.6	Initial Conservation Plan Return				*Sub-Total*	***$2,700.00***
	Mission RCD Representative	4	15	60	$45.00	$2,700.00
1.7	Technical Assistance and BMP Implementation				*Sub-Total*	***$177,500.00***
	Mission RCD Representative	32	15	480	$45.00	$21,600.00
	Funds for BMPs Implementation	$ 10,000.00	15	$ 150,000.00	$150,000.00	$150,000.00
	CEQA Requirements Completion	N/A	N/A	80	$45.00	$3,600.00
	CEQA	N/A	N/A	N/A	$2,300.00	$2,300.00
1.8	Follow-Up Site Visits (Prep and Site Visit)				*Sub-Total*	***$16,200.00***
	Mission RCD Representative	24	15	360	$45.00	$16,200.00
1.9	Program Reporting				*Sub-Total*	***$7,875.00***
	Mission RCD Representative	N/A	N/A	175	$45.00	$7,875.00

Discuss all permitting requirements, including CEQA, and their status. If exempt, cite applicable statute.

The structural BMPs that would be implemented would not require County of San Diego permits. A Notice of Exemption under Section 15304 (Minor Alterations to Land) will be filed for CEQA as Class 4 "consists of minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of healthy, mature, scenic trees except for forestry or agricultural purposes".

Watershed(s) affected.

The Program would be implemented on properties within the San Luis Rey Watershed.

Describe if this project can be a basis for additional funding from other sources.

The Program can be a basis for additional funding from other sources as MRCD will be able to use the budget from this Program as match funds for similar projects. MRCD works extensively with many agencies and funding sources and the opportunity to use the funds from this Program as cost-share funds would greatly increase the opportunities for MRCD to find funding for other projects that would include Conservation Planning and BMP implementation.

Monitoring, success criteria, and other tools to track long-term success.

The long-term success of the Program will be able to be monitored for the life of the implemented BMPs. If maintained and repaired on a regular basis, the recommended BMPs should last up to 20 or more years. The success criteria for the Program will be calculated by the Load Reduction Calculator, which will be able to estimate the annual load reduction of several nutrients and water quality parameters. These estimates will hold true for the life of the implemented BMPs.

Description of how the project is resilient to climate change.

The Program's efforts and results will be resilient to climate change in that the BMPs that will be implemented will be engineered to withstand any changing frequency or intensity of storm events that can occur as a result of climate change. The resource concerns on the participating properties that are currently impacting downstream water quality will be reduced and will not rematerialize as a result of changing climate patterns.

Applicant's ability/authority to receive and distribute funds.

Under Division 9 of the State of California Public Resources Code, Resource Conservation Districts are authorized to receive and administer funds for work they are allowed to undertake, including but not limited to watershed projects.

The District has successfully managed and completed, and continues to manage, grants and funds from a wide variety of funding sources, including the Water Board. Other funding sources including the San Diego County Water Authority, County of San Diego, San Diego Integrated Regional Water Management, Wildlife Conservation Board, US Bureau of Reclamation, USDA Natural Resources Conservation Service,

California Department of Fish & Wildlife, and San Diego Association of Governments TransNet Environmental Mitigation Program, among others.

The District has a consistent and proven track record of successfully utilizing program funds for their specified purposes both on time and on budget. The District is continually seeking funding to further its mission and goals and ensure that the projects undertaken are sustainable and provides lasting results that benefit the community and watershed health. The District has been operating since its conception in 1944 and maintains highly qualified staff members that have the capacity to complete the project, including the ability to accomplish the work and provide the products and reports expected under this application.

Is the project to conduct work that is required by any entity/agency? (e.g. cleanup or mitigation)

The project will not conduct work that is required by any entity/agency.

Residential Property Evaluation Program

Summary Report

April 2016

MISSION RESOURCE CONSERVATION DISTRICT

1588 South Mission Road, Suite 100
Fallbrook, CA 92028
Phone: 760-728-1332

"Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board and the U.S. Environmental Protection Agency under the Federal Nonpoint Source Pollution Control Program (Clean Water Act Section 319). The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use."

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Executive Summary

The Residential Property Evaluation Program (Program) was developed and implemented with the objectives of educating property owners and managers about erosion, sediment movement and other resource concerns, as well as how to identify and properly control and manage those concerns. The targeted property owners were those within the San Diego portion of the Rainbow Creek Watershed, which is located in northern San Diego County and southern Riverside County, California. The Program's objectives aligned with the goals of the Rainbow Creek Total Maximum Daily Loads (TMDLs) that were adopted by the San Diego Regional Water Quality Control Board for Total Nitrogen and Total Phosphorus. The Program utilized comprehensive site visits with property owners and subsequent Evaluation Plans as part of the education efforts. The site visits and evaluation plans were aimed at increasing the baseline knowledge of Program participants regarding sources of water pollution on residential properties and what actions can be taken to help lessen the impact on water quality from those properties. A total of nine properties, covering 34 acres, participated in the Program.

A Certified Conservation Planner and a Certified Landscape Auditor with Mission Resource Conservation District (MRCD) conducted site visits, for each participating property, with the property owner(s) to observe any resource concerns that existed on the property and to evaluate the property's irrigation system. Recommendations for Best Management Practices (BMPs) for the noted resource concerns were given at the site visit, as well as in the form of an Initial Evaluation Report (IER) that was developed and given to the property owner following the initial site visit. After an average of 17 months, the Conservation Planner and Landscape Auditor returned to the sites and completed a follow-up site visit with the property owner(s) to ascertain if any of the recommended BMPs had been implemented and if the property owner(s) had any new resource concerns needing to be addressed. A Follow-Up Evaluation Report (FUER) was developed as an addendum to the IER and was returned to the property owner(s) after the follow-up site visits.

A total of 31 different BMPs were implemented on the properties, with 24 of those BMPs having been recommended by the Conservation Planner during the initial site visit and in the IER. All of the recommended and implemented BMPs decreased or eliminated the potential for erosion on the properties and/or helped to control the sediment moving from adjacent properties during storm events onto the participating properties. Mulching, critical area planting and heavy use area protection were the most commonly recommended and implemented BMPs. Over the duration of the Program, BMPs covering 2.37 acres and 1,194 linear feet were implemented or installed. A total of 12 different types of individual BMPs (e.g. rock dissipaters) were also implemented during the course of the Program.

A Wet and Dry Weather Load Reduction Calculator (Calculator) was also used to determine the effectiveness of the implemented BMPs. The Calculator estimated an annual load reduction of 152 kg/year of Total Nitrogen and 8.8 kg/year of Total Phosphorus on the participating properties as a result of the implemented BMPs. A total of 979,656 cubic feet/year of runoff volume was also reduced on the properties as a result of the implemented BMPs.

I. Introduction

Rainbow Creek Watershed

Rainbow Creek Watershed lies within the larger Santa Margarita Watershed and encompasses 7,085 acres, mostly within northern San Diego County with a small portion in southern Riverside County. Rainbow Creek begins east of Rainbow Valley and flows west through the valley, where it runs under Old Highway 395 and the Interstate-15 Freeway. West of the freeway, the creek flows through the northern portion of Fallbrook before converging with the Santa Margarita River. A map of Rainbow Creek Watershed is attached to this report as Appendix A.

The terrain of Rainbow Creek Watershed is mostly hilly with some steep slopes and a flat valley floor. The Watershed's elevation ranges from 2,070 feet above sea level in the eastern portion, to just 400 feet above sea level at the base of the watershed in the western portion. Rainbow Valley has an elevation of approximately 1,100 to 1,050 feet above sea level. Land use in the watershed is primarily rural, undeveloped land. Several agricultural operations, including orchards, groves, commercial nurseries, and mixed use fields are within Rainbow Creek Watershed.

Large quantities of water are imported into Rainbow Valley, mainly for agricultural irrigation, but also for residential and limited commercial use. The geology and shape of Rainbow Valley allow for high rates of water infiltration from this imported water. The unconfined groundwater aquifer below Rainbow Valley has a high water table, meaning that water can be found at relatively shallow depths below the soil's surface in many portions of Rainbow Valley. The water table may be higher in some areas due to agricultural irrigation and residential or commercial septic system leach fields. In addition to high groundwater levels, imported water has resulted in increased flows in Rainbow Creek, with some sections having year round (perennial) flow.

The high groundwater levels in Rainbow Valley increase the potential for groundwater pollution. Shallow soils drastically reduce the potential for water filtration before it reaches the groundwater basin. Nitrogen and phosphorus from agricultural runoff and nitrogen from septic systems significantly contribute to groundwater pollution in Rainbow Valley. Nitrogen and phosphorus, among other contaminants, have led to the degradation of ground water and surface water quality in Rainbow Creek. The San Diego Regional Water Quality Control Board has adopted Total Maximum Daily Loads (TMDLs) for Total Nitrogen and Total Phosphorus to address the water quality impairments in Rainbow Creek.

Mission Resource Conservation District

Mission Resource Conservation District (MRCD) was organized on September 14, 1944 as the Middle San Luis Rey Soil Conservation District. The initial efforts centered on the need to store runoff water, correct the erosion occurring on dry-farmed grain and bean land, and protect the level land along the larger streams and river.

MRCD's district boundary encompasses portions of northern San Diego County where, during the last 71 years, the farming methods and land use patterns have changed dramatically. Farming changed from non-irrigated crops to irrigated orchards, row crops and pasture; and the trend of land ownership has been toward small farms averaging five to ten acres. In 1971, the name of the Middle San Luis Rey Soil Conservation District was changed to Mission Resource Conservation District to reflect a broader emphasis on the conservation of soil, water and other natural resources. Presently, land uses within the boundaries of MRCD include residential, agriculture, commercial, industrial and public lands.

Since MRCD's formation, MRCD staff has worked with hundreds of local property owners and managers to assist them in setting priorities, implementing Best Management Practices, complying with local, state and federal regulations, and keeping their land, livestock and surrounding environment productive and healthy for the long term.

II. Purpose

In 2012, the County of San Diego, in cooperation with MRCD, the University of California Cooperative Extension's Farm and Home Advisor Office, and the County of San Diego's Department of Agriculture, Weights and Measures, were granted funding from the Clean Water Act 319(h) Non-Point Source Reduction Program (NSRP). The implemented activities for the NSRP grant were selected to strategically target key nutrient sources and as well as to expand upon existing programs that have proven effective in the past.

The Residential Property Evaluation Program (Program) was one of the activities implemented by MRCD, under the NSRP grant, that utilized education outreach efforts to help property owners in the San Diego County portion of the Rainbow Creek Watershed reduce the amount of nutrients, sediment and other parameters that impact water quality from leaving the properties. By working on a one-to-one basis with owners and managers of properties in the Rainbow Creek Watershed, MRCD attempted to increase the property owners' knowledge base of how the activities and site conditions on his or her property could impact (both in a negative or positive manner) not only the health and sustainability of the property itself, but that of its surrounding environment. Initial and follow-up site visits, educational materials, and Initial and Follow-Up Evaluation Reports were utilized as educational outreach tools for the Program.

III. Publicity and Participation

Efforts to publicize the Program and encourage participation began in March 2013 when a press release and flyer for the program were developed. In April 2014, the flyer and press release were published in the Rainbow Property Owner's Association's quarterly newsletter, *The Rainbow News*. In May 2014, the press release and an advertisement designed by the *Fallbrook/Bonsall Village News* newspaper were printed. The press release was published on the front page of the *Fallbrook/Bonsall Village News'* May 8, 2014 edition and the advertisement was published in the May 15, 2014 edition. In May 2014, the press release was also posted on the homepage of the *Fallbrook/Bonsall Village News* website as well as having a link to the full press release on a subsequent webpage.

Publicity efforts continued in June 2014 with the development, printing and mailing of the Program's postcard announcement. The 4 x 6 inch, glossy, colored, double-sided postcard was mailed to approximately 590 properties in the Rainbow Creek Watershed. The mailing list was carefully edited to exclude the properties that were being targeted by UC Cooperative Extension and the San Diego County's Department of Agriculture, Weights and Measures education and participation efforts. In July of 2014, the Program advertisement was published for a second time in *The Rainbow News*.

By the end of July 2014, a total of four individuals had signed up to participate in the Program. In order to increase participation in the Program, the postcard mailing list was used to create a phone call list. All of the individuals who's phone numbers were able to be determined were called, starting in September 2014 with the calling efforts ending in November 2014. A total of five more individuals signed up to participate in the Program as a result of the calling efforts.

In addition to the printed publicity and calling efforts, the Program was also discussed at the end of six workshops hosted by MRCD. A total of 297 people attended the six workshops, which were held between July 2013 and September 2014. No individuals signed up for the Program based on the publicity efforts at the workshops.

The publicity efforts of press releases, advertisements, newsletters, notices on websites, and distribution to local businesses and organizations resulted in a total of nine property owners participating in the Program.

IV. Methodology

Participation in the Program began when the property owner or manager either contacted MRCD or was contacted by MRCD to discuss resource concerns on his or her property. These concerns generally focused on erosion or pest animals (which can often lead to erosion and sediment loss from properties). After the participant signed up for the Program, an initial site

visit was scheduled with MRCD's Certified Conservation Planner and the property owner at the property.

During the initial site visit, the Conservation Planner and property owner walked the property and looked at any resource concerns that currently existed on the property. The purpose of the initial site visit was to gather the necessary information needed in order to identify the resource concerns on the property and to determine the appropriate BMP that would eliminate or control the resource concern. The initial site visit was also utilized as the first step in educating property owners about how to structure and maintain the property in a manner that minimized the impact on water quality downstream. In addition to the Certified Conservation Planner, one of MRCD's Certified Landscape Auditors was also present during the initial site visit and performed a thorough analysis of the irrigation system on the property.

Assessment materials, in the form on data intake sheets used during the site visit, were completed. These intake sheets included questions regarding how the property owner addressed household and property maintenance on the property (such as how they disposed of household trash, household hazardous waste, domestic pet waste, non-domestic animal waste, past water usage, pest animal management, and undesirable plant management). A list of resource concerns was also included on the intake sheet. An example of the Initial Site Visit Intake Sheet for the Program is attached to this report as Appendix B.

After the initial site visit was conducted, an Initial Evaluation Report (IER) was completed and returned, in person, to the property owner or manager. The report included an overview of the property, including a map of the site conditions at the time of the initial site visit, soil map and report, topography map and a map of the nearby waterbodies and streams. A map of the recommended BMPs and written summary of the BMPs were included in the report. Supporting documentation for each recommended BMP was included in the report, as well. In addition to the BMP documentation for the resource concerns, an initial irrigation evaluation report was included that summarized the existing conditions of the property's irrigation system and made recommendations for increasing the efficiency of the system. An example of an IER is attached to this report as Appendix C.

After a minimum of one year after the IER was returned, a follow-up site visit with the property owner was completed. The purpose of the follow-up site visit was to ascertain what, if any, recommended BMPs had been implemented and in what quantity or amount. A Follow-Up Evaluation Report (FUER), in the form addendums to the IER, was completed and returned to the property owner(s). The FUER included an updated map of the site conditions at the time of the follow-up site visit, as well as any additional BMPs required to address new resource concerns. An example of a FUER is attached to this report as Appendix D.

The initial site visits began in March 2014 and continued through November 2014, with the follow-up site visits completed between January 2016 and February 2016. The shortest duration between initial and follow-up site visits was 14 months and the longest duration was 22 months. On average, a total of 17 months passed between the initial and follow-up site visits. This time frame was assumed to be of long enough duration to allow the property owners time to implement the recommended BMPs, if they were so inclined and able.

It should be noted that one of the properties changed ownership between the initial and follow-up site visits. The new property owners agreed to participate in the program. At the follow-up site visit for this property, while the follow-up site conditions were accessed and necessary information was recorded, the Conservation Planner and Landscape Irrigation Auditor spoke and interacted with the new property owners as if it were the initial site visit. It was possible to observe on the property, during the follow-up site visit, if any of the recommended BMPs in the IER had been implemented by the original property owner. The FUER for this property included additional BMPs that addressed newly discovered resource concerns found on the property.

In 2015, the County of San Diego contracted Geosyntec Consultants to develop a Dry and Wet Weather Load Reduction Calculator (Calculator). This tool estimated the amount of nutrients and other water quality parameters that were prevented from leaving the property after BMPs were implemented. The land cover type (e.g. bare soil, landscaped, and tree crop) and the BMPs implemented (and the amount of each implemented BMP for each land cover type) for each property was entered into the Calculator. A running total was kept of all nine properties so that a summary load reduction estimate was calculated in addition to calculations for each property.

While the Calculator only required the land cover type of the property at the time of the initial site visit, the land cover type was mapped for each property after both the initial and follow-up site visits. The land cover types were categorized as: bare soil, detention pond, development (any impermeable surface including driveways and buildings), landscaped (any permeable surface that was modified by the property owners, but not necessarily irrigated), non-native grass or fallow, nursery or field crops, tree crops (including any crops that were not sold), and woody vegetation (natural vegetation or habitat that was not modified by the property owner).

V. Results

Participating Properties

A total of nine properties located within San Diego County portion of the Rainbow Creek Watershed participated in the Program. The land use designation for all of the properties was

"Single Spaced Residential" and the properties ranged in size from 0.8 to 10.0 acres, with an average size of 3.8 acres. The total acreage of all nine properties was 34.1 acres. One of the properties was also an equestrian property with a total of two horses that resided full time on the land. The total irrigated acreage for all nine properties was 3.6 acres, with tree crops existing on three of the nine properties. The average irrigated area for each property was 0.4 acres.

When the acreage of the initial and follow-up site visit land cover types for the nine properties were compared, the footprint of most cover types remained unchanged, with the exception of the bare soil and landscaped acreage (Table 1). The amount of exposed bare soil observed during the initial site visits was reduced (usually through the application of mulch or another implemented BMP) and was categorized as landscaped area during the follow-up site visits.

Table 1. Summary of the land cover types for all of the participating properties in the Residential Property Evaluation Program.

Land Cover Type	Initial Site Visit (Acres)	Follow-Up Site Visit (Acres)
Bare Soil	3.8	2.7
Detention Pond	0.01	0.01
Development	2.9	2.9
Landscaped	6.3	7.5
Non-native Grass/Fallow	2.6	2.5
Nursery/Field Crop	0.0	0.0
Tree Crop	0.7	0.7
Woody Vegetation	17.8	17.8
Total Acres	34.1	34.1

Recommended and Implemented Best Management Practices

The two main objectives of the BMPs recommended during the initial site visits and in the IERs were: 1) to stop and/or control erosion that was occurring on the property and, 2) to help control and manage any sediment that was flowing onto the property during storm events from adjacent, neighboring parcels. A total of 24 different BMPs were recommended to the participating property owners by the Conservation Planner in the IERs. A total of 20 of the recommended BMPs were installed or implemented by the property owners between the initial and follow-up site visits (Table 2). Property owners also installed seven different BMPs that had not been recommended in the IERs, but were effective at helping to control and reduce erosion and sediment loss from the property. In all, 31 different BMPs were either recommended and/or implemented during the course of the Program.

The BMPs that were most frequently recommended were mulching, critical area planting and heavy use area protection. These BMPs were recommended on nine, seven, and six different properties, respectively. They were also the most implemented BMPs with all nine properties utilizing some form of mulch (in one case the mulch used was gravel), six properties implementing heavy use area protection and six properties installing critical area planting. Mulching and heavy use area protection BMPs are very similar practices that are differentiated by how the land is used for each practice. Heavy use area protection is specifically for areas on the property that are heavily impacted and used frequently - such as dirt access roads, holding pens for horses or parking areas for vehicles and heavy equipment. Mulch is used for areas that are not heavily utilized, such as slopes, landscaped garden beds or in orchards or groves.

Table 2. Recommended and implemented Best Management Practices on Residential Property Evaluation Program properties.

Best Management Practice	No. of Properties BMP Recommended	No. of Properties BMP Implemented
Heavy Use Area Protection - Organic	4	5
Heavy Use Area Protection - Inorganic	2	1
Access Road - Build Up Road	1	1
Access Road - Regrade/Reshape	2	0
Ditch/Diversion - Fill In	1	1
Critical Area Planting	7	6
Mulch - Organic	9	8
Mulch - Inorganic	0	1
Retaining Wall/Terracing	0	2
Hedgerow	1	0
Straw Wattle	0	2
Structure For Water Control - Water Bar	1	0
Structure For Water Control - Dissipater	2	1
Structure For Water Control - Culvert - Repair or Maintenance	1	2
Underground Outlet - Pipe	1	1
Underground Outlet - Repair or Maintenance	3	2
Underground Outlet - Dissipater	2	1
Roof Runoff Structure - Dissipater	1	0
Berm	0	1
Wildlife Structure - Owl Box	1	1
Wildlife Structure - Raptor Perch	5	0
Pile of Dead Vegetation - Remove	4	3
Diversion	0	1
Lined Waterway	3	3
Lined Waterway - Repair or Maintenance	2	1
Open Channel	1	1
Sand Bag - Remove and Replace	1	1
Water and Sediment Control Basin - Repair or Maintenance	1	1
Silt Barriers - Fabric	0	1
Silt Barriers - Sand Bags	0	1
Sediment Behind Silt Barrier - Remove	1	1

The goals of the recommended BMPs could be divided into five categories that frequently overlap as one BMP can successfully complete two different objectives. The five goals of the

recommended and implemented BMPs were: 1) to protect access roads, 2) to protect slopes, 3) to prevent general erosion and control stormwater runoff, 4) to protect artificial waterways and, 5) to manage sediment in stormwater runoff from adjacent, neighboring properties. The total area of the recommended BMPs was 2.31 acres with a total of 2.37 acres covered by BMPs that had been implemented with or without direct recommendation. A total of six BMPs were measured in acreage (such as mulching). The total length of the recommended BMPs was 1,194 feet with a total of 1,476 feet of BMPs that were implemented with or without recommendation. A total of 13 BMPs were measured in feet (such as lined waterways). The total number of recommended individual BMPs was 38 with 29 of those implemented with or without recommendation. A total of 12 different BMPs were individually counted (such as raptor perches or dissipaters). The amount of recommended and implemented (with or without recommendation) BMPs for all nine participating properties can be found in Tables 3 through 7.

Table 3. Total amount of recommended and implemented BMPs for erosion control and prevention on dirt access roads on the participating properties in the Residential Property Evaluation Program.

Best Management Practice	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Heavy Use Area Protection - Organic	Ac.	0.19	0.14	74%
Heavy Use Area Protection - Inorganic	Ac.	0.07	0.01	14%
Access Road - Build Up Road	Ft.	50	50	100%
Access Road - Regrade/Reshape	Ft.	320	0	0%
Ditch/Diversion - Fill In	Ft.	95	95	100%

Table 4. Total amount of recommended and implemented BMPs for erosion control and prevention on slopes on the Residential Property Evaluation Program participating properties.

Best Management Practice	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Critical Area Planting	Ac.	0.73	0.57	78%
Mulch - Organic	Ac.	1.27	1.63	128%
Mulch - Inorganic	Ac.	0.03	0.01	33%
Retaining Wall/Terracing	Ft.	0	190	100%
Hedgerow	Ft.	21	0	0%
Straw Wattle	Ft.	0	357	100%

Table 5. Total amount of recommended and implemented stormwater runoff control and erosion prevention BMPs on the Residential Property Evaluation Program participating properties.

Best Management Practice	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Structure For Water Control - Water Bar	No.	5	0	0%
Structure For Water Control - Dissipater	No.	6	1	17%
Structure For Water Control - Culvert - Repair or Maintenance	No.	5	7	140%
Underground Outlet - Pipe	Ft.	90	90	100%
Underground Outlet - Repair or Maintenance	No.	3	2	67%
Underground Outlet - Dissipater	No.	2	1	50%
Roof Runoff Structure - Dissipater	No.	1	0	0%
Berm	Ft.	0	33	100%
Wildlife Structure - Owl Box	No.	1	2	200%
Wildlife Structure - Raptor Perch	No.	7	0	0%
Pile of Dead Vegetation - Remove	No.	6	6	100%

Table 6. Total amount of recommended and implemented BMPs for artificial stormwater runoff waterways on the Residential Property Evaluation Program participating properties.

Best Management Practice	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Diversion	Ft.	0	72	100%
Lined Waterway	Ft.	440	385	88%
Lined Waterway - Repair or Maintenance	Ft.	158	126	80%
Open Channel	Ac.	0.02	0.01	50%
Sand Bag - Remove and Replace	Ft.	20	20	100%

Table 7. Total amount of recommended and implemented BMPs for sediment control in stormwater runoff on the Residential Property Evaluation Program participating properties.

Best Management Practice	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Water and Sediment Control Basin - Repair or Maintenance	No.	1	1	100%
Silt Barriers - Fabric	Ft.	0	58	100%
Silt Barriers - Sand Bags	No.	0	8	100%
Sediment Behind Silt Barrier - Remove	No.	1	1	100%

A complete list of the recommended BMPs and implementation actions is attached to this report as Appendix E.

Photographs of site conditions before and after Best Management Practices were implemented are attached to this report as Appendix F.

Irrigation System Evaluations

The IER and FUER included a section detailing the results of the irrigation system evaluation conducted during the initial and follow-up site visits. The total irrigated acreage for properties receiving an irrigation system evaluation was 3.6 acres. One property was solely irrigated by drip irrigation and, due to the small size of total irrigated area (0.01 acres), did not receive an irrigation system evaluation. The average irrigated acreage for the eight properties that did have an irrigation system was 0.4 acres per property.

The BMPs that were included in the irrigation system evaluations included fixing existing leaks and breaks in the system as well as making sure that similar hydrozones were irrigated with the same type of spray heads or nozzles. Removing vegetation that was blocking the irrigation water and installing pressure regulators were also included in the list of recommended BMPs. During the follow-up site visit, the Landscape Auditor asked each property owner if the recommended BMPs had been implemented. While the property owners had all fixed the major leaks and breaks in the irrigation system, none had implemented the other recommended irrigation system BMPs to maximize the efficiency of the irrigation system.

Wet and Dry Weather Load Reduction Calculator

After the implementation of BMPs, the land cover types, at the time of the initial site visit, for each property and the amount of implemented BMPs for each land cover type were entered into the Calculator. The summary load reduction estimates for dry weather conditions, wet weather conditions, and the total annual reduction for all of the properties that participated in the Program were calculated. The overall percent reduction in Total Nitrogen and Total Phosphorus (kg/year) for the dry weather was 17% and 16%, respectively (Table 8). The overall percent reduction in Total Nitrogen and Total Phosphorus (kg/year) for wet weather was 2% and 3%, respectively (Table 9). The overall annual percent reduction in Total Nitrogen and Total Phosphorus (kg/year) was 14% and 6%, respectively (Table 10).

Table 8. Estimated annual dry weather pollutant runoff/load reduction after Best Management Practices implementation on Residential Property Evaluation Program properties.

Pollutant	Baseline Runoff/Loads of Parcels Inspected	Estimated Runoff/Load Reduction from BMPs	Resultant Runoff/Load	Overall Percent Reduction
Runoff Volume (cubic feet/year)	707,876	119,858	588,018	17%
Total Nitrogen (kg/year)	139.8	24	116	17%
Total Phosphorus (kg/year)	2.5	0.4	2.1	16%
TSS (kg/year)	234	50	184	21%
Fecal Coliform (MPN/year)	2.11E+10	50	2.11E+10	0%

Table 9. Estimated annual wet weather pollutant runoff/load reduction after Best Management Practices implementation on Residential Property Evaluation Program properties.

Pollutant	Baseline Runoff/Loads of Parcels Inspected	Estimated Runoff/Load Reduction from BMPs	Resultant Runoff/Load	Overall Percent Reduction
Runoff Volume (cubic feet/year)	399,054	7,417	391,638	2%
Total Nitrogen (kg/year)	37	1	36	2%
Total Phosphorus (kg/year)	6.9	0.2	6.7	3%
TSS (kg/year)	11,059	413	10,645	4%
Fecal Coliform (MPN/year)	2.61E+11	7.74E+09	2.53E+11	3%

Table 10. Estimated annual wet weather pollutant runoff/load reduction after Best Management Practices implementation on Residential Property Evaluation Program properties.

Pollutant	Baseline Runoff/Loads of Parcels Inspected	Estimated Runoff/Load Reduction from BMPs	Resultant Runoff/Load	Overall Percent Reduction
Runoff Volume (cubic feet/year)	1,106,930	127,275	979,656	11%
Total Nitrogen (kg/year)	177	24	152	14%
Total Phosphorus (kg/year)	9.4	0.6	8.8	6%
TSS (kg/year)	11,293	464	10,830	4%
Fecal Coliform (MPN/year)	2.82E+11	7.74E+09	2.74E+11	3%

The wet and dry weather load reduction calculations, after BMPs implementation, for each participating property are attached to this report as Appendix G.

VI. Conclusions and Lessons Learned

The Program's objective of increasing the knowledge base of property owners regarding erosion, water quality issues and what actions can be taken on residential properties to increase the health and sustainability of the properties while also protecting the surrounding environment were successfully met by the conclusion of the Program. A total of 2.37 acres (approximately 7% of the total area covered by the participating properties) of BMPs were implemented as a result of the Program's educational efforts. The implemented BMPs resulted in an estimated 14% annual load reduction of Total Nitrogen and 6% annual load reduction of Total Phosphorus that would have entered Rainbow Creek.

A total of 31 different BMPs were implemented on the properties, with 24 of those BMPs having been recommended by the Conservation Planner during the initial site visit and in the IER. All of the recommended and implemented BMPs decreased or eliminated the potential for erosion on the properties and/or helped to control the sediment moving from adjacent properties during storm events onto the participating properties. Mulching, critical area planting and heavy use area protection were the most commonly recommended and implemented BMPs. Over the duration of the Program, BMPs covering 2.37 acres and 1,194 linear feet were implemented or installed. A total of 12 different types of individual BMPs (e.g. rock dissipaters) were also implemented during the course of the Program.

While not all of the recommended BMPs had been implemented by the time of the follow-up site visit, all of the property owners had indicated that most, if not all, of the recommended BMPs would be installed or implemented in the future. Several participants also reported that they had discussed recommended BMPs with neighbors and friends to address potential resource concerns on their respective properties. It was observed by the Conservation Planner that during the follow-up site visits the property owners were much more aware of how stormwater flowed on their properties and if any erosion was occurring than during the initial site visits. Overall, all of the property owners stated how beneficial the Program was for their properties in addressing the resource concerns.

The first major lesson learned during the course of the Program was that participation levels were much less than what had been anticipated. Despite the tremendous effort and energy expended on educating people about the Program and publicizing the Program, only nine properties signed up to participate. In the future, participation levels may be increased if some type of rebate or incentive (such as rain barrels or deliveries of mulch) is available to participants.

The irrigation system evaluations were beneficial in identifying leaks and other problems with the irrigation systems. However, without some sort of incentive to implement BMPs to

increase the efficiency of the irrigation system (other than to fix leaks or breaks), the property owners were not interested in implementing the recommended BMPs. In the future, incentives (such as free irrigation equipment for recommended BMPs or rewards for increasing the irrigation system efficiency levels) could be offered to encourage property owners to implement the irrigation system BMPs.

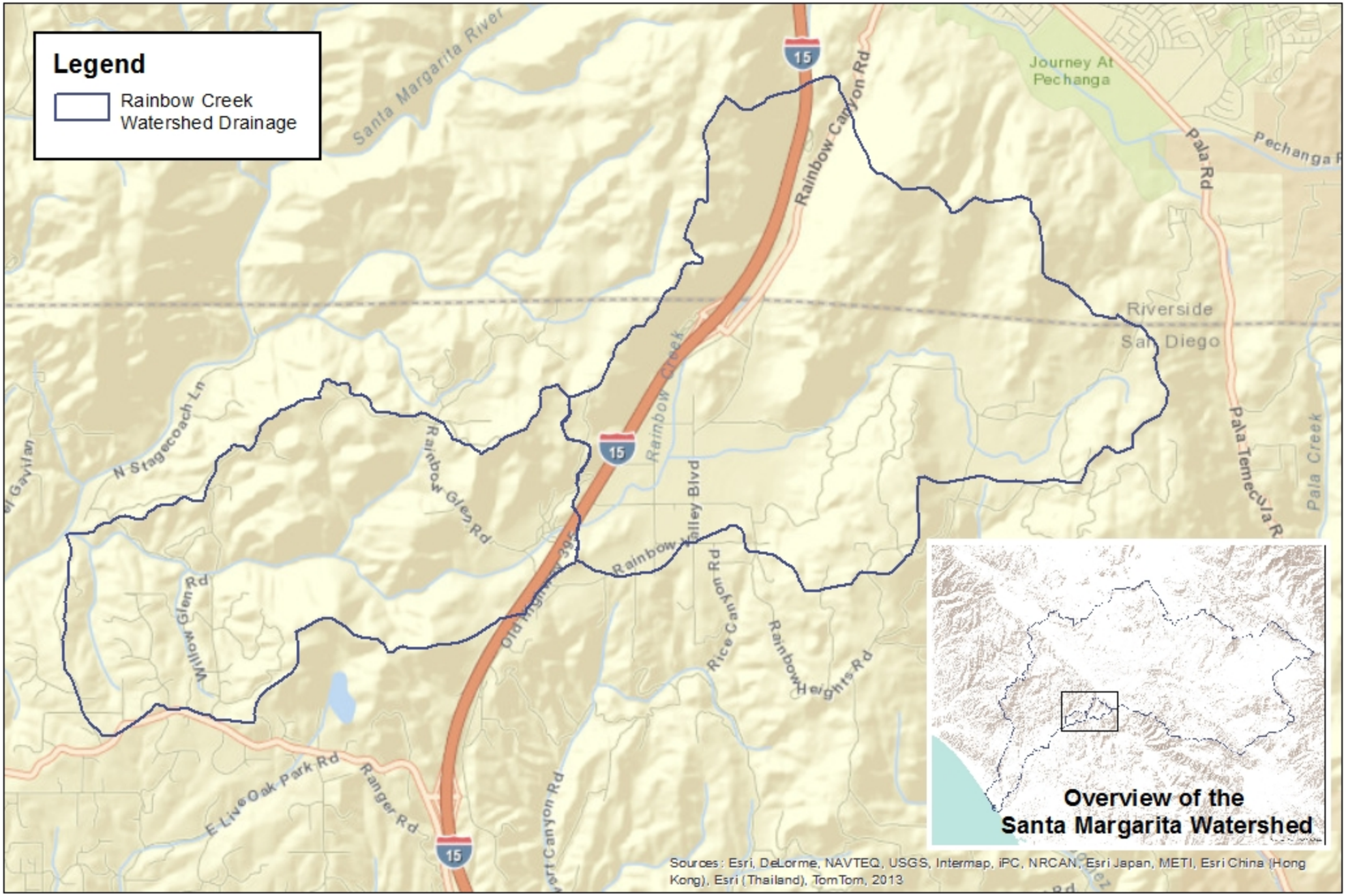
During the course of the Program, one of the properties changed ownership and the new property owners agreed to participate in the Program. The efforts to educate the new property owners on erosion and other resource concerns that can impact water quality and what they can do on their property to address those concerns equaled the education efforts that all of the other participating property owners received. Thus, the number of property owners who participated in the Program was more than the number of participating properties.

Overall, the participants gave a lot of positive feedback to the Conservation Planner about how beneficial the Program was in regards to the management of their properties. In addition to participating in the Program, several of the property owners then utilized MRCD for other assistance and educational efforts.

Appendix A

Map of Rainbow Creek Watershed

Rainbow Creek Watershed Drainage



Appendix B

Initial Site Visit Intake Sheet

Mission Resource Conservation District

Residential Property Field Visit Summary Sheet

RPEP ID #: _____ Site Visit Date: _____ Resource Specialist: _____

Water Source on Property

Water source: ☐ Well ☐ Municipal ☐ Both Water District: _____

Well water use: ☐ N/A ☐ Drinking ☐ Agricultural/Irrigation _____ Gallons/Minute

Estimated annual water usage: _____

_____

Irrigated Residential Landscape Areas

Landscaping on property? ☐ No ☐ Yes ☐ Notated on map Approximate acres: _____

Landscape contractor used? ☐ No ☐ Yes ☐ Manages irrigation schedule as well as maintenance

How was the contractor chosen? ☐ N/A ☐ Cares for neighbor/friend/family member's landscape

☐ Recommendation ☐ Website ☐ Advertisement ☐ Other: _____

Fertilizer Use in Residential Landscape Areas

Fertilizer used? ☐ No ☐ Yes ☐ Turf ☐ Shrubs/Trees ☐ Granular ☐ Fertigation

Fertilizer name: _____ Nutrient ratio: _____ N: _____ P: _____ K

Application rate: _____ Application frequency: _____

Applied seasonally? ☐ No ☐ Yes ☐ Spring ☐ Summer ☐ Fall ☐ Winter

Where do you obtain the information on fertilizer application? ☐ Label ☐ Landscaper

☐ Store employee at: _____ ☐ Other: _____

Has the soil ever been tested for nutrients? ☐ No ☐ Yes When? _____

What laboratory was used? _____

Pesticide Use in Residential Landscape Areas

Pesticide used? ☐ No ☐ Yes ☐ Pesticide ☐ Herbicide ☐ Fungicide ☐ Other: _____

Application rate: _____ Application frequency: _____

Applied seasonally? ☐ No ☐ Yes ☐ Spring ☐ Summer ☐ Fall ☐ Winter

Where do you obtain the information on pesticide application? ☐ Label: Follow directions? ☐ No ☐ Yes

☐ Store employee at: _____ ☐ Landscaper ☐ Other: _____

Care and Maintenance of Residential Landscape Areas

Have you sought advice on: ☐ Irrigation ☐ Composting ☐ Fertilizing ☐ Other: _____

☐ I have not sought advice on general landscape care

Have you sought advice specifically for lawn care? ☐ Yes ☐ No

☐ Yes, and I did change how I cared for the lawn after receiving the information

☐ Yes, and I did not change how I cared for the lawn after receiving the information

Irrigated Agricultural Areas

Agriculture on property? ☐ No ☐ Yes ☐ Notated on map Approximate acres: _____

Ag. Irrigation System Evaluation Conducted? ☐ Yes ☐ No ☐ No, but interested. Please tell me more.

Residential Property Field Visit Summary Sheet

RPEP ID #: _____ Site Visit Date: _____

Household Waste Management/Residential "Good Housekeeping"

Method of household waste disposal: ☐ Curbside pickup ☐ No curbside pickup ☐ Dumpster on property ☐ Other: _____ Frequency/amount of other: _____

Covered storage areas? ☐ Yes ☐ No Lids on trash cans? ☐ Yes ☐ No

Green waste disposal? ☐ Yes ☐ No Lids on trash cans? ☐ Yes ☐ No Bags? ☐ Yes ☐ No

Compost? ☐ Kitchen Scraps ☐ Yard Waste ☐ Pet Waste ☐ No

Household Hazardous Waste Disposal Methods:

Batteries:	☐ Regular Trash	☐ Recycling Event	☐ Recycling Facility	☐ Other: _____
Car Batteries:	☐ Regular Trash	☐ Auto Parts Store	☐ Recycling Facility	☐ Other: _____
Oil:	☐ Regular Trash	☐ Mechanic	☐ Recycling Facility	☐ Other: _____
Motor Fluids:	☐ Regular Trash	☐ Mechanic	☐ Recycling Facility	☐ Other: _____
Paint:	☐ Regular Trash	☐ Recycling Event	☐ Recycling Facility	☐ Other: _____
Electronics:	☐ Regular Trash	☐ Recycling Event	☐ Recycling Facility	☐ Other: _____
Appliances:	☐ Regular Trash	☐ Recycling Event	☐ Recycling Facility	☐ Other: _____
Other: _____	☐ Regular Trash	☐ Recycling Event	☐ Recycling Facility	☐ Other: _____

Notes: _____

Animals on Property

Domestic Animals

Total number of non-livestock domestic animals on property: _____

Species: ☐ Dogs # _____ ☐ Cats # _____ ☐ Other: _____ # _____ ☐ Other: _____ # _____

Confinement practices for dogs: ☐ Indoor only ☐ Indoor/Outdoor ☐ Free run of property ☐ Kennel

Frequency of outdoor time: _____

Confinement, Other 1: _____ ☐ Indoor only ☐ Indoor/Outdoor ☐ Free run of property ☐ Kennel

Frequency of outdoor time: _____

Confinement, Other 2: _____ ☐ Indoor only ☐ Indoor/Outdoor ☐ Free run of property ☐ Kennel

Frequency of outdoor time: _____

Animal waste management: ☐ Do not pick it up ☐ Pick up waste Frequency: _____

Method of waste disposal? ☐ Leave in place ☐ Curbside trash Other: _____

Notes: _____

Horses/Livestock

Total number of horses/livestock animals on property: _____

Species: ☐ Horses # _____ ☐ Cows # _____ ☐ Other: _____ # _____ ☐ Other: _____ # _____

Horse areas on property: ☐ Paddock ☐ Barn/Stable/Shelter ☐ Pasture ☐ Arena

Horse waste management: ☐ Do not pick it up ☐ Pick up waste Frequency: _____

Waste disposal method: ☐ Haul away ☐ Leave in place ☐ Compost ☐ Pile, not for hauling

Horse wash areas: ☐ No wash areas ☐ Pervious surface ☐ Impervious surface

Livestock areas on property: ☐ Paddock ☐ Barn/Stable/Shelter ☐ Pasture ☐ Arena

Animal waste management: ☐ Do not pick it up ☐ Pick up waste Frequency: _____

Waste disposal method: ☐ Haul away ☐ Leave in place ☐ Compost ☐ Pile, not for hauling

Notes: _____

Residential Property Field Visit Summary Sheet

RPEP ID #: _____ Site Visit Date: _____

Onsite Wastewater Treatment System (OWTS)

Number Of Bedrooms In House: _____ Number Of Inhabitants: _____ Age of septic system: _____

Location of Septic Tank: ☐ Known ☐ Know Approx. Area ☐ Not Known ☐ Notated on Map

Location of Leach Field: ☐ Known ☐ Know Approx. Area ☐ Not Known ☐ Notated on Map

Three Previous Pumping Dates: _____ ☐ Not Known

Have you ever noticed or experienced any problems with the septic system? ☐ Yes ☐ No

☐ Liquid on/around tank ☐ Liquid on/around leach field ☐ Sewage backed up into drains/toilets

☐ Green over leach field ☐ Slow flushing or draining ☐ Unpleasant odors from plumbing/system

Open Space/Undeveloped Land Management

Undesirable Plants Management Methods

Weeds Satisfactorily Managed On Property? ☐ Yes ☐ No

Current Management Methods: ☐ Chemical ☐ Mechanical Removal ☐ Removal By Hand

☐ Composting ☐ Flaming ☐ Removed Prior To Seed Maturity ☐ Mulch

☐ Solarization ☐ Discing ☐ Other: _____

To Be Completed By Mission RCD Resource Specialist

Notated on the Site Visit Map:

- ☐ **Activities/Resources/Land Uses**
  - ☐ Agricultural Areas
    - ☐ N/A
    - ☐ Orchard/Grove
    - ☐ Row Crops
    - ☐ Potted Plants
    - ☐ Greenhouse
  - ☐ **Residential/Buildings**
    - ☐ N/A
    - ☐ House
    - ☐ Other
  - ☐ **Equestrian Areas**
    - ☐ N/A
    - ☐ Barn/Stable
    - ☐ Paddock
    - ☐ Pasture
    - ☐ Arena
    - ☐ Wash Areas
  - ☐ **Undeveloped Land**
    - ☐ N/A
- ☐ **Irrigated Areas**
  - ☐ Landscape
  - ☐ Agriculture
  - ☐ Equestrian
  - ☐ Undeveloped Land
- ☐ **Areas of Erosion**
  - ☐ Agricultural Areas
  - ☐ Residential Areas
  - ☐ Equestrian Areas
  - ☐ Undeveloped Areas
- ☐ **Potential Transport Pathways**
  - ☐ Creeks
  - ☐ Drainages
  - ☐ Swells
  - ☐ Roads
- ☐ **OWTS Location**
  - ☐ Tank
  - ☐ Leach Field
- ☐ **Well**
  - ☐ Location
  - ☐ N/A

Residential Property Field Visit Summary Sheet

RPEP ID #: _____ Site Visit Date: _____

Notes for Resource Specialist During Site Visit:

Appendix C

Example of Initial Evaluation Report

Residential Evaluation Report

Residential Property Evaluation Program Number 05

October 2014

Developed By
Mission Resource Conservation District
1588 S. Mission Road, Suite 100
Fallbrook, CA 92028
(760) 728-1332

"Funding for this project has been provided in full or in part through an agreement with the State Water Resources Control Board and the U.S. Environmental Protection Agency under the Federal Nonpoint Source Pollution Control Program (Clean Water Act Section 319). The contents of this document do not necessarily reflect the views and policies of the State Water Resources Control Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use."

Residential Evaluation Report – RPEP 05

Table of Contents

Property Information:
Existing Conditions Map,
Topographic Map,
Soil Map and Report,
and
Streams & Water Bodies Map

Property Overview Map
Existing Conditions on 9-3-2014

Date: 10-16-2014

Residential Property Evaluation Program #: 05
Approximate Acres: 0.83
Land Use: Spaced Rural Residential
Hydrologic Subarea Name and Number: Gavilan, 902.22
USGS Quad: Temecula SW
County, State: San Diego County, CA

Field Office: Escondido Service Center
Agency: Mission RCD
RCD District: Mission RCD
Assisted By: Bethany Principe

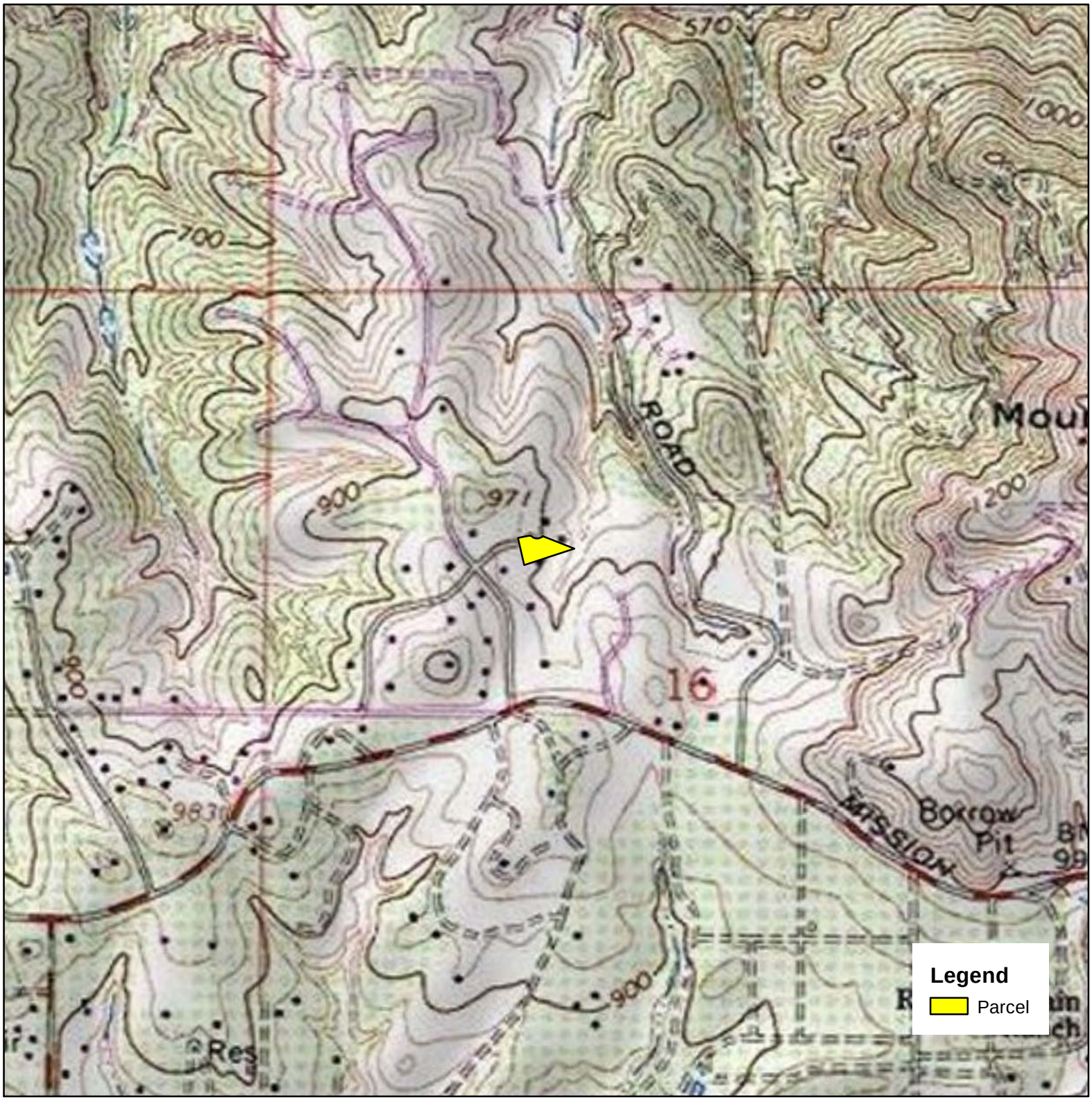
0 15 30 60 90 120 Feet

N
W E
S

Topographic Map

REPOP #: 05
District: Mission RCD
Approximate Acres: 0.8
Date: 9-2-2014

Field Office: Escondido Service Center
Agency: Mission RCD
Assisted By: Bethany Principe
County, State: San Diego County, CA



0 305 610 1,220 1,830 2,440
Feet

N
W E
S

C-5

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

RPEP #: 05
District: Mission RCD
Approximate Acres: 0.8
Date: 9-2-2014

Field Office: Escondido Service Center
Agency: Mission RCD
Assisted By: Bethany Principe
County, State: San Diego County, CA

Custom Soil Resource Report
Soil Map

Map Scale: 1:601 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 7, Nov 15, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 3, 2010—Jun 7, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

San Diego County Area, California (CA638)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
FaC2	Fallbrook sandy loam, 5 to 9 percent slopes, eroded	0.5	52.7%
StG	Steep gullied land	0.4	47.3%
Totals for Area of Interest		**0.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

San Diego County Area, California

FaC2—Fallbrook sandy loam, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: hbbt
Elevation: 200 to 3,500 feet
Mean annual precipitation: 12 to 18 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 250 to 320 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Fallbrook and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fallbrook

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granodiorite

Typical profile

H1 - 0 to 6 inches: sandy loam
H2 - 6 to 12 inches: loam, sandy loam
H2 - 6 to 12 inches: sandy clay loam, clay loam
H3 - 12 to 28 inches: loam, sandy loam
H3 - 12 to 28 inches: weathered bedrock
H4 - 28 to 47 inches:
H4 - 28 to 47 inches:
H5 - 47 to 51 inches:

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: 40 to 60 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very high (about 13.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: Loamy (1975) (R019XD029CA)

Minor Components

Vista
Percent of map unit: 10 percent

Cieneba
Percent of map unit: 2 percent

Bonsall
Percent of map unit: 2 percent

Las posas
Percent of map unit: 1 percent

StG—Steep gullied land

Map Unit Composition
Steep gullied land: 85 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Steep Gullied Land

Setting
Landform: Gullies
Landform position (three-dimensional): Riser

Typical profile
H1 - 0 to 60 inches: variable

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8

Minor Components

Unnamed
Percent of map unit: 1 percent
Landform: Depressions

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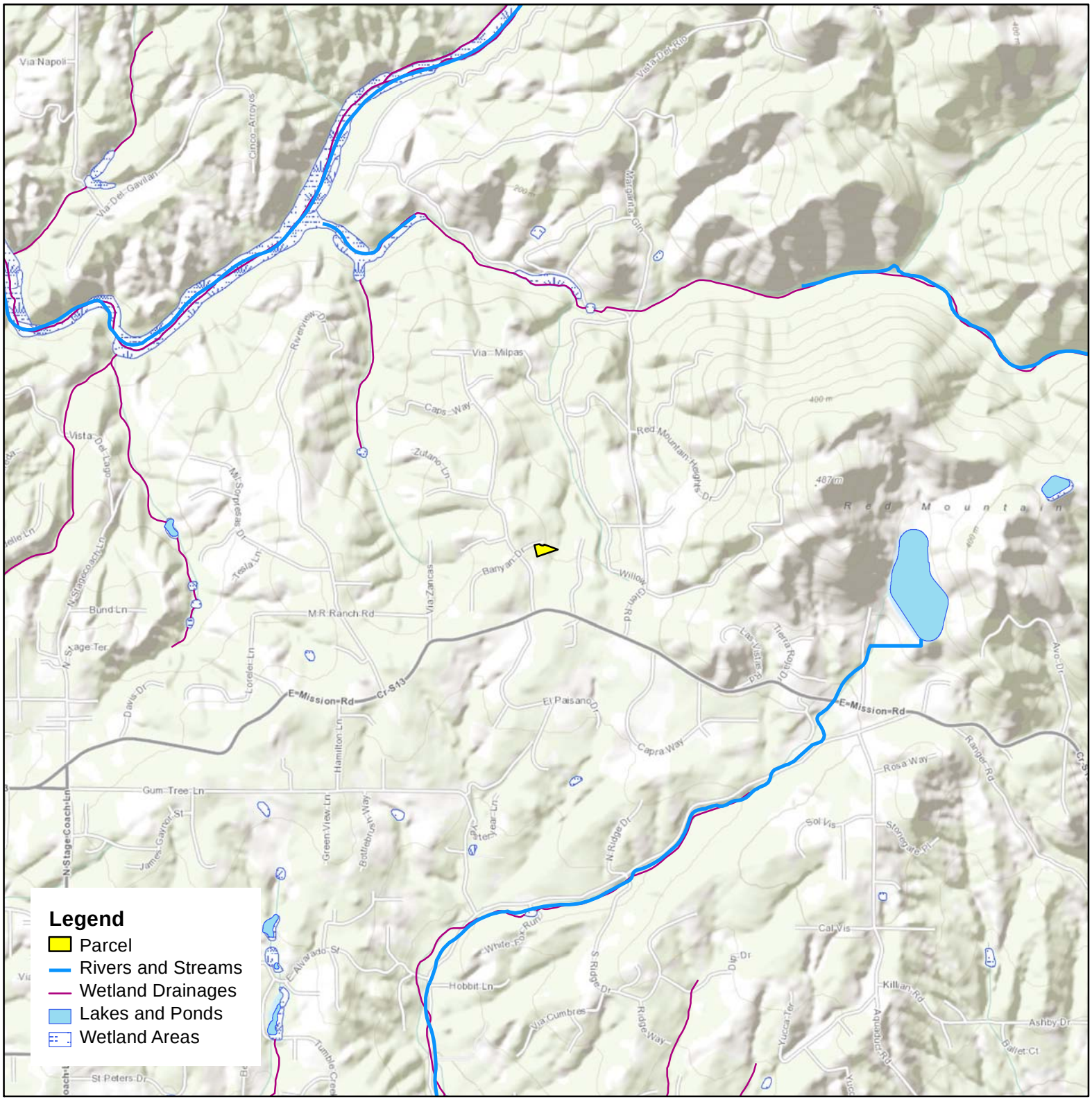
Streams and Waterbodies Map

RPEP #: 05
District: Mission RCD
Approximate Acres: 0.8
Date: 9-2-2014

Field Office: Escondido Service Center
Agency: Mission RCD
Assisted By: Bethany Principe



0 750 1,500 3,000 4,500 6,000
Feet

N
W E
S

Residential Evaluation Map and Report

Residential Evaluation Plan Map

Date: 10-16-2014

Residential Property Evaluation Program #: 05
Approximate Acres: 0.83
Land Use: Spaced Rural Residential
Hydrologic Subarea Name and Number: Gavilan, 902.22
USGS Quad: Temecula SW
County, State: San Diego County, CA

Field Office: Escondido Service Center
Agency: Mission RCD
RCD District: Mission RCD
Assisted By: Bethany Principe

0 15 30 60 90 120 Feet

N W E S

C-18

BETHANY PRINCIPE
MISSION RCD BIOLOGIST

Residential Evaluation Plan

Residential Property Evaluation Program
Identification Number 05

OBJECTIVE(S)

To landscape around the house and a portion of the property with ornamental plants, fruit trees and vegetable garden with the purpose of creating a landscape design and pallet that supports and benefits itself. Structure the property so that the resource concerns are managed and easily addressed if needed.

Practice 342: Critical Area Planting: Seed, Straw Mulch

Practice Summary:
This practice is to establish permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices. The conditions where this practice applies includes on areas with existing or expected high rates of erosion or degraded sites that usually cannot be stabilized by ordinary conservation treatment and/or management. If these areas are left untreated, they could be severely damaged by erosion or sedimentation or could cause significant off-site damage.

In this Conservation Plan, **wood chips, compost or landscape clippings** will be used to addition to seeding.

Supplemental Materials:
The *Nifty 50 Plants for Water Smart Landscapes* guide and *Don't Plant a Pest* brochure are included in this Conservation Plan with recommendations for ground cover and wildflower plant species.

Operation and Maintenance:
The area shall be managed as long as necessary to stabilize the site and achieve the intended purpose.

Field	**Planned Amount**
1	0.04 Ac.
Total	0.04 Ac.

Practice 468: Lined Waterway or Outlet, Rock Lined Waterway DA <25 ac.

Practice Summary:
This practice is a waterway or outlet having an erosion-resistant lining of concrete, stone, synthetic turf reinforcement fabric, or other permanent material. Conditions of where this practice applies include concentrated runoff, steep grades, wetness, prolonged base flow, seepage, or piping in such that a lining is needed to control erosion.

Operation and Maintenance:
Regular inspection and maintenance is required to ensure optimal efficiency of the practice.

Field	**Planned Amount**
1	235 Ft.
Total	235 Ft.

Practice 484: Mulch: Soil Cover (Wood Chips, Compost or Landscape Clippings)

Practice Summary:
This practice applies plant residues or other suitable materials produced off site to the land surface. This practice is applicable for all lands were mulches are needed for wind or water erosion control, weed control, soil quality improvement, and soil moisture control.

In this Conservation Plan, this practice applies to areas **that are vulnerable to soil erosion as well as areas that need weed control**.

Operation and Maintenance:
Reapplication of mulch on an annual basis is a typical requirement for this practice.

Field	**Planned Amount**
1	0.17 Ac.
Total	0.17 Ac.

Practice 734: Fish and Wildlife Structure: Raptor Perch

Practice Summary:
This practice involves constructing, installing, maintaining, and monitoring artificial wildlife structures to provide perching features. It is applied on sites where a habitat evaluation has revealed that perching features are a limiting factor for raptors and where natural recovery of those habitat elements is either unlikely or will take many years. This practice should only be used where it is necessary to attract raptors to aid in reducing crop damage by rodents; this may not be used on rangeland or other natural settings due to potential detrimental impacts on prey species.

Supplemental Materials:
The information guide, *Managing Ground Squirrels*, is included in this Conservation Plan and briefly describes several methods of managing ground squirrel populations via the use of traps, biological control, habitat modification and shooting. These methods can be used concurrently with the Raptor Perches. The informational guide, *Knowing Rabbits: Integrated Pest Management for Home Gardeners and Landscape Professionals*, is included in this plan and describes Best Management Practices for controlling rabbit populations.

Operation and Maintenance:
The perches should be checked regularly and repaired if necessary. **Raptor Perches should NOT be installed and used if rabbit/gopher/squirrel bait is used, as eating poisoned rodents will kill the raptors.**

Field	**Planned Amount**
1	1 No.
Total	1 No.

Onsite Wastewater Treatment System

Summary:
The proper care and maintenance of the Onsite Wastewater Treatment System or septic system is crucial to ensuring a healthy and functioning septic system.

Best Management Practice Materials:
The County of San Diego's Department of Environmental Health's septic system plan (or "as built") for this property is included in this report and will help identify where the septic tank and septic leach field are located on the property. Also included in this plan are the *Septic System Sense* brochure and *Septic System Basics & You* informational sheet. Two lists from the County of San Diego's Department of Environmental Health are also included in this plan. One list is of permitted (officially recognized) septic tank pumpers/haulers and the other list is of licensed septic system contractors.

Operation and Maintenance:
Regular inspection and maintenance is required to ensure optimal efficiency of the onsite wastewater treatment system.

Field	**Existing Amount**
1	1 No.
Total	1 No.

Composting

Summary:
The proper techniques of composting horse manure as well as landscape clippings.

Best Management Practice Materials:
The informational brochure *Horse Manure Composting* is included in this plan.

Operation and Maintenance:
Regular inspection and maintenance is required to ensure optimal efficiency of the horse manure composting practice.

Field	**Existing Amount**
1	1 No.
Total	1 No.

Miscellaneous Practice 1

Summary:
Removal of dead vegetation piles to eliminate habitat for pest animals (such as squirrels) and reduce fire hazard.

Operation and Maintenance:
None.

Field	**Planned Amount**
1	1 No.
Total	1 No.

Practice 342
Critical Area Planting

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

CRITICAL AREA PLANTING

(Ac.)

CODE 342

DEFINITION

Establishing permanent vegetation on sites that have or are expected to have high erosion rates, and on sites that have physical, chemical or biological conditions that prevent the establishment of vegetation with normal practices.

PURPOSE

- Stabilize areas with existing or expected high rates of soil erosion by water.
- Stabilize areas with existing or expected high rates of soil erosion by wind.
- Restore degraded sites that cannot be stabilized through normal methods.

CONDITIONS WHERE PRACTICE APPLIES

On areas with existing or expected high rates of erosion or degraded sites that usually cannot be stabilized by ordinary conservation treatment and/or management, and if left untreated, could be severely damaged by erosion or sedimentation or could cause significant off-site damage.

CRITERIA

General Criteria Applicable To All Purposes

Species selected for seeding or planting shall be suited to current site conditions and intended uses. Selected species will have the capacity to achieve adequate density and vigor within an appropriate time frame to stabilize the site sufficiently to permit suited uses with ordinary management activities.

Species, rates of seeding or planting, minimum quality of planting stock, such as PLS or stem caliper, and method of establishment shall be specified before application. Only viable, high quality seed or planting stock will be used.

Plant species and their cultivars shall be selected based on:

- Climate conditions, such as annual rainfall, seasonal rainfall pasterns growing season length, temperature extremes.
- Species selected for use shall be in conformance with the respective Major Land Resource Area (MLRA) Vegetative Guide in Section II of the Field Office Technical Guide.
- Soil condition and position attributes such as soil texture, pH, available water holding capacity, slope, aspect, soil depth, restrictive pans, fertility, salinity and alkalinity, drainage class, flooding and ponding, and severe levels of toxic elements.
- Plant resistance to disease and insects common to the site or location.
- Plant compatibility with irrigation when applied.

All seed and planting materials shall be labeled and meet state seed quality law standards and use of certified seed, if available, will be encouraged.

Based on seed tags, adjust seeding rates to insure the required amount of pure live seed (PLS) is applied to site.

Fertilization, mulching, or other facilitating practices for plant growth shall be timed and

applied to accelerate establishment of selected species.

Additional Criteria To Restore Degraded Sites

If gullies or deep rills are present, they will be treated, if feasible, to allow equipment operation and ensure proper site and seedbed preparation.

Soil amendments will be added as necessary to ameliorate or eliminate physical or chemical conditions that inhibit plant establishment and growth. Required amendments, such as compost or manure to add organic matter and improve soil structure and water holding capacity; agricultural limestone to increase the pH of acid soils; or elemental sulfur to lower the pH of calcareous soils shall be included in the site specification with amounts, timing, and method of application.

CONSIDERATIONS

Critical area planting sites are generally severely eroded or disturbed and have low fertility and few, if any, resident seeds. High seeding and fertilizer rates are needed to insure adequate vegetative cover.

Sites reshaped with heavy equipment may have a smooth hard surface and soil compaction making it difficult to prepare a good seedbed. Disking, ripping or other treatment may be necessary to prepare the site for seeding.

The horizontal indentations left by tracked equipment may provide a suitable planting site on steep slopes.

Straw is the preferred mulch but needs to be anchored in place with equipment such as rollers and crimpers. Tackifiers, woven netting, and other covers can be used to anchor mulch when slopes are too steep to use equipment on the site. Wheat straw deteriorates less rapidly and results in less volunteer growth compared to barley straw. Use clean straw to minimize spread of noxious weeds. Woven, fabric, and artificial mulches scan also be used.

Many soils in critical area planting sites are low in most plant nutrients and should be tested for fertilizer recommendations. Consider initial and follow up applications of fertilizer to ensure stand establishment.

When soils are course sandy, gravelly or granitic, or when water quality will be adversely affected reduce fertilizer rates.

Consider using hydro planting and mulching on steep, inaccessible sites not suitable for straw mulch planting. Do not use when high winds or animal or foot traffic are expected to interfere. Consider the effective range of straw blowing equipment and hydro seeders when use is planned.

A split hydromulch, hydroplanting operation is recommended on sites suitable to hydromulch planting. Seed and fertilizer should be applied first to provide better seed to soil contact and then the mulch is hydromulched over the site.

When plantings are to be irrigated, use non-erosive methods to maintain adequate moisture in at least the upper six (6) inches of soil during the first four (4) weeks and then in the upper 12 inches until the end of the growing season. Seedlings may be susceptible to excessive irrigation during establishment.

Consider exclusion of domestic livestock and other disturbances.

Consider effects on erosion and the movement of sediment and soluble and sediment-attached substances carried by runoff including filtering effect of vegetation on movement of sediment and dissolved and sediment-attached substance.

Native species or mixes that are adapted to the site and have multiple values should be considered.

Avoid species that may harbor pests. Species diversity should be considered to avoid loss of function due to species-specific pests.

CULTURAL RESOURCES CONSIDERATIONS

NRCS policy is to avoid any effect to cultural resources and protect them in their original location. Determine if installation of this practice or associated practices in the plan could have an effect on cultural resources. The National Historic Preservation Act may require

consultation with the California State Historic Preservation Officer.

http://www.nrcs.usda.gov/technical/cultural.html is the primary website for cultural resources information. The California Environmental Handbook and the California Environmental Assessment Worksheet also provide guidance on how the NRCS must account for cultural resources. The e-Field Office Technical Guide, Section II contains general information, with Web sites for additional information.

Document any specific considerations for cultural resources in the design docket and the Practice Requirements worksheet.

ENDANGERED SPECIES CONSIDERATIONS

If during the Environmental Assessment NRCS determines that installation of this practice, along with any others proposed, will have an effect on any federal or state listed Rare, Threatened or Endangered species or their habitat, NRCS will advise the client of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the client selects one of the alternative conservation treatments for installation; or with concurrence of the client, NRCS initiates consultations concerning the listed species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game.

Comply with all applicable federal, state, and local laws, rules, and regulations.

PLANS AND SPECIFICATIONS

Specifications for applying this practice shall be prepared for each site and recorded and filed using the approved specification sheets or narrative statements in the conservation plan.

Site preparation and seeding or planting shall be done at a time and in a manner that best ensures survival and growth of the selected species. What constitutes successful establishment, e.g. minimum percent ground/canopy cover, percent survival, stand density, etc. shall be specified before application.

Species, rates of seeding or planting, minimum quality of planting stock, such as PLS or stem caliper, and method of establishment shall be specified before application. Only viable, high quality seed or planting stock will be used.

OPERATION AND MAINTENANCE

Use of the area shall be managed as long as necessary to stabilize the site and achieve the intended purpose.

Control or exclude pests that will interfere with the timely establishment of vegetation.

Inspections, reseeding or replanting, fertilization, and pest control may be needed to insure that this practice functions as intended throughout its expected life.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

342A - CRITICAL AREA PLANTING - STRAW MULCH

I. SCOPE

The work shall consist of furnishing all materials and placing them on all exposed, disturbed, or barren areas within the designated areas to the limits as shown on the drawings, or as staked in the field.

II. MATERIALS

Seed

All seed shall be delivered to the site tagged and labeled in accordance with the California Agricultural Code, and shall be acceptable to the County Agricultural Commissioner.

Bag tag figures will be evidence of purity and germination. Time since date of seed test shall not exceed 9 months.

Seed shall be of a quality that weed seed shall not exceed 0.5 percent of the aggregate of pure live seed (PLS) (percent germination x percent purity) and other material.

Fertilizer

Unless otherwise specified on the Practice Requirements sheet, all fertilizer shall be Ammonium Phosphate Sulfate containing a minimum of 16 percent Nitrogen, 20 percent available phosphoric acid and 0 percent water soluble potash and be uniform in composition, dry and free flowing, pelleted or granular.

All fertilizer shall be labeled in accordance with applicable state regulations and bear the warranty of the producer for the grade furnished.

Inoculants

The inoculant for treating legume seeds shall be a pure culture of Nitrogen fixing bacteria prepared specifically for the plant species and shall not be used later than the date indicated on the container. A mixing medium, as recommended by the manufacturer or approved substitute, shall be used to bond the inoculant to the seed. For nonpellet inoculated seed, two times the amount of the inoculant recommended by the manufacturer shall be used and seed shall be sown with 24 hours.

For pellet inoculated seed, at least 30 pounds of inoculant shall be used per 1,000 pounds of raw seed and the seed shall be labeled to show the Lot Number, Expiration Date, and Percent Coat of the finished product. Pellet inoculated seed shall be kept cool and sown within 180 days.

Straw

Straw shall be new straw derived from rice, wheat, oats, or barley that meets the County Agricultural Commissioner's standards for weed pests. Clearance shall be obtained from the County Agricultural Commissioner, as required by law, before straw obtained outside the county in which it is to be used is delivered to the site.

Jute Matting

Jute matting shall be cloth mesh of uniform plain weave of undyed and unbleached jute yarn with a minimum weight of one pound per 10 square feet, and a maximum opening size of 1 inch by 1 inch.

Plastic Netting

Plastic netting shall be a polypropylene extruded plastic netting with square or rectangular openings not greater than 3/4 inches and weight of not less than 2.6 pounds per 1000 square feet.

Excelsior Matting

Excelsior matting shall consist of a machine-produced mat of wood excelsior fiber with consistent thickness and fiber evenly distributed over the entire area of the blanket. At least 70 percent of the fibers shall be 6 inches or longer in length. The topside of each blanket shall be covered with a biodegradable extruded plastic mesh with a maximum opening size of 2-inch by 2-inch.

NRCS, CA
July, 2000

Staples

Staples shall be made of 0.09 inch diameter or heavier wire, "U" shaped, with legs at least 8 inches in length.

Anchor pins may also be used to anchor jute matting. Anchor pins shall be made of rigid 0.12 inch diameter or heavier galvanized wire with a minimum length of 10 inches for hook or "J" type pins.

III. SEEDING MIXTURE AND PLANTING DATE

The seed(s) and rate(s) specified on the Practice Requirements sheet shall be used.

The seeding rate(s) shall be the weight exclusive of any coating material. Any legume seed used shall be inoculated. Based on bag tags, seeding rates shall be adjusted to insure the required amounts of pure live seed.

Planting shall be performed after final grading is completed unless otherwise specified on the Practice Requirements sheet.

IV. SEEDBED PREPARATION

The area to be planted shall be weed free and have a firm seedbed which has previously been roughened by scarifying, disking, harrowing, chiseling, or otherwise worked to a depth of 2 to 4 inches. No implement shall be used that will create an excessive amount of downward movement of clods on sloping areas. Seedbed may be prepared at time of completion of earth moving work. The horizontal indentations left by tracked equipment is acceptable on steep slopes.

Rocks larger than 6 inches in diameter, trash, weeds, and other debris that will interfere with seeding or maintenance shall be removed.

Seedbed preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory seedbed.

V. FERTILIZING, SEEDING, MULCHING

Fertilizing

Fertilizer shall be distributed uniformly over the seedbed at the rate of 500 pounds per acre unless a different amount is specified on the Practice Requirements sheet.

Fertilizer shall be applied in any way that will result in uniform distribution. The fertilizer shall be incorporated into the soil. Incorporation may be as part of the seedbed preparation, or as part of the seeding operation.

Seeding

Seed shall be drilled or broadcast by hand, mechanical hand seeder, or power operated seeder. Seed shall be incorporated into the soil, but not more than 1 inch deep.

Mulching

A straw covering shall be distributed uniformly over the seeded area within 48 hours after seeding. Straw shall be applied at the rate of 2 tons per acre unless a different amount is specified on the Practice Requirements sheet. The straw shall be applied by hand, blower, or other suitable equipment. If straw is applied by blower, it shall not be chopped in lengths less than 6 inches.

Anchoring the Mulch

The mulch shall be anchored in place using one of the following methods as specified on the Practice Requirements sheet.

Method 1

The straw shall be anchored using hand tools, mulching rollers, straight serrated disks, or similar types of suitable equipment and shall be performed in a satisfactory manner. The straw shall be tucked in a minimum of 3 inches on a spacing not to exceed one foot in both directions.

Method 2

The straw shall be anchored in place by the placement of jute matting or excelsior matting. The matting shall be applied up and down the slope and shall continue beyond the edge of the mulched or seeded area at least 1 foot at the sides and at the top and bottom of the mulched area. If existing vegetation or structures mark the boundaries of the area, the matting shall be continued into the stable vegetated area or to the edge of the structure. The matting shall be cut around objects so it will lay flat on the soil surface.

The upper end of the matting at the top of the area shall be buried in a trench at least 6 inches deep. Sides of rolls shall overlap at least 4 inches, and rolls shall

overlap at least 3 feet where an uphill roll joins a downhill roll. The uphill roll shall overlie the downhill roll.

Staples shall be installed perpendicular to the slope and shall be spaced approximately 5 feet apart down the sides in the overlap area and center of the roll. Staples spaced not more than 1 foot apart shall be installed across the upper end of each roll and across the overlap area where an uphill roll joins a downhill roll.

Method 3

The straw mulch shall be anchored in place by covering the mulch with plastic netting. The netting shall be applied up and down the slope, and shall continue beyond the edge of the mulched area at least 1 foot at the sides and at the top and bottom of the area.

The upper end of the netting at the top of the area shall be buried in a trench at least 6 inches deep. Sides of rolls shall overlap at least 4 inches and rolls shall overlap at least 3 feet where an uphill roll joins a downhill roll. The uphill roll shall overlie the downhill roll.

Staples shall be installed perpendicular to the slope and shall be spaced 5 feet apart in both directions. The staples on the exterior edges of the netting shall be spaced 5 feet apart.

Method 4

No anchoring is required.

VI. IRRIGATION

When specified, irrigation water shall be applied during the establishment period at the times and rates as listed on the Practice Requirements sheet.

VII. OTHER REQUIREMENTS

Other details for the establishment and maintenance of the plants including, but not limited to, the need for livestock and traffic control shall be applied when specified on the Practice Requirements sheet.

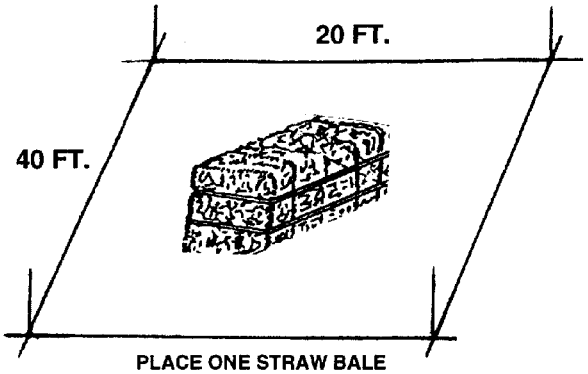
Measures and methods that enhance fish and wildlife values, protect visual resources, and maintain key shade, food, and den trees shall be performed when specified on the Practice Requirements sheet.

Operations shall be done in such a manner that soil erosion and air and water pollution are minimized and held within legal limits.

The owner, operator, contractor, or other persons shall conduct all work and operations in accordance with proper safety codes for the type of work being performed with due regards to the safety of all persons and property.

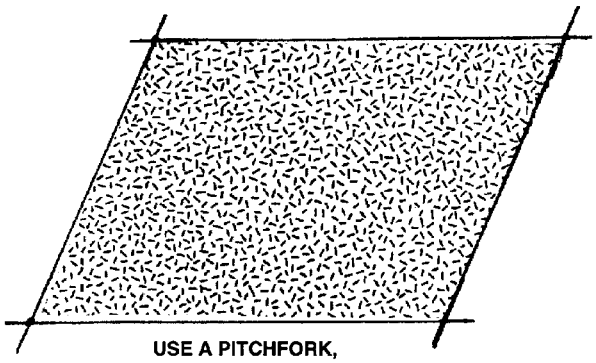
SPREAD THE STRAW

MARK OFF 800 SQ FT. PLOTS



PLACE ONE STRAW BALE
PER PLOT (~74 POUNDS).
THIS IS EQUIVALENT
TO 2 TONS PER ACRE.

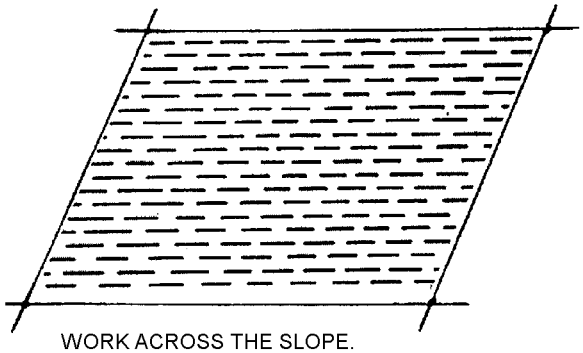
SPREAD EVENLY



USE A PITCHFORK,
SPADING FORK,
OR BY HAND

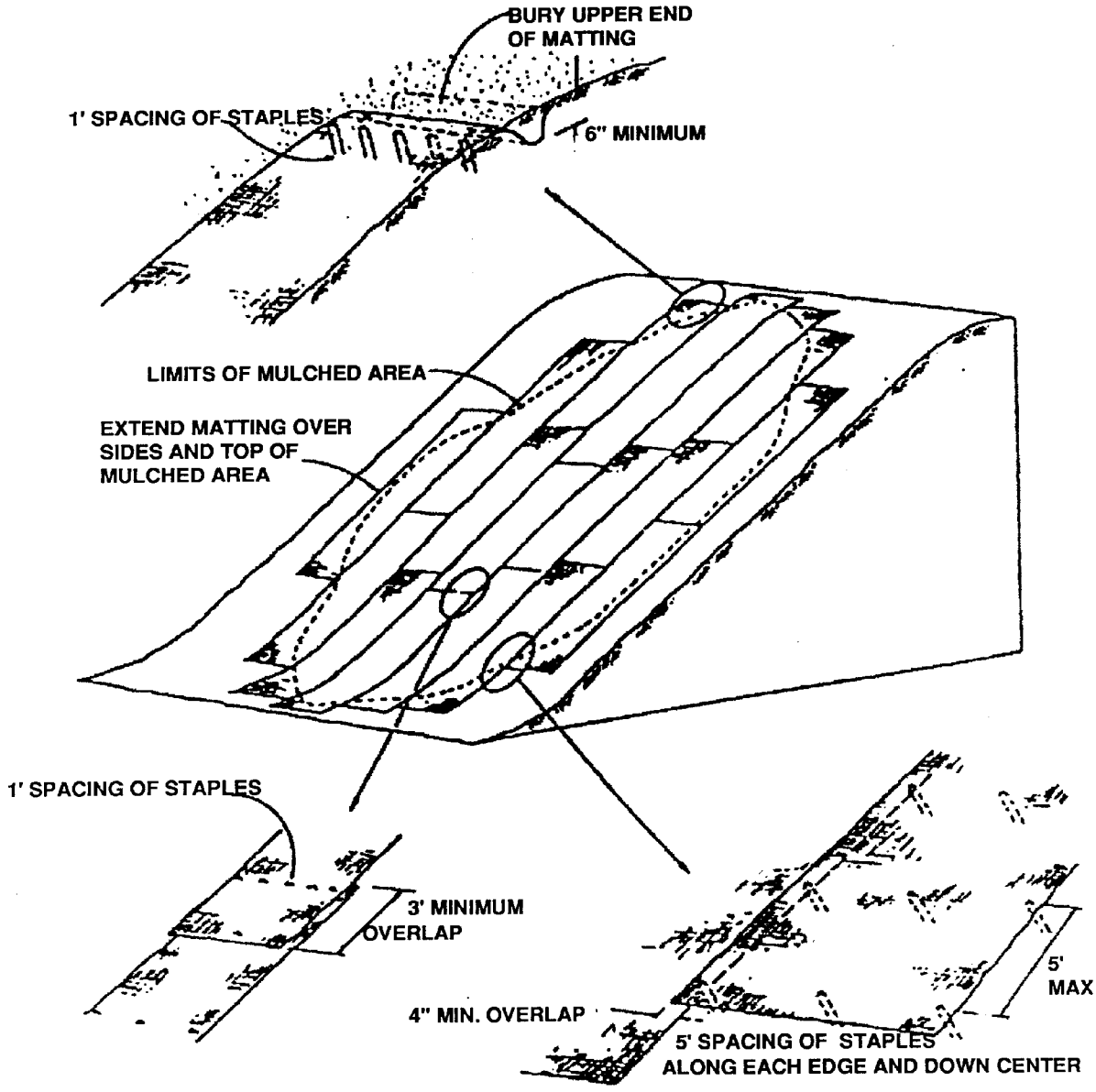
ANCHOR THE STRAW - METHOD 1

CRIMP BY HAND



WORK ACROSS THE SLOPE.
PUNCH STRAW 3 TO 4 INCHES DEEP.
A SQUARE END SPADE WORKS WELL.
MAKE PUNCH EVERY 12 INCHES.

ANCHOR THE STRAW - METHOD 2

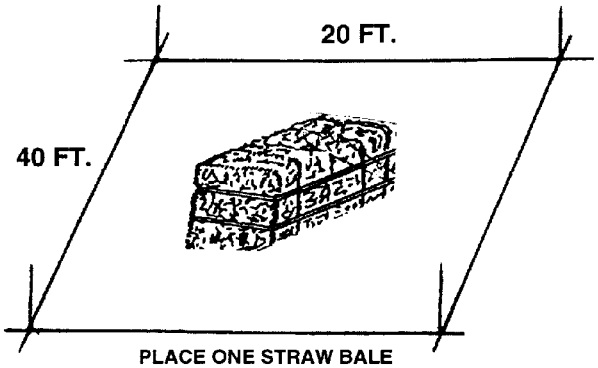


DRAWING 342A - 2

ANCHOR THE STRAW - METHOD 2

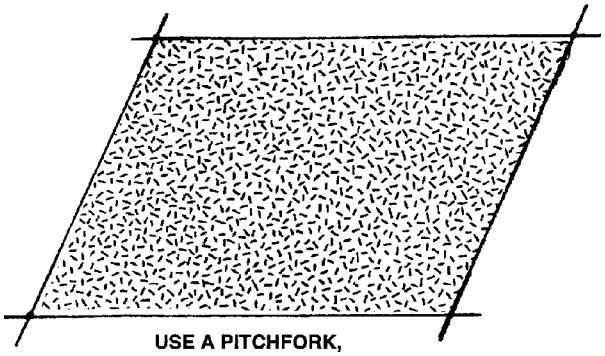
SPREAD THE STRAW

MARK OFF 800 SQ FT. PLOTS



PLACE ONE STRAW BALE PER PLOT (~74 POUNDS). THIS IS EQUIVALENT TO 2 TONS PER ACRE.

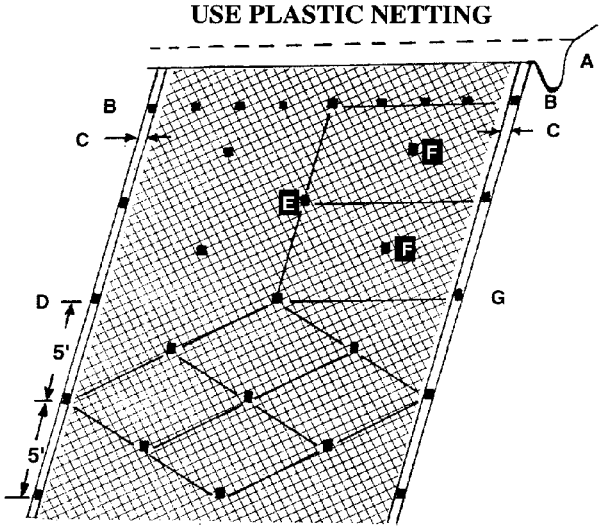
SPREAD EVENLY



USE A PITCHFORK, SPADING FORK, OR BY HAND

ANCHOR THE STRAW - METHOD 3

USE PLASTIC NETTING



A. LAY BIRD CONTROL NETTING OR SIMILAR MATTING IN STRIPS DOWN THE SLOPE OVER THE STRAW. BURY UPPER END IN 6-8 INCH DEEP AND WIDE TRENCH. MOST NETTING COMES IN 14 TO 17 FT. WIDE ROLLS.

B. SECURE THE UPPER END WITH STAKES EVERY 2 FEET.

C. OVERLAP SEAMS ON EACH SIDE 4-5 INCHES.

D. SECURE SEAMS WITH STAKES EVERY 5 FEET.

E. STAKE DOWN THE CENTER EVERY 5 FEET.

F. STAKE MIDDLES TO CREATE DIAMOND PATTERN THAT PROVIDES STAKES SPACED 4-5 FEET APART.

G. USE POINTED 1X2 INCH STAKES 8 TO 9 INCHES LONG. LEAVE 1 TO 2 INCH TOP ABOVE NETTING, OR USE "U" SHAPED METAL PINS AT LEAST 9 INCHES LONG.

NOTE WHEN JOINING TWO STRIPS, OVERLAP UPPER STRIP 3 FEET OVER LOWER STRIP AND SECURE WITH STAKES EVERY 2 FEET LIKE IN "B" ABOVE.

DRAWING 342A - 3

NRCS, CA
July, 2000

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
CALIFORNIA

PRACTICE REQUIREMENTS
FOR
342A - CRITICAL AREA PLANTING - STRAW MULCH

For: Residential Property Evaluation Program Identification Number: 05

Job Location A residential property in the Rainbow Creek watershed

County San Diego RCD Mission RCD Farm/Tract No. _____

Referral No. _____ Prepared By Bethany Principe Date 10-17-2014

IT SHALL BE THE RESPONSIBILITY OF THE OWNER TO OBTAIN ALL NECESSARY PERMITS AND/OR RIGHTS, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THIS INSTALLATION.

Installation shall be in accordance with the following drawings, specifications and special requirements. NO CHANGES ARE TO BE MADE IN THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF THE NRCS TECHNICIAN.

1. Drawings, No. On Evaluation Plan Map

2. Practice Specifications 342A , _____, _____.

3. Seedbed Preparation _____, _____, _____

4. Seed To Be Decided By Owner rate _____ lbs/ac
   Seed _____ rate _____ lbs/ac
   Seed _____ rate _____ lbs/ac

5. Fertilizer _____ rate _____ lbs/ac

6. Mulch _____ rate _____ lbs/ac

7. Mulch anchoring shall be performed using Method _____

8. Planting shall be performed within the period _____

9. Special Requirements: _____

NRCS, CA
July, 2000

PRACTICE APPROVAL:

Job Classification:

Show the limiting elements for this job. This job is classified as, Class _____

Limiting elements:	Units
_____	_____
_____	_____
_____	_____
_____	_____

Area Treated = 0.04 acres Field Slopes = 5 to 9 percent

Approved by:_____ Date:_____

LANDOWNER'S/OPERATOR'S ACKNOWLEDGEMENT:

The landowner/operator acknowledges that:

a. He/she has received a copy of the drawings and specifications, and that he/she has an understanding of the contents, and the requirements.

b. He/she has obtained all the necessary permits.

c. No changes will be made in the installation of the job without prior concurrence of the NRCS technician.

d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by:_____ Date:_____

PRACTICE COMPLETION:

I have made an on site inspection of the site (or I am accepting owner/contractor documentation), and have determined that the job as installed does conform to the drawings and practice specifications.

Completion Certification by:

/s/_____ Date _____

Practice 468
Lined Waterway

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

LINED WATERWAY OR OUTLET

(Ft.)

CODE 468

DEFINITION

A waterway or outlet having an erosion-resistant lining of concrete, stone, synthetic turf reinforcement fabrics, or other permanent material.

PURPOSE

This practice may be applied as part of a resource management system to support one or more of the following purposes:

- Provide for safe conveyance of runoff from conservation structures or other water concentrations without causing erosion or flooding
- Stabilize existing and prevent future gully erosion
- Protect and improve water quality

CONDITIONS WHERE PRACTICE APPLIES

This practice applies if the following or similar conditions exist:

1. Concentrated runoff, steep grades, wetness, prolonged base flow, seepage, or piping is such that a lining is needed to control erosion
2. Use by people or animals precludes vegetation as suitable cover.
3. Limited space is available for design width, which requires higher velocities and lining.
4. Soils are highly erosive or other soil or climatic conditions preclude using vegetation only.

CRITERIA

General Criteria Applicable to All Purposes:

Capacity. The maximum capacity of the waterway flowing at designed depth shall not exceed 200 ft^3/s. The minimum capacity shall be adequate to carry the peak rate of runoff from a 10-year, 24-hour frequency storm. Velocity shall be computed by using Manning's Formula with a coefficient of roughness "n" as follows:

Lining	"n" Value
Concrete	
Trowel finish.....	0.011– 0.015
Float finish…….....	0.013 - 0.016
Shotcrete..... .	0.016 – 0.025
Flagstone..... .	0.020 – 0.025
1/ Riprap - (Angular Rock)	$n = 0.047(D_{50}\,S)^{0.147}$
Synthetic Turf Reinforcement Fabrics and Grid Pavers	Manufacturer's recommendations

1/ Applies on slopes between 2 and 40% with a rock mantle thickness of 2 x D_{50}

where:

D_{50} = median rock diameter (in.),
S = lined section slope (ft./ft.) ($.02 \leq S \leq 0.4$)

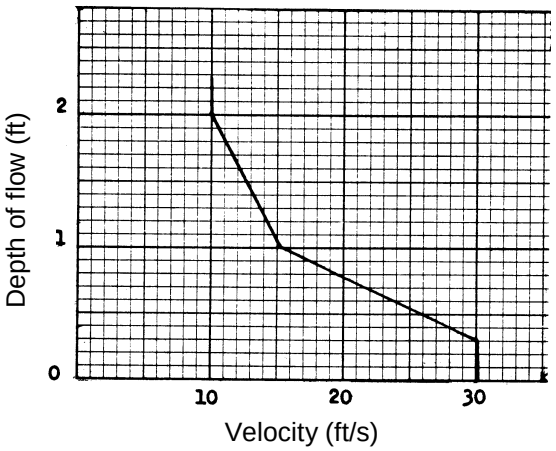


Figure 2. Maximum velocity versus depth of flow for concrete-lined channels

Velocity. Maximum design velocity and rock gradation limits for rock riprap-lined channel sections shall be determined using National Engineering Handbook (NEH), Part 650, Engineering Field Handbook, Chapter 16, Appendix 16A, or NEH 654.14C, unless a detailed design analysis appropriate to the specific slope, flow depth and hydraulic conditions indicate that a higher velocity is acceptable.

Maximum design velocity for concrete-lined sections should not exceed those using Figure 2.

Maximum design velocity for synthetic turf reinforcement fabrics and grid pavers shall not exceed manufacturer's recommendations.

Stable rock sizes and flow depths for rock-lined channels having gradients between 2 percent and 40 percent may be determined using the following detailed design process. This design process is from **Design of Rock Chutes** by Robinson, Rice, and Kadavy.

For channel slopes between 2% and 10%:

$$D_{50} = [q\,(S)^{1.5}/4.75(10)^{-3}]^{0.53}$$

For channel slopes between 10% and 40%:

$$D_{50} = [q\,(S)^{0.58}/3.93(10)^{-2}]^{0.53}$$

$$z = [n(q)/1.486(S)^{0.50}]^{0.6}$$

where:

D_{50} = Particle size for which 50% (by weight) of the sample is finer, in.

S = Bed slope, ft./ft.

z = Flow depth, ft.

n=Manning's roughness coefficient

q = Unit discharge, $ft^3/s/ft$

Avoid channel slopes between 0.7 and 1.3 of the critical slope except for short transition sections. Supercritical flow shall be restricted to straight reaches. Design guidance on the use of this equation is available in NEH 654.14C

Waterways or outlets with supercritical flow shall discharge into an energy dissipator to reduce discharge velocity to less than critical.

Side slope. The steepest permissible side slopes, horizontal to vertical, shall be:

Nonreinforced concrete:
Hand-placed, formed concrete
Height of lining, 1.5 ft or less .....Vertical
Hand-placed screeded concrete or mortared in place flagstone
Height of lining, less that 2 ft .....1 to 1
Height of lining, more than 2 ft .....2 to 1
Slip form concrete:
Height of lining, less than 3 ft .....1 to 1
Rock riprap .....2 to 1
Synthetic Turf Reinforcement Fabrics …2 to 1
Grid Pavers……..1 to 1

Cross section. The cross section shall be triangular, parabolic, or trapezoidal. Cross section made of monolithic concrete may be rectangular.

Freeboard. The minimum freeboard for lined waterways or outlets shall be 0.25 ft above design high water in areas where erosion-resistant vegetation cannot be grown adjacent to the paved or reinforced side slopes. No freeboard is required if vegetation can be grown and maintained.

Lining thickness. Minimum lining thickness shall be:

Concrete.....4 in. (minimum thickness shall be 5 in. if the liner is reinforced).

Rock riprap.....Maximum stone size plus thickness of filter or bedding

Flagstone.....4 in., including mortar bed

Synthetic Turf
Reinforcement Fabrics
and Grid Pavers……Manufacturer's
Recommendations

Lining Durability. Use of non-reinforced concrete or mortared flagstone linings shall be made only on low shrink-swell soils that are well drained or where subgrade drainage facilities are installed.

Related structures. Side inlets, drop structures, and energy dissipators shall meet the hydraulic and structural requirements for the site.

Outlets. All lined waterways and outlets shall have a stable outlet with adequate capacity to prevent erosion and flooding damages.

Geotextiles. Geotextiles shall be used where appropriate as a separator between rock, flagstone, or concrete linings and soil to prevent migration of soil particles from the subgrade, through the lining material. Geotextiles shall be designed according to AASHTO M288, Section 7.3., NEH 654.14D,or NRCS Design Note 24, Guide for the Use of Geotextiles.

Filters or bedding. Filters or bedding shall be used where appropriate to prevent piping. Drains shall be used to reduce uplift pressure and to collect water, as required. Filters, bedding, and drains shall be designed according to NEH Part 633, Chapter 26. Weep holes may be used with drains if needed.

Concrete. Concrete used for lining shall be proportioned so that it is plastic enough for thorough consolidation and stiff enough to stay in place on side slopes. A dense durable product shall be required. Specify a mix that can be certified as suitable to produce a minimum strength of 3,000 pounds per square inch.

Contraction joints. Contraction joints in concrete linings, if required, shall be formed transversely to a depth of about one-third the thickness of the lining at a uniform spacing in the range of 8 to 15 feet. Provide steel reinforcement or other uniform support to the joint to prevent unequal settlement.

Site and Subgrade Preparation. Proper site preparation is necessary to provide a stable, uniform foundation for the waterway lining. The site should be graded to remove any rutting or uneven surfaces and to provide good surface drainage throughout the construction period and the design life of the waterway or outlet. Proof rolling can be used to identify soft pockets of soil, additional rutting, or other soil conditions that require removal, and replacement by compacted soil to provide a uniform surface for base, subbase, or concrete liner.

CONSIDERATIONS

Streambank Soil Bioengineering. Trees, shrubs, forbs and grasses can be incorporated into or adjacent to the lined portions of the channel. This may improve aesthetics and habitat benefits as well as reduce erosion potential. Plantings are especially beneficial where the channel transitions to natural ground. However, such plantings are not appropriate in all circumstances. Guidance on the use of plantings is available in NEH 654.14I and NEH 654.14K.

Fish and Wildlife Resources. This practice may impact important fish and wildlife habitats such as streams, creeks, riparian areas, floodplains, and wetlands.

Aquatic organism passage concerns (e.g., velocity, depth, slope, air entrainment, screening, etc.) should be evaluated to minimize negative impacts. Swimming and leaping performance for target species should be considered.

Important fish and wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the lined waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of the grassed portion of the lined waterways so they do not interfere with hydraulic functions and roots do not damage the lined portion of the waterway. Mid- or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat.

Plant selections that benefit pollinators should be incorporated into the design. Waterways with these wildlife features are more beneficial when connecting other habitat types: e.g., riparian areas, wooded tracts, and wetlands.

Other Considerations.

Filter strips established on each side of the waterway may improve water quality.

Consideration should be given to livestock and vehicular crossings as necessary to prevent damage to the waterway. Crossing design shall not interfere with design flow capacity.

Reinforcement of concrete liners should be considered where high pore water pressures exist in the subgrade, movement of the subgrade may occur, or in reaches where failure would endanger public safety or property.

Cultural Resources and Endangered Species

This practice is likely to occur in areas where Cultural Resources or Endangered Species habitat may be found. Follow NRCS Planning Policy to address these concerns.

PLANS AND SPECIFICATIONS

Plans and specifications for lined waterways or outlets shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

As a minimum the plans and specifications shall include:

- A plan view of the layout of the lined waterway or outlet.
- Typical cross section of the lined waterway or outlet.
- Profile of the lined waterway or outlet.
- Disposal requirements for excess soil material.
- Site specific construction specifications that describe the installation of the lined waterway or outlet. Include specification for control of concentrated flow during construction.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity and outlet stability.

Lining damaged by machinery or erosion must be repaired promptly.

Inspect lined waterways regularly, especially following heavy rains. Damaged areas shall be repaired immediately. Remove sediment deposits to maintain capacity of lined waterways.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover. Control noxious weeds. Do not use as a field road. Avoid crossing with heavy equipment.

REFERENCES

AASHTO M288. Standard Specification for Geotextile Specification for Highway Applications.

National Engineering Handbook, Part 654, Stream Restoration Design, August 2007.

National Engineering Handbook, Part 650, Engineering Field Handbook: Chapter 16, Streambank and Shoreline Protection.

National Engineering Handbook, Part 633, Soil Engineering: Chapter 26 – Gradation Design of Sand and Gravel Filers.

Robinson, K.M., C.E. Rice, and K.C. Kadavy. 1998. Design of Rock Chutes.Transactions of ASAE, Vol. 41(3): 621-626.

USDA, NRCS Guide for the Use of Geotextiles. Design Note 24 (210-VI-DN-24, 1991).

USDA, NRCS, Pollinator Conservation. http://www.plant-materials.nrcs.usda.gov/news/features/pollinatorconservation.html (accessed August 20, 2009.)

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

468 - LINED WATERWAY OR OUTLET

I. SCOPE

The work shall consist of grading and shaping a waterway to the lines and grades as shown on the drawings, and includes furnishing and placing a lining of the type and thickness as specified.

II. MATERIALS

Concrete, when specified, will be placed in conformance with the requirements of Construction Specification 900 – Concrete (3000 psi).

Rock riprap, when specified, rock will be placed in conformance with the requirements of Construction Specification 907 - Rock Riprap.

Other materials, when specified other materials will be placed in conformance with the requirements of Special Construction Specifications to be attached to the drawings.

Geotextile fabric, when specified will conform to the required of Construction Specification 905 - Geotextile Fabric.

III. SITE PREPARATION

The foundation area shall be cleared of all trees, stumps, roots, brush, boulders, sod, debris, and other objectionable materials. All topsoil shall be removed and stockpiled until the needed for spreading over areas requiring vegetative cover. Removal operations shall be done in such a manner as to avoid damage to other trees and property.

IV. FOUNDATION

To shape the required cross-section, excavation shall be to the lines and grades as shown on the drawings, or as staked in the field. Subgrade shall be firm and free of water. Any earthfill required to bring subgrade to grade, shall be placed in layers not exceeding 8-inches, and compacted to the same density as the adjacent undisturbed material.

V. PLACEMENT

Placement of the lining materials shall be conformance of the Construction Specification as shown on the Practice Requirement sheet, and as shown on the drawings.

VI. VEGETATIVE COVER

Unless otherwise specified, a protective cover of vegetation shall be established on the disturbed area. The planting of vegetative materials shall conform to the requirements of Practice Specification 342, Critical Area Planting.

VII. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical, that enhance fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food and den trees.

VIII. CONSTRUCTION OPERATIONS

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

The completed job shall be workmanlike and present a good appearance.

U.S DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
CALIFORNIA

PRACTICE REQUIREMENTS
FOR
468 - LINED WATERWAY OR OUTLET

For: Residential Property Evaluation Program Identification Number: 05

Job Location A residential property in Rainbow, CA in the Rainbow Creek watershed

County San Diego RCD Mission RCD Farm/Tract No. _____

Referral No. _____ Prepared By Bethany Principe Date 10-17-2014

IT SHALL BE THE RESPONSIBILITY OF THE OWNER TO OBTAIN ALL NECESSARY PERMITS AND/OR RIGHTS, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THIS INSTALLATION.

Installation shall be in accordance with the following drawings, specifications and special requirements. NO CHANGES ARE TO BE MADE IN THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF THE NRCS TECHNICIAN.

1. Drawings, No. On Conservation Plan Map

2. Practice Specifications 468 , _____ , _____

3. Type of Lining _____ Thickness _____ (inches)(mils)

4. Elevation of turnout in relation to field elevation: _____

5. Special Requirements: _____

6. Special Maintenance Requirements: Repair the existing lined waterway to prevent it from degrading any further. Frequent inspection and removal of accumulated sediment and debris will help ensure the maximum efficiency of the practice.

PRACTICE APPROVAL:

Job Classification: (Ref: Section 501 NEM)

Show the limiting elements for this job. This job is classified as, Class _____III_____

Limiting elements:	Units
Drainage area	acres
Capacity	10 cfs

Design Approved by:_____ Date:_____

LANDOWNER'S/OPERATOR'S ACKNOWLEDGEMENT:

The landowner/operator acknowledges that:

a. He/she has received a copy of the construction drawings and specification, and that he/she has an understanding of the contents, and the requirements.

b. He/she has obtained all the necessary permits.

c. No changes will be made in the installation of the job without prior concurrence of the NRCS technician.

d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by:_____ Date:_____

PRACTICE COMPLETION:

I have made an on site inspection of the site (or I am accepting owner/contractor documentation), and have determined that the job as installed does conform to the drawings and practice specifications.

Completion Certification by:

/s/_____ Date _____

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

468 – LINED WATERWAY OR OUTLET

OPERATION AND MAINTENANCE

For: Residential Property Evaluation Program Identification Number: 05

Job Location A residential property in Rainbow, CA in the Rainbow Creek watershed

County San Diego RCD Mission RCD Farm/Tract No. _____

Referral No. _____ Prepared By Bethany Principe Date 10-17-2014

A properly operated and maintained lined waterway or outlet is an asset to the farm. This lining facility was designed and installed to provide erosion protection for the waterway or outlet. The estimated life span of this installation is at least 15 years. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program:

GENERAL RECOMMENDATIONS

- Maintain adequate drainage of foundations.
- Maintain widths of soil berms or banks. Avoid use of tillage equipment that accelerates soil removal.
- Drain all lined waterways or outlets when not being used. Immediately repair any cracks or breaks in the lining, and if settlement is present, investigate cause before repair.
- If livestock are present, prevent their access to linings and provide other drinking water facilities.
- Remove any blockage (sediments, debris, foreign material etc.) that restrict flow capacity.
- Immediately repair any vandalism, vehicular or livestock damage.
- Inspect for damage from rodents or burrowing animals. Repair any damage. Take appropriate corrective actions to alleviate further damage.
- Remove woody vegetation and perennials from areas adjacent to lining,
- Repair spalls, cracks and weathered areas in concrete surfaces.
- Repair or replace rusted or damaged metal and paint and apply paint as a protective coating.
- Avoid crossings of equipment or vehicles except at designated areas.

SPECIFIC RECOMMENDATIONS FOR YOUR LINED WATERWAY OR OUTLET

Regular inspection and repair of the waterway will help ensure the effectiveness of the practice.

CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR LINED WATERWAY OR OUTLET.

Practice 484
Mulching

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

484 - MULCHING

I. SCOPE

The work shall consist of furnishing all materials and placing them on the project area according to the Practice Requirements sheet to areas shown on the plan map or described in the plan.

II. MATERIALS

Straw

Straw shall be new straw derived from rice, wheat, oats, or barley. Clearance shall be obtained from the County Agricultural Commissioner, when required by law, before straw obtained outside the county in which it is to be used is delivered to the site.

Wood Fiber

Wood fiber shall be a wood cellulose fiber that contains no germination or growth inhibiting factors. The wood fiber has the property to be evenly dispersed and suspended when agitated in water. The wood fiber mulch may also be produced from the following materials:

A. Recycled wood fiber, such as wood chips or similar wood materials

B. A combination of recycled newsprint and cardboard materials that contain at least 50 percent cardboard or,

C. A combination of recycled newsprint and non-recycled wood fiber or recycled wood fiber materials that does not contain more than 50 percent newsprint

Tackifier

Tackifier material shall be of the material specified on the Practice Requirements Sheet and shall have the property to be evenly dispersed and suspended in water when agitated. It shall be colored with a nontoxic water-soluble dye to provide a proper gauge for metering of material over ground surfaces. Anionic Polyacrylaimide based tackifiers shall be applied in accordance with manufacturer's specifications.

Jute Matting

Jute matting shall be of cloth of uniform plain weave of undyed and unbleached jute yarn with a minimum weight of 1 pound per 10 square feet, and shall have ¾ inch square openings**.**

Excelsior Matting

Excelsior matting shall consist of a mat of wood excelsior fiber with a consistent thickness and the fiber evenly distributed over the entire area of the blanket. At least 70% of the fibers shall be 6 inches or longer in length. The topside of the blanket shall be covered with a biodegradable, extruded plastic mesh with a maximum opening size of 2 by 2 inches.

Plastic Netting

Plastic netting shall be polypropylene extruded plastic netting with square or rectangular openings not greater than 1 inch and a weight of not less than 2.6 pounds per 1000 square feet.

Staples, Pins, and Stakes

Staples, pins, and stakes shall be of metal, wood, plastic, or other acceptable material and of a length as specified on the Practice Requirements Sheet.

Plastic Mulches

Plastic mulches shall be chosen based on their purpose considering mulch properties such as durability, color, and permeability or semi-permeability of material to specific electromagnetic wavelengths or chemicals. Plastic mulch will be removed from the field and not incorporated into the soil after meeting the intended use. Plastic mulch will be recycled if possible.

Other Materials

Other materials shall be used when specified on the Practice Requirements Sheet.

III. MULCHING DATES

Mulching shall be performed prior as specified on the Practice Requirements Sheet.

IV. SITE PREPARATION

Trash, weeds, and other debris that will interfere with mulch application, effectiveness, or maintenance shall be removed. No implement shall be used that will create an excessive amount of downward movement of clods on sloping areas. Site preparation shall be suspended when soil moisture conditions are not suitable for obtaining a satisfactory surface.

V. APPLYING THE MULCH

Use one of the following methods of application as specified on the Practice Requirements Sheet.

Mulching with Wood Fiber

A wood fiber covering shall be distributed uniformly over the area in a water slurry by hydroseeder.

The slurry shall contain wood fiber at the rate of 2,000 pounds per acre with a tackifier unless a different amount is specified on the Practice Requirements Sheet.

Application rates for wood fiber mulch products that have moisture contents greater than 15 percent shall be increased by the following factor, c:

$$c: = \frac{85 \text{ percent}}{\text{percent fiber (solids) in product}}$$

The application rate of the tackifier shall be consistent with the manufacturer's recommendation for the site conditions and the intended purpose unless otherwise indicated on the Practice Requirements sheet.

The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce a homogenous slurry and a discharge system which will apply the slurry to the slopes at a continuous and uniform rate.

The materials shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class 1 or 2 agricultural irrigation water.

The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts.

The slurry shall be applied uniformly over the site.

Mulching with Straw

A straw covering shall be distributed uniformly over the area at the rate specified on the Practice Requirements Sheet. The straw shall be applied by hand, blower, or other suitable equipment. If straw is applied by blower, it shall not be chopped in lengths less than 6 inches.

Anchoring the Straw Mulch

When specified on the Practice Requirements Sheet, the straw mulch shall be anchored in place. The anchoring process may include hand tools, mulching rollers, disks, or similar types of suitable equipment alone or in combination with a hydro-mulch material and shall be performed in a satisfactory manner. When specified on the Practice Requirements Sheet, hydro-mulch material alone may be used.

Anchoring may be accomplished using the following:

Hand Punching: A spade or shovel shall be used to punch the straw into the slope until 95 percent of the area has straw standing perpendicular to the slope and embedded at least 3 inches into the soil. It shall be punched from 12 to 18 inches apart.

Roller punching: A roller equipped with straight studs not less than 6 inches long, from 4 to 6 inches wide and approximately 1 inch thick shall be rolled over the slope.

Crimper Punching: A crimper with serrated disk blades about 4 to 8 inches apart shall be rolled over the slope forcing the straw mulch into the soil. Crimping should be done in two directions with the final pass across the slope.

The following shall be used on large steep areas which cannot be punched by hand or by roller:

Matting. Jute, excelsior or other matting specified on the Practice requirements Sheet shall be utilized.

Matting shall be applied up and down slope and continue beyond the edge of the mulched area at least I foot.

Matting shall be cut around objects so that it lies flat on the soil surface.

At the top of the area the matting shall be buried in a trench at least 6 inches deep.

Overlap: Sides of the rolls shall overlap at least 4 inches. Overlapping ends will have at least 6 inches of overlap with the uphill roll overlying the downhill roll.

Staple: Staples shall be driven perpendicularly into the slope and spaced approximately 5 feet apart on the sides of the rolls and approximately 1-foot apart where the ends of the rolls overlap.

Plastic Netting

Plastic netting shall be applied up and down slope and shall continue beyond the edge of the mulched area at least one foot at the sides, top, and bottom of the area.

At the top of the area, the netting shall be buried in a trench at least 6 inches deep.

Overlap: Sides of the rolls shall overlap at least 4 inches. Overlap the upper strip 3 feet over the lower strip and secure with stakes every 2 feet.

Staples, pins, or stakes shall be driven perpendicularly into the slope.

Secure the upper end with stakes every 2 feet. The sides of the rolls shall be secured with stakes spaced approximately 5 feet apart. Additionally, the center of each roll shall be secured down the center approximately every 5 feet.

Where the ends of the rolls overlap, secure with stakes approximately 2 feet apart.

Tackifier

The hydro-mulch material shall be applied uniformly over the straw in water slurry by hydroseeder within 48 hours following mulching. Unless otherwise specified on the Practice Requirements Sheet, the hydro-mulch shall be wood fiber mulch, a tackifier, and water at rates recommended by the manufacturer for the site conditions and intended purpose.

Application rates for wood fiber mulch products that have moisture contents greater than 15 percent shall be increased by the following factor, c:

$$c: = \frac{85 \text{ percent}}{\text{percent fiber (solids) in product}}$$

The hydroseeder shall be equipped with a built-in continuous agitation system of sufficient operating capacity to produce homogenous slurry and a discharge system, which will apply the slurry to the slopes at a continuous and uniform rate.

The materials shall not remain in the slurry longer than two (2) hours. Water used shall be potable water or Class 1 or 2 agricultural irrigation water.

The slurry shall be continuously mixed and shall be mixed for at least five (5) minutes after the last addition before application starts.

The slurry shall be applied uniformly over the site.

Apply Anionic Polyacrylamide stabilized fiber mulch as recommended by manufacturer,

Mulching with Gravel

A gravel covering, with the size of the gravel specified on the Practice Requirements Sheet shall be distributed uniformly over the area at the rate specified on the Practice Requirements sheet. A fabric may be placed under the gravel.

Mats

Mats shall be applied as specified on the Practice Requirements Sheet. They will be anchored in a manner that will keep them in place.

Amendments for soil condition in organic systems

Amendments must be certified for N, P, and K content, and C:N ratio. These materials may be tilled. Adequate residue must be left to control erosion to T or less. A positive SCI rating for the field must be maintained.

Mulching with Other Materials

Other material(s) shall be applied according to manufacturers' specification or as described on the Practice Requirements Sheet. Material from municipal sources may contain only trace amounts of trash.

VI. OTHER REQUIREMENTS

Operations shall be done in such a manner that soil erosion and air and water pollution are minimized and held within legal limits.

The owner, operator, contractor, and other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operations being performed with due regards to the safety of all persons and property.

U.S DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
CALIFORNIA

PRACTICE REQUIREMENTS
FOR
484 – MULCHING

For: Residential Property Evaluation Program Identification Number: 05

Job Location A residential property in Rainbow, CA in the Rainbow Creek watershed

County San Diego, CA RCD Mission RCD Farm/Tract No.

Referral No. Prepared By Bethany Principe Date 10-17-2014

IT SHALL BE THE RESPONSIBILITY OF THE OWNER TO OBTAIN ALL NECESSARY PERMITS AND/OR RIGHTS, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THIS INSTALLATION.

Installation shall be in accordance with the following drawings, specifications and special requirements. NO CHANGES ARE TO BE MADE IN THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF THE NRCS.

1. Drawings, No. Evaluation Plan Map

2. Practice Specifications 484 , ,

3. Mulch Wood Chips, Compost or Landscape Clippings (straw on slopes greater than 33%) rate 90-300 tons/ac

   Depth of coverage 3-4 inches Minimum Percent of Coverage 85 %

4. Work shall be performed within the period

5. Method of Applying the Mulch Hand or Machine spreading

6. Method of Anchoring the Mulch Unnecessary on slopes less than 33%

   Tackifier: Type: _____ Rate: _____

   Hand Punch ___ Roller Punch ___ Crimper Punch ___ Matting ___ Plastic Netting ___

7. Plastic or geotextile mulch description and installation: N/A

8. Special Requirements: Mulch must be weed-free. Ground should be as weed-free as possible prior to application. Use course-textured mulch. If organic, check with your certifying agency before application. Avoid direct contact between mulch and plants. If ground is currently nitrogen deficient, include a small amount of nitrogen-rich material in order to prevent nitrate depression.

NRCS, CA
October 2011

9. Maintenance: Maintain at a depth of 3-4 inches. Practice expected lifespan is one year.

PRACTICE APPROVAL:

Job Classification:

Show the limiting elements for this job. This job is classified as, Class II

Limiting elements:	Units

Area Mulched = 0.17 acres

Approved by: Date:

LANDOWNER'S/OPERATOR'S ACKNOWLEDGEMENT:

The landowner/operator acknowledges that:

a. He/she has received a copy of the drawings and specifications, and that he/she has an understanding of the contents, and the requirements.

b. He/she has obtained all the necessary permits.

c. No changes will be made in the installation of the job without prior concurrence of the NRCS technician.

d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by: Date:

PRACTICE COMPLETION:

I have made an on site inspection of the site (or I am accepting owner/contractor documentation), and have determined that the job as installed does conform to the drawings and practice specifications.

Completion Certification by:

/s/ Date

Practice 734
Fish and Wildlife Structure

Raptor Perch

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FISH AND WILDLIFE STRUCTURE

(No.)

CODE 734 (INTERIM PRACTICE)

DEFINITION

A structure designed and installed specifically for fish or wildlife.

PURPOSE

To improve overall habitat conditions for fish or wildlife species. This practice may be applied as part of a fish or wildlife habitat management plan to serve one or more of the following functions:

- Provide structure for loafing, escape, nesting, rearing, roosting, perching, or basking.
- Provide an escape, avoidance, or exclusionary feature from otherwise life-threatening conditions.
- Provide alternative cover when natural cover is not readily available.
- Isolate native species populations from non-natives.
- Improve or restore habitat connectivity.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where the land manager has identified an objective to conserve fish or wildlife.

CRITERIA

Structures shall be designed and installed to meet the targeted species biology and life history needs.

Structures will be designed according to the applicable Biology Technical Notes or other design references approved by the NRCS state office.

Plastic and fiberglass structures shall be made of ultraviolet resistant materials and may be coated with non-toxic substances for additional protection from deterioration due to sunlight exposure.

Structures shall be built to withstand expected environmental conditions at the site to maximize structural lifespan, stability, and habitat benefits.

CONSIDERATIONS

Give consideration to effects the location of the structure will have on targeted and non-targeted species.

Consider the need to prevent increased predation on both targeted and non-targeted fish and wildlife species as a result of installation of structures under this practice.

Consider combining this practice with vegetative practices to establish natural habitat features in the long term.

Types of fish and wildlife structures to consider include:

- Artificial nest boxes or platforms for species such as cavity-nesting birds, bats, pollinators, and waterfowl
- Artificial cover such as brush piles, rock piles, buried concrete pipe, engineered log jams
- Wood structures in or along stream banks for fish cover
- Natural cover manipulation, such as girdling trees to encourage snag development

- Measures to facilitate passage including elk jumps, escape ramps, road crossings
- Measures to inhibit passage including predator guards, non-native fish barriers, beaver dam exclusion features

PLANS AND SPECIFICATIONS

Plans and specifications for installing fish and wildlife structures shall be in keeping with this standard and shall describe the biological and physical requirements for applying the practice.

The plan shall specify the location, quantities, dimensions, materials, and timing of installation for each structure.

OPERATION AND MAINTENANCE

Operation and maintenance provisions shall be provided to and reviewed with the land manager. The provisions shall be site specific and include but not be limited to the following:

- Structures will be inspected at least semi-annually and after major storms
- Necessary maintenance, including removal of debris, shall be performed

REFERENCES

May, H. 2001. Artificial Nesting Structures. USDA Natural Resources Conservation Service Wildlife Habitat Management Institute and Wildlife Habitat Council, Fish and Wildlife Habitat Leaflet, No 20

Mueller, J. 1999. American kestrel. USDA Natural Resources Conservation Service Wildlife Habitat Management Institute and Wildlife Habitat Council, Fish and Wild-life Habitat Management Leaflet, No. 3.

Mueller, J. 1999. Bats. USDA Natural Resources Conservation Service Wildlife Habitat Management Institute and Wildlife Habitat Council, Fish and Wild-life Habitat Management Leaflet, No. 5.

Novinger, D. C. and Rahel, F.J. 2003. Isolation management with artificial barriers as a conservation strategy for cutthroat trout in headwater streams. Conservation Biology 17: 772-781.

Oregon NRCS Biology Technical Notes: http://www.or.nrcs.usda.gov/technical/ecs/biology/biology-technotes.html

Payne, N. F. and F. C. Bryant. 1994. Techniques for wildlife management of uplands. McGraw-Hill, New York, NY.

Payne, N. F. 1992. Techniques for wildlife habitat management of wetlands. McGraw-Hill, New York, NY.

Rewa, C. 1999. Wood duck. USDA Natural Resources Conservation Service Wildlife Habitat Management Institute and Wildlife Habitat Council, Fish and Wild-life Habitat Management Leaflet, No. 1.

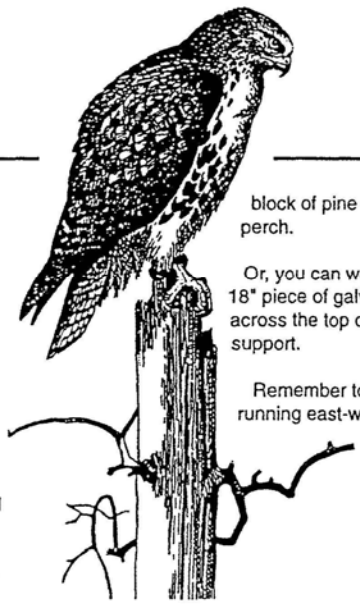
Tuttle, M. D. and D. Hensley. 1993. The bat builder's hand-book (2000 revision). Bat Conservation International, Austin, Texas, USA. 30

ARTIFICAL PERCHES FOR RAPTORS

Plans and Instructions

United States Department of Agriculture

Natural Resources Conservation Service
Davis, CA 95616



ENCOURAGE RAPTORS IN YOUR AREA FOR MORE EFFICIENT RODENT CONTROL

Raptors are birds of prey that are greatly beneficial in controlling of rodents. A small, one-time investment in artificial perches can help increase the presence of these birds in your area, reducing the need for other methods of pest control.

PERCH SITES

Raptors hunt in open areas such as mowed alfalfa fields, golf courses, vineyards, along roadsides, ditch banks, rural school grounds and meadows. Any of these areas are good potential perch sites.

By providing strategically-located vantage points to these sharp-sighted birds through artificial perches you can help improve the hunting efficiency of raptors, reducing rodent pests. These perches can be especially valuable in the winter and early spring, before the primary rodent breeding season when many crops are either absent or provide little

While we are not familiar with any studies of the impact of artificial perches on rodent populations, it would clearly be beneficial to your raptor population if artificial perches make it easier for them to spot prey or help them use less energy to hunt.

IMPORTANT POINTS TO CONSIDER

All perches should be placed with the horizontal axis pointing east-west to avoid instability due to wind direction and changing visibility due to sun and moonlight.

Artificial perches are readily accepted by many resident raptors, including American kestrels, barn owls, great horned owls, burrowing owls, short-eared owls, red-tailed and red-shouldered hawks and black-shouldered kites.

Perches can be erected any time of year. The acceptance and use of the perches by raptors indicate that perches may prove useful as a management tool for raptors.

BUILDING A PERCH

Artificial perches are easy to build. The ideal material is 3/4" galvanized steel pipe, 18' long. Set the pipe about 3 feet deep in the ground with an 18" x 2" x 2" rounded edge block of pine or redwood as the perch.

Or, you can weld a 1 1/2N to 2" x 18" piece of galvanized steel pipe across the top of the vertical support.

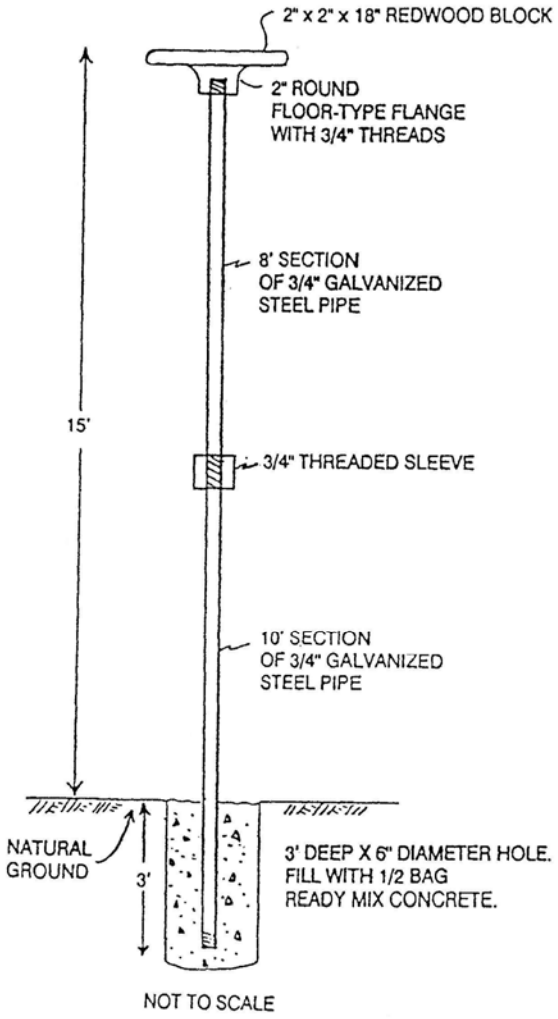
Remember to place the perch running east-west, longways.

Job sheet compiled by Patrick J. Burke, (Natural Resources Conservation Service, Escondido) from a research paper, "Raptor Use of Artificial Perches," by Timothy R. Hall, Walter E. Howard and Rex E. Marsh, Wildlife and Fisheries Biology, University of California at Davis, 1980 and 1981.

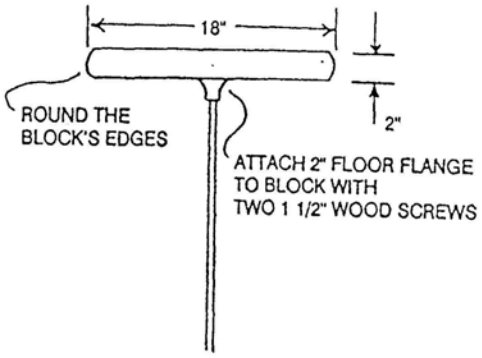
Revised January 1996 Job Sheet CA-502

ARTIFICAL PERCHES FOR RAPTORS

Plans



NOT TO SCALE



BLOCK DETAIL
SCALE 1:10

MATERIALS

A. TWO 10' SECTIONS GALVANIZED STEEL POPE, 3.4" DIAMETER
B. ONE 2"X2"X18" REDWOOD BLOCK
C. TWO 1 1/2" WOOD SCREWS
D. ONE CUBIC FOOT READY MIX CONCRETE
E. ONE 2"X3/4" FLOOR FLANGE
F. ONE 3/4" THREADED SLEEVE
G. ONE CAN "DUNE TAN" RUST PREVENTIVE SPRAY PAINT

NOTES

1. PAINT ALL ABOUVE-GROUND STEEL WITH "DUNE TAN" RUST PREVENTIVE PAINT.
2. MIX CONCRETE AS RECOM MENDED BY MANUFACTURER.
3. ORIENT THE PERCH EAST TO WEST TO MINIMIZE GLARE.

REFERENCE

THE WILDLIFE SOCIETY
VOLUME 9, NUMBER 4, WINTER 1981
PAGES 296-298

Managing Ground Squirrels

Based on University of California's Ground Squirrel Best Management Practices

Live Catch Trapping

Time of Year: All year
Efficacy: Medium
Cost of Materials: Medium
Labor: High
Restrictions: High

HOW THEY WORK:
You set up numerous traps in infested areas and the door closes once the animal has gone far enough inside the trap and trips the spring. Using bait in the trap lures the squirrel in. After trapping the squirrel, you must euthanize it.

HOW TO USE IT:
1. Place traps near burrows or in runways, but not directly in front of burrows. Squirrels forage for food and will be more likely to enter them if they are set several feet from the burrow entrance. Be sure to secure trap to the ground or other solid object to prevent scavengers from carrying them off.
2. Prebait but do not set the traps with the same bait you will use when trapping. This will increase the effectiveness of the traps. Bait must be at least as attractive as what they are currently feeding on. Good baits are walnuts, almonds, slices of orange, pieces of melon, wheat, oats, and barley.
3. After 2-3 days, re-bait and set traps.
4. Check traps twice daily to remove squirrels.
5. Euthanize animals and dispose of properly.
6. Release the trigger in the evening to avoid trapping nocturnal animals.

SAFETY:
These traps are relatively safe to use in public areas.

WHERE TO GET IT:
Live catch traps are available at your local hardware and garden store.

LAWS AND REGULATIONS :
After trapping a ground squirrel it must be euthanized. It is illegal to relocate and release ground squirrels into another area.
The Department of Fish and Game stipulates that traps must be checked and animals removed at least once daily.

OTHER CONSIDERATIONS:
Birds and other animals can get caught inside traps. Fortunately, live catch traps generally don't seriously harm these non-target animals.

- Do not set the trap close to the burrow entrance.
- These traps (right) are placed correctly, several feet from the burrow entrance.
- Trap covers help to provide shade for the squirrels and prevent inhumane death. They also help to keep birds out of the traps.

Habitat Modification and Biological Control

Time of Year: All year
Efficacy: Low
Cost of Materials: Low
Labor: Medium
Restrictions: Low

HOW IT WORKS:
Habitat modification generally means physically removing or adding things that change the habitat for ground squirrels. There are 4 basic methods of altering a squirrel's habitat; their effect on control appears limited. Another more efficient method of habitat modification is burrow destruction.

HOW TO USE IT:
Eliminating piles
Burn brush piles and eliminate trash piles immediately. Squirrels will often use these for cover if they are available. However, removing these piles is no guarantee that you will have any affect on the population. Squirrels infest areas with no cover without a problem.

Vegetative Cover
It has been found that squirrels generally prefer open areas to areas with dense vegetation. However, studies that have looked at planting dense vegetative cover have not shown much success in control.

Cultivation
Land under frequent tillage, such as for crops, may deter California ground squirrels from inhabiting in the tilled area. However, that will not keep them from inhabiting the area immediately surrounding the land. And it will not keep the squirrels from foraging in that area for food.

BIOLOGICAL CONTROL:
Biological control, or predation, is also considered a method of habitat modification. Many predators eat ground squirrels, including hawks, eagles, rattlesnakes, and coyotes.

Burrow Destruction

Time of Year: All year
Efficacy: Medium
Cost of Materials: Medium
Labor: Medium
Restrictions: Low

HOW IT WORKS:
Ground squirrels work hard on their burrows and do not abandon them easily. They continue to improve their burrows through multiple years and generations, creating complex systems that can be anywhere from 3 to 30 feet long and 2 to 4 feet deep. It has been observed that when burrows are abandoned, new squirrels will reinfest the area and occupy the old burrows. By destroying the burrows, you will slow or prevent the reinfestation of ground squirrels.

HOW TO USE IT:
Use a ripping blade attached to a tractor. Drag the blade over the burrow entrances. You want to go at least 18 inches deep. Anything less than that does not seem to be nearly as effective. Rototilling and filling in with a shovel were not effective in preventing reinfestation because they are not deep enough and the squirrels will just dig new entrances.

LAWS AND REGULATIONS :
Be aware of endangered species that inhabit ground squirrel burrows.

Shooting

Time of Year: All year
Efficacy: Low
Cost of Materials: Medium
Labor: High
Restrictions: Low

HOW IT WORKS:
Shooting controls squirrels in small numbers. The biggest problem with shooting is that the squirrels will often come to recognize it and become gun shy. They may learn to retreat to their burrows any time a vehicle drives into the area or they hear a gunshot. This is also a time intensive method.

HOW TO USE IT:
Shoot the squirrels from as far a distance as you can. To increase the effectiveness, it may be wise to settle into a location and wait a while before you begin shooting so that squirrels become acclimated to your presence.

SAFETY (from DFG Hunter Education, **www.dfg.ca.gov/huntered**):
Follow any safety guidelines you would for gun use.

- Treat every gun as if it were loaded.
- Watch that muzzle! Be able to control the direction of the muzzle at all times.
- Be sure the barrel and action are clear of obstructions.
- Be sure of your target before you pull the trigger.
- Unload guns when not in use.
- Never point a gun at anything you do not intend to shoot.
- Never climb a fence or tree or jump a ditch with a loaded gun.
- Never shoot a bullet at a flat, hard surface or water.
- Store guns and ammunition separately, beyond the reach of children and careless adults.
- Avoid alcoholic beverages and mind altering drugs before or during shooting.

WHERE TO GET IT:
Guns are available at a variety of sporting goods stores or hunting specialty shops.

LAWS AND REGULATIONS :
Local laws must be consulted to determine if this is an acceptable practice in your area.

OTHER CONSIDERATIONS:
Shooting with lead shot or bullets can result in lead contamination of the squirrel carcass. If scavengers or predators feed on the dead squirrel, they can be poisoned or even killed by the toxic lead. This is especially important in the range of the California condor, a federally listed endangered species. Condors do feed on dead squirrels and are especially susceptible to lead poisoning. If shooting to control squirrels with lead type ammunition, collect and disposed of carcasses so that other animals will not have access to them. For information about alternatives to lead ammunition, go to: http://condorinfo.org/.

RABBITS

Integrated Pest Management for Home Gardeners and Landscape Professionals

Rabbits are a type of wildlife many people enjoy, but they also are an animal that can be very destructive to gardens and landscaped areas. Eight species of rabbits are found in California. Three of these species—the black-tailed hare or jackrabbit, *Lepus californicus*, (Fig. 1), the desert cottontail, *Sylvilagus audubonii*, (Fig. 2), and the brush rabbit, *S. bachmani*, (Fig. 3)—are widespread and cause the majority of problems. Because of its greater size and abundance, the jackrabbit is the most destructive.

IDENTIFICATION

The jackrabbit is about as large as a house cat, weighing 3 to 7 pounds with a body length of 17 to 21 inches. It has a grayish-brown body, long black-tipped ears, relatively long front legs, and even longer hind legs. The top of its tail is black.

The desert cottontail rabbit and brush rabbit are distinguished from jackrabbits by their smaller size and shorter ears. The desert cottontail is 12 to 15 inches long, weighs 1 1/2 to 2 3/4 pounds, and has pale gray fur with yellow tints. The brush rabbit is slightly smaller at 11 to 13 inches long; it weighs 1 1/4 to 1 4/5 pounds and has brown fur.

A good sign that rabbits are present is coarse, circular fecal droppings, or pellets, found scattered over an area. Pellet size varies roughly with the body size of the species. Jackrabbit pellets are about 1/2 inch in diameter, whereas pellets of the cottontail are closer to 1/4 inch.

BIOLOGY AND BEHAVIOR

Jackrabbits

You'll usually find jackrabbits in open or semi-open areas of California's valleys and foothills but seldom in dense brush or woodlands. Within their preferred habitats, jackrabbits are quite adaptable and inhabit areas around the fringes of urban and suburban developments, green belts, golf courses, parks, airports, and agricultural lands. They make a depression in the soil, called a "form," beneath a bush or other vegetation and use it for hiding and resting during the day. Jackrabbits depend on speed and dodging to elude predators. In California an average density of about 1 1/5 jackrabbits per acre is typical, but during periods of high reproduction, this number can increase.

The breeding season for jackrabbits runs from late January through August, although breeding is possible during any month of the year where winters are mild. Litters average between 2 to 3 young, and jackrabbits can have as many as 5 to 6 litters per year. Young jackrabbits are born fully furred and with their eyes open. Within a day they can move about quite rapidly.

The food habits of jackrabbits vary, depending on location and the availability of appropriate plants. Rabbits prefer to eat succulent, green vegetation, with grasses and herbaceous plants making up the bulk of their diet. In some areas rabbits eat the leaves, bark, or seeds of woody shrubs. Feeding usually begins during the evening hours and continues throughout the night into the early morning. Jackrabbits can survive without a supply of drinking water.

Figure 1. Adult black-tailed jackrabbit.

Figure 2. Desert cottontail rabbit in front of its burrow.

Figure 3. Young brush rabbits.

If food and other necessary resources are available in one place, jackrabbits exhibit no major daily movements. If food sources and areas for shelter are separated, jackrabbits will move between these areas in the morning and evening. Daily travel of 1 to 2 miles between areas is common. During dry periods, roundtrips of up to 10 miles have been observed. These travels are

PEST NOTES Publication 7447

University of California
Statewide Integrated Pest Management Program
Agriculture and Natural Resources

April 2010
C-61

habitually made on the same trails every day, producing noticeable paths through herbaceous vegetation.

Desert Cottontail and Brush Rabbits

Unlike jackrabbits, desert cottontail and brush rabbits generally inhabit places with dense cover such as brushy areas, wooded areas with some underbrush, or areas with piles of rocks or debris. You also might find them living beneath slightly raised sheds or other buildings where there is an opening at the base. They also will use abandoned structures and sometimes cultivated fields for cover. These rabbits use open areas more at night and dense cover more during the day. The brush rabbit, however, seldom feeds more than a few feet from its cover.

Most cottontails and brush rabbits have a home range of up to 10 to 15 acres. A good habitat, such as a park with a clump of low-growing junipers about 30 feet wide, can harbor 10 to 15 cottontails, but normal density is considerably less—an average of 1 rabbit per acre. In urban areas with few predators the populations will be considerably more. Cottontails and brush rabbits aren't territorial but maintain home ranges that overlap broadly with other individuals of all age and sex classes. Cottontails and brush rabbits don't exhibit the same magnitude of daily travel as seen in jackrabbits, although they do make habitual use of travel lanes within their home range.

The breeding season for both cottontails and brush rabbits begins in December and ends in June. The average litter size is usually 3 to 4 young, and there can be up to 6 litters per year. These rabbits give birth in a shallow depression on the ground. The newborn rabbits, which are nearly furless and have closed eyes, remain in the nest for several weeks.

The food habits of cottontails and brush rabbits vary with the location and time of year. Cottontails feed seasonally on grasses, sedges, herbaceous plants, willows, oaks, blackberries, and wild roses. Brush rabbits prefer clover and also feed on the stems and berries of woody plants such as blackberries.

DAMAGE

Rabbits can be very destructive in gardens and landscaped places. This is particularly true where wild or uncultivated lands border residential zones, parks, greenbelts, or other landscaped places. Open lands such as uncultivated, wild areas provide resting and hiding cover during the day within easy travel distances to prime, irrigated food sources. A partial list of crops and plants rabbits damage includes:

- Vegetables—beans, beet, broccoli, carrot, lettuce, and peas;
- Tree and berry crops—almond, apple, blackberry, cherry, citrus, pistachio, plum, raspberry, and strawberry;
- Herbs—cilantro and parsley; and
- Ornamental plants—various flowers, shrubs, trees, and turf.

Rabbits also gnaw and cut plastic irrigation lines, especially small diameter tubes. You can protect these by hanging them out of the reach of rabbits or by encasing them in regular 3/4-inch PVC pipe.

Most rabbit damage is close to the ground, except where snow allows rabbits to reach higher portions of plants. Rabbits use their incisors to make a characteristic diagonal, 45° cut when clipping off woody twigs, buds from saplings, or flower heads. At first you might confuse a rabbit's twig clipping with deer browsing. However, you easily can identify deer damage on woody plants if it occurs above a height that rabbits can reach—about 2 feet—and by carefully examining the damaged twigs. Deer have no upper front teeth and must twist and pull when browsing, leaving a ragged break on the branch. Rabbits clip twigs off cleanly, as if with a knife.

Rabbits tend to gnaw the smooth, thin bark from young trees. The rough bark of older trees discourages gnawing, although old damage and gnaw marks often are present on old bark along with fresh patches of gnawing in areas of younger growth. Gnawing can completely girdle, or remove a ring of outer and inner bark from, a tree; clipping can remove the terminal shoot and lateral branches from plants. Damage by cottontails and brush rabbits often is concentrated in areas near escape cover. Jackrabbits, however, will feed far into open areas and can eat 1/2 to 1 pound of green vegetation each day.

Rabbits can be carriers of tularemia, or rabbit fever. This disease is relatively rare in humans, but you can contract it by handling an infected rabbit with bare hands or by eating insufficiently cooked rabbit meat.

LEGAL STATUS

The California Fish and Game Code classifies jackrabbits, cottontails, and brush rabbits as game mammals. Under this code and a 2007 legal opinion, the owner or tenant of a property or an employee working on that person's behalf can control jackrabbits, cottontails, and brush rabbits anytime or in any legal manner if the rabbits are damaging crops, landscaping, ornamental plants, or gardens.

No license is required for the owner or tenant to take rabbits doing damage. A trapping license from the California Department of Fish and Game is required when trapping rabbits for hire or profit. When using firearms to take rabbits, nonlead ammunition must be used in areas within the historic California condor range; check with your local game warden for more information on these areas, and always check local ordinances before using firearms. It is illegal to sell the meat or fur of rabbits taken as pests.

MANAGEMENT

A number of methods are available for reducing rabbit damage, but physical exclusion, trapping, and—to a lesser degree—repellents are better choices for protecting garden and home areas. In cases where these methods aren't practical, contact your local farm advi-

sor or agricultural commissioner for more information. There are also professional pest control companies that will trap rabbits

Exclusion

Fencing. Probably the most long-term, effective way to protect plantings from rabbit damage is to build a fence. Poultry netting (chicken wire) supported by light stakes will provide adequate control, although the mesh size should be no larger than 1 inch in order to exclude young rabbits. Use 48-inch-tall wire, and bury the bottom at least 6 to 10 inches into the ground. Bending a few inches of the fence bottom outwardly will further deter rabbits from digging beneath it (Fig. 4).

If you don't bury the bottom of the wire fence, you'll need to stake the bottom edge to deter rabbits from passing beneath it. Use tight-fitting gates with sills to keep rabbits from digging below the bottom rails. Keep gates closed as much as possible, because rabbits can be active day or night. Inspect the fence regularly to make sure rabbits or other animals haven't dug beneath it.

You can use reusable fence panels instead of a wire fence. Construct a wood lath or PVC frame 24 to 30 inches high. You can vary the length of the panels to match the size of the garden or area you want to protect. Attach 1-inch mesh wire to the frame, then wire the panels to lightweight, temporary fence posts. The low panels allow easy access for gardening, and you can move them when needed.

Cottontails and brush rabbits won't jump a 2-foot fence. Jackrabbits ordinarily won't jump a 2-foot fence unless a dog chases them, or they become otherwise frightened. Discourage jumping by increasing the above-ground height to 3 feet. In snow areas, a higher fence might be necessary. Remember, once a rabbit gets into the fenced area, it might not be able to get out.

Electric netting, a type of electric fence, also is suitable for rabbit control. It is designed for ease of installation and frequent repositioning. Electric netting is intended for temporary use at any one site, making it ideal for seasonal gardens. Because of the many variables affecting the selection of a power source and operation of an electric fence, it is best to consult a reputable dealer for specific details regarding its use.

Trunk Guards. In some cases protecting individual plants might be more practical than excluding rabbits from an entire area (Fig. 5). Poultry netting with a 1-inch mesh and that is 18 to 24 inches wide is ideal for cutting into strips 18 to 20 inches long and forming into cylinders for placement around the trunks of young trees, shrubs, or vines. Bury the bottom of the cylinders 2 to 3 inches, and brace them away from the trunk, so rabbits can't press against the cylinder and nibble through the mesh. Inspect these barriers regularly, and be sure to keep the area inside the barriers clean of leaves, weeds, and other debris to eliminate feeding sites for small rodents. Commercial tree trunk protectors also are available.

Trapping

Cottontail and brush rabbits are relatively easy to trap; however, jackrabbits are very difficult to capture, because they are reluctant to enter a confining space.

Live trapping of cottontails and brush rabbits isn't recommended, because it creates the dilemma of what to do with the trapped animal. Rabbits can carry certain diseases and are considered agricultural pests. According to California Fish and Game Code, it is illegal to release them in other areas without a written permit. Handling a live rabbit also creates the possible hazard of disease transmission to the trapper.

You can trap cottontails and brush rabbits with a Conibear trap (No. 110), which kills the animal outright. Place the trap inside a covered box constructed from 3/4-inch exterior plywood with a 4-inch wide entrance (Fig. 6). To further reduce hazards to children, pets, and poultry, position the trap back from the entrance. Slots at the back end of the box help in positioning the trap as does the hinged lid. The hole cut in the top of the hinged portion and covered with 1/4-inch mesh hardware cloth serves as a means to check the trap or

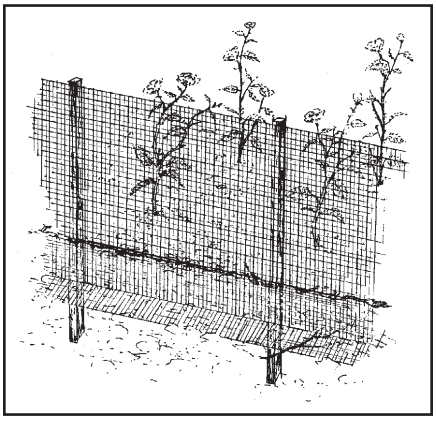


Figure 4. Bury a rabbit fence at least 6 to 10 inches and turn the bottom portion of the fence outward to prevent rabbits from digging beneath it.

Figure 5. Tree exclusion cylinders.

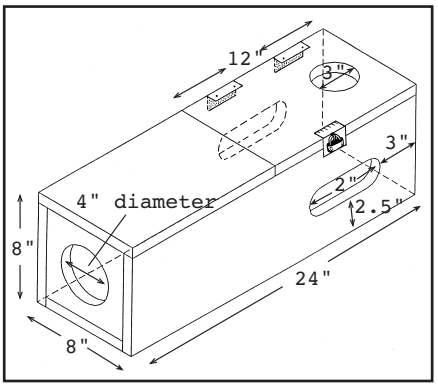


Figure 6. Box for use with Conibear trap (No. 110).

bait. Other kill-type traps, such as a tunnel trap, also are available.

Place traps near cover where the rabbits feed or rest. For bait, use whatever the rabbits are feeding on, or use carrots, cabbage, fresh green vegetables, or apples. Place the bait at the back of the trap. Placing some just outside the trap is helpful too. Check traps daily to replenish bait or remove the catch.

Repellents

Various chemical repellents can reduce or prevent rabbit damage. They are most useful when you apply them to trees, vines, or ornamentals. These products work by creating an unpleasant odor, taste, or stickiness. Research has shown that repellents with putrescent whole-egg solids can reduce rabbit browsing.

Apply repellents before damage occurs, and reapply them frequently, especially after a rain, heavy dew, or sprinkler irrigation or when new growth occurs. In all cases, follow the label directions for the repellent you are using.

The usefulness of repellents is limited. They work best to protect woody plants during the early years before they bear fruit or during winter. Most, except for some of the taste repellents, can't be used on plants or plant parts that humans eat. Repellents usually fail when you use them in a vegetable garden, an area that contains highly preferred rabbit foods, even if the repellents are registered for use on edible crops.

Habitat Management

To discourage cottontails and brush rabbits, especially in suburban habitats where alternate habitats might be limited, remove brambles, piles of brush, stones, or other debris where rabbits can hide. Control vegetation along fence rows, ditch banks, or brushy areas. Keep in mind vegetation management can affect other wildlife such as songbirds. Removing cover probably will have little effect on jackrabbits, because they can use cover that often is great distances from their feeding sites.

If outbuildings such as sheds, trailers, or other storage units are on slightly raised platforms of about 2 to 12 inches, construct a mesh barrier to exclude rabbits from hiding underneath.

Other Control Methods

Shooting can be an effective means of eliminating small numbers of rabbits where it is safe to do so in rural locations, but it is prohibited in urban and suburban locations. Best results are achieved in early morning or around dusk when rabbits are more active. Check both local and game regulations for license requirements and any restrictions on shooting in your area.

"Frightening" devices, such as noisemakers and flashing lights, generally aren't effective nor are ultrasonic units, which rely on sound waves to repel rabbits. A pet dog left loose within the area you want to protect can be somewhat effective in keeping rabbits away, but some dogs are better at this than others.

Toxic baits are registered for use in agricultural situations to resolve serious crop damage problems when jackrabbits are numerous, but their use in urban and suburban situations isn't practical. In order to comply with label instructions, you must recover all rabbits that die after coming into contact with the bait. Because the rabbits are likely to die outside the baited property, carcass recovery is almost impossible.

Rabbits serve as food for a number of predators, including hawks and coyotes, but in urban and suburban situations, the greatest threat is from cats and dogs. Although relatively vulnerable to predators, rabbits generally cope well and maintain their populations in spite of this threat.

FOLLOW UP

If you have built barriers to exclude rabbits, follow up consists of regularly inspecting the area to ensure rabbits aren't breaching them. Inspect previously undamaged plantings for new damage, as rabbits can switch to new food sources after you have excluded them from an existing feeding site.

If trapping or shooting has reduced the rabbit population to a tolerable level, periodically search the area for signs of an increase in rabbits. Look for droppings, trails, and the characteristic 45° cut on twigs and stems. Rabbits are easy to see, but because they frequently feed when it is dark, you might have to examine the garden at night with a flashlight to see them. Their eyes shine yellow or red in a flashlight beam.

Because few, if any, rabbits are acceptable in a garden or landscaped area, take appropriate action when you first observe signs of them. Rabbits seen nearby frequently will invade a garden when the plantings become desirable to them. Consider exclusion methods such as a fence before damage actually occurs.

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This and other Pest Notes are available at www.ipm.ucdavis.edu.

For more information, contact the University of California Cooperative Extension office in your county. See your telephone directory for addresses and phone numbers, or visit http://ucanr.org/ce.cfm.

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To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

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Produced by **UC Statewide Integrated Pest Management Program**
University of California, Davis, CA 95616

University of California
Agriculture and Natural Resources Program

Onsite Wastewater Treatment System

San Diego County As Built Map
Septic System Sense Brochure
Informational Brochure
Permitted Pumpers/Haulers List
Licensed Contractors List

LOUNSBURY DESIGN
P.O. BOX 3179 ESCONDIDO, CA 92033
PH: 760-518-9085 FX: 760-297-1503
lounsburydesign@yahoo.com
SEPTIC DESIGN
MINOR GRADING DESIGN
HOUSE DESIGN

"I CERTIFY THAT THE LAYOUT DRAWING SHOWS THE LOCATION OF ALL PUBLIC WATER LINES ON THE LOT AND ALL PUBLIC WATER LINES THAT ARE WITH IN 20 FEET OF THE LOT BOUNDARY."

RECEIVED
SEP 27 2007
County of San Diego
Dept. of Environmental Health

t = percolation rate = 28 mpi
Horizontal Seepage Pit length = L
Per the San D-14 for a 3-bedroom residence
410 linear feet of leach line are required.
L = (410'x 3)-56' sq.ft. = 84' of Horizontal Seepage Pit
14 sq. ft./linear ft.

PIT	
LEACH LINE	355' EX.
PIT LENGTH	84'R
PIT WIDTH	4'
PIT DEPTH	7'
CAP DEPTH	10'

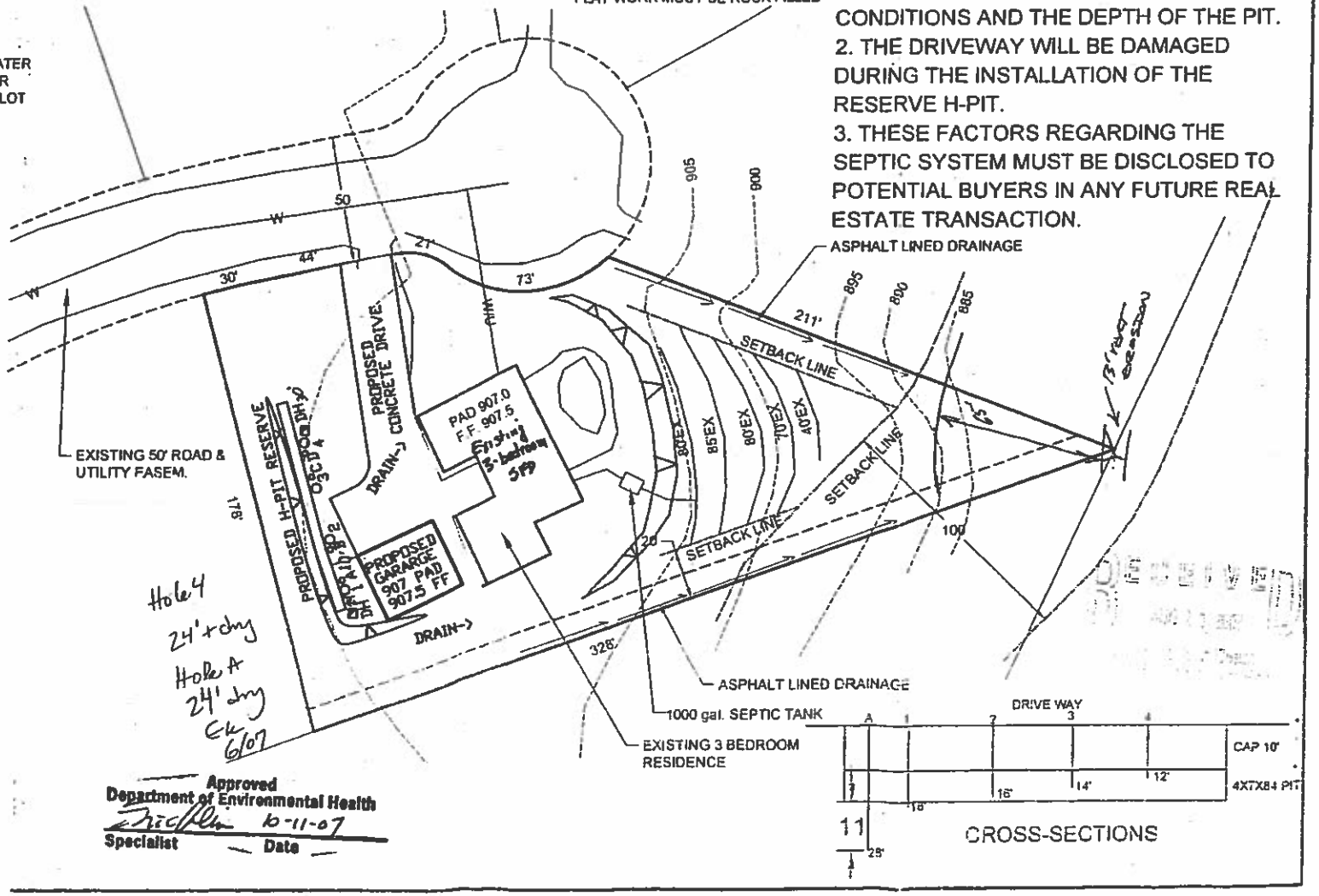
NOTE
PITS UNDER DRIVEWAYS AND FLAT WORK MUST BE ROCK FILLED

NOTE:

1. THE PROPOSED RESERVE WILL BE MORE DIFFICULT AND EXPENSIVE TO INSTALL DUE TO EXISTING SOIL CONDITIONS AND THE DEPTH OF THE PIT.
2. THE DRIVEWAY WILL BE DAMAGED DURING THE INSTALLATION OF THE RESERVE H-PIT.
3. THESE FACTORS REGARDING THE SEPTIC SYSTEM MUST BE DISCLOSED TO POTENTIAL BUYERS IN ANY FUTURE REAL ESTATE TRANSACTION.

LEGEND

850	CONTOUR LINE
355' EX.	EXISTING LEACH LINE
84'R	RESERVE H-PIT
	SETBACK LINE
0.83	ACRES



Hole 4
24' + dry
Hole A
24' dry
EK 6/07

Approved
Department of Environmental Health
[signature] 10-11-07
Specialist — Date

Septic System Basics & You

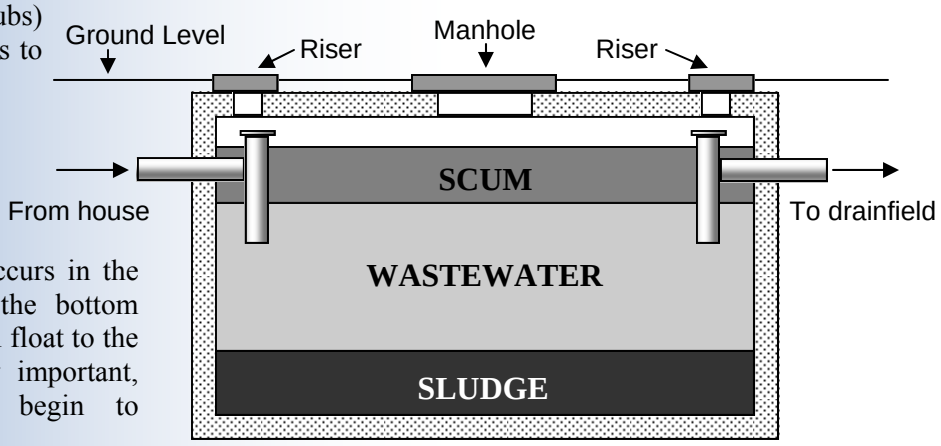
(Based on the EPA's "A Homeowner's Guide to Septic Systems")

How septic systems work

There are typically four components of a septic system. They are the pipe from the house to the septic tank, the septic tank, the drainfield, and the soil between the drainfield and the groundwater.

The Pipe: All of the wastewater (including water from sinks, toilets, and bathtubs) from a home drain into a pipe that leads to the septic tank.

The Tank: The septic tank is a watertight container (usually concrete, fiberglass, or polyethylene) that is buried underground. The first step of treating the wastewater occurs in the septic tank as solids will settle to the bottom (forming sludge) and oil and grease will float to the top (forming the scum layer). Very important, natural microbes (small bacteria) begin to decompose the solid waste.



Normal single-compartment septic tank.

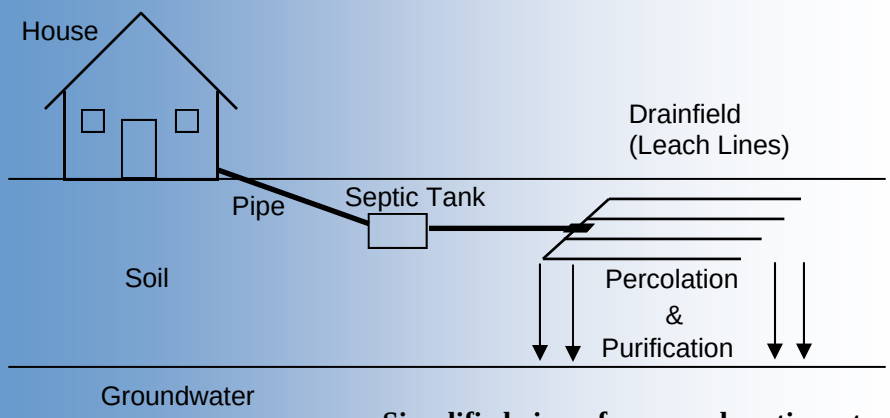
The Drainfield: Once the wastewater exits the septic tank through the T-shaped outlet, it is discharged into the drainfield where the partially treated wastewater will drain into the soil for further purification.

The Soil: As the wastewater percolates (drains) through the soil into the groundwater, it is filtered and purified as bacteria, viruses and nutrients attach to the soil. Suitable soil and groundwater levels are important for successful wastewater treatment!

Quick Fact!

In California, there are over one million septic systems in use. San Diego County has over 61,000 septic systems, while Riverside County has almost 97,000 systems in place.

Don't put household chemicals, pesticides, herbicides, paint, oil, gasoline, antifreeze, etc into the system. They will kill the microbes vital to decomposing the solids in the septic tank!



Simplified view of a normal septic system.

Don't put diapers, cat litter, grease, feminine products, coffee grounds, cigarette filters, etc into the system. They will clog the septic tank or drainfield!

Septic System Care

Important Best Management Practices (BMPs)
For Protecting & Maintaining Septic Systems

- **Use water efficiently.** By conserving the amount of water entering the septic system, the operation of the septic tank will improve and the risk of septic system failure is reduced. A leaking toilet can waste as much as 200 gallons of water per day, which overloads the system and will cause the system to fail.
- **Pump the septic tank periodically.** By regularly pumping the septic tank, and removing the sludge and scum layers, the possibility of clogs in the pipes to and from the tank will be reduced. If clogging occurs, the wastewater will not make its way to the drainfield and can back up into the house. The table at the bottom of the page recommends the proper pumping frequency.
- **Never put industrial waste, solvents, paint, pesticides, fertilizers into the system.** Any of these items will kill the microbes in the septic tank which decompose the solid wastes.
- **Don't use your septic system as a trash can.** Non-biodegradable items such as dental floss, feminine hygiene products, diapers, cigarette butts, coffee grounds, cat litter, paper towels, etc can clog your system and the system will fail.
- **Commercial additives do not replace the need for periodic pumping.** Commercial additives are not recommended for septic tanks as they can be harmful to the system and all of the necessary microbes for decomposition are present in the system naturally.
- **Don't drive or park your car over any part of the septic system.** Driving over the septic system can compact the soil, damage the system components (the pipes or tank), and reduce the efficiency of the system.
- **Keep records of septic system maintenance.** Keeping records of pumping, inspections, permits, and other maintenance activities will help you keep your septic system in great shape.

Recommended Septic Tank Pumping Frequency

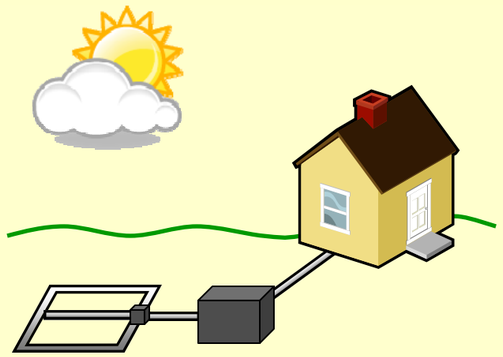
	Household Size—Number of Occupants									
	1	2	3	4	5	6	7	8	9	10
Septic Tank Size (# of bedrooms in the house)	Years									
1000 gal (1 to 3 bedrooms)	12.4	5.9	3.7	2.6	2.0	1.5	1.2	1.0	0.8	0.7
1250 gal (1 to 4 bedrooms)	15.6	7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500 gal (1 to 6 bedrooms)	18.9	9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
2000 gal (1 to 7 bedrooms)	25.4	12.4	8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0

Funding for this project provided by the County of San Diego and the State Water Resources Control Board.

Content developed by: Mission Resource Conservation District
Phone (760) 728-1332 www.missionrcd.org

Septic System Sense

A Guide to the Maintenance and Care of an Onsite Wastewater Disposal System



What you *don't* know may harm your septic system (and your wallet).

HOW A SEPTIC SYSTEM WORKS

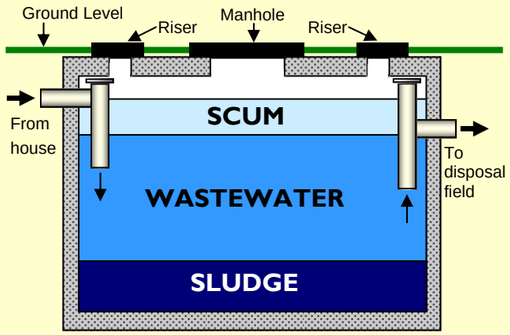
A standard septic system has four components: a sewer pipe from the house, septic tank, drainfield and the soil.

Sewer pipe from the house

Wastewater exits the home through the sewer pipe and enters the septic tank for initial treatment.

Septic Tank

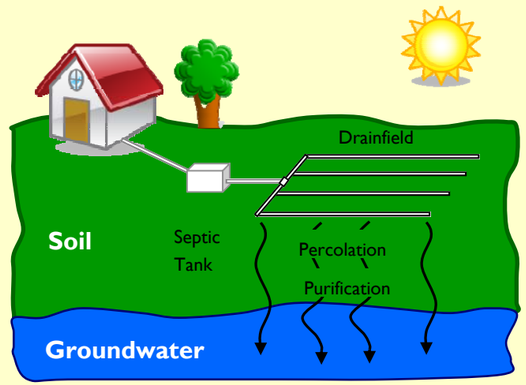
The septic tank is a watertight concrete, plastic or fiberglass container that is buried underground. The tank retains wastewater long enough to allow organic solids to settle to the bottom of the tank (forming a layer of sludge) and the grease and oil to float to the top of the tank (forming the scum layer). Naturally occurring bacteria in the tank decompose the solid waste in the scum and sludge layers. Only the clarified liquid wastewater between the sludge and the floating scum is allowed to flow into the drainfield.



Normal single-compartment septic tank.

Drainfield

The drainfield (or leach field) is the area where effluent from the septic tank is discharged into the soil for additional treatment. Perforated pipes are placed in gravel-filled trenches and effluent from the septic tank is distributed evenly through the pipes into the soil.



A typical septic system (not to scale).

Soil

The soil below the drainfield provides the final step in the onsite wastewater treatment process. The pipes in the drainfield should be at least five feet above groundwater levels. As wastewater percolates (filters through the soil), it is filtered and purified. Bacteria, viruses, chemicals and some nutrients are removed. Only treated water should reach the groundwater in a properly functioning septic system.

Quick Fact!

In California, there are over one million septic systems in use. San Diego County has over 61,000 septic systems, while Riverside County has almost 97,000 systems in place.

MAINTENANCE RECORDS

An important Best Management Practice (BMP) for maintaining a healthy septic system is to keep records of any maintenance activities (including pumping and inspections) .

The form below can be used to help organize your records.

Date system installed_____

Installer_____

Phone_____

Tank size_____gallons

Capacity_____bedrooms

Next Service	Scheduled Activity	Pumping Company Phone #	Activities Completed
Jan. 2008	Inspection	555-pump	Inspection

Funding for this project provided by the County of San Diego and the State Water Resources Control Board.

Mission Resource Conservation District

P.O. Box 1777 Fallbrook, CA 92088
990 East Mission Road, Fallbrook, CA
(442) 728-1332 www.missionrcd.org

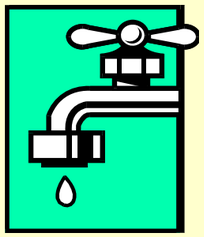
SEPTIC SYSTEM MAINTENANCE & CARE

Maintaining your septic system can save you thousands of dollars and extend its life by many years. The following list includes tips for septic system care and maintenance.

♦ Inspection

Having your septic system inspected at least every three years will ensure that the system is in tip-top shape and reduce the risk of system failure. A septic system inspection will include: locating the system, uncovering the access holes in the septic tank, flushing the toilets to check for signs of sewage backup, measuring the scum and sludge layers in the septic tank, locating and identifying any leaks, and pumping the tank if necessary.

♦ Efficient Water Use



Conserving water, or using water efficiently, is a critical factor in extending the life of your septic system. When too much water enters the septic tank at one time, the sludge and scum layers do not adequately separate and may inadvertently enter the drainfield along with the clarified wastewater. This can clog the drainfield pipes and cause septic system failure. There are several ways to improve water use efficiency including installing high-efficiency (water conserving) toilets and showerheads, fixing any leaking plumbing, turning off the water when you brush your teeth or wash the dishes, taking short showers, and doing fewer loads of laundry in one day. Water purification systems, including water softeners, can add hundreds of gallons of extra salty water into the system.

♦ Pumping Frequency

Pumping the septic tank is critical to maintaining a healthy, functioning septic system. Pumping ensures that the sludge and scum layers do not build up and enter the drainfield, which could cause system failure. Use the table above to determine how often your septic tank should be pumped.

Estimated Septic Tank Pumping Frequency

Tank Size (gallons)	Household Size - Number of Occupants				
	1	2	3	5	10
	Years				
1000	12	6	4	2	<1
1250	16	8	5	3	1
1500	19	9	6	3	1

Source: Adapted from "Estimated Septic Tank Pumping Frequency," by Karen Mancl, 1984. *Journal of Environmental Engineering*. Volume 110.

♦ Biodegradable Waste Only

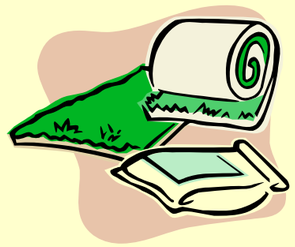
As the sludge layer in the septic tank (the solid waste) is decomposed by naturally occurring bacteria, it is important to only put biodegradable waste into your septic tank. Non-biodegradable items, such as diapers, cat litter, feminine products, cigarette filters, coffee grounds, baby wipes and grease, can cause clogs in the system that can be expensive to repair.

♦ Non-toxic Waste Only

The naturally occurring bacteria in the septic tank can easily be killed by household cleaners and bleach. This can result in a poorly functioning system and premature failure. By minimizing or eliminating the amount of household chemicals that are poured down the drain, the health of you septic system will increase. Chemical from containers labeled with "Danger", "Poison", "Warning", and "Caution" should not enter the system. Other chemicals that kill bacteria and should not be introduced into the septic tank include oil, gasoline, pesticides, and paint.

♦ Drainfield Care

There are several ways to maintain and care for the drainfield that will help extend the life of your septic system. Properly landscaping the drainfield with grass or other shallow-rooted plants will prevent clogging of the perforated leach pipes. Avoid driving or parking on the drainfield as this can damage the pipes and compact the soil. Finally, don't build any structures or grade over the drainfield as this can damage the system.



♦ Records

Keep detailed records of where the septic system is located on your property, when it was inspected and pumped, and any permits that were issued. Please use the table on the last panel to help organize your records.

SYSTEM FAILURE SIGNS

There are several signs that a septic system is failing or is not functioning properly.

Failure signs include:

- Sewage backup in your drains and toilets.
- Unpleasant smelling liquid on or around the septic system drainfield or septic tank.
- Slow flushing of your toilets and slower draining in sinks, bathtubs or showers.
- Unpleasant odors from plumbing or septic system.
- Lush, green grass over the drainfield, even in the dry seasons.

If you suspect that your septic system has failed, please call the County Department of Environmental Health or a septic system professional immediately.

County of San Diego

Department of Environmental Health

Land and Water Quality Division

www.sdcdeh.org

San Diego Office
5500 Overland Avenue, Suite 210
San Diego, CA 92123
(858) 565-5173

San Marcos Office
151 E. Carmel Street
San Marcos, CA 92078
(760) 471-0730

Septic Tank Pumper List

August 1, 2013

A & A Septic	619-478-5277
Abbott Rooter	760-744-3104
Action Cleaning Corp	619-233-1881
Affordable Septic	619-933-6549
Al-Max Septic Service	619-562-5540
Andy Gump, Inc.	661-977-3839
Anytime Septic 'N' Drain Service	619-443-2031
A-Pot Rentals	619-465-8073
Atlas Pumping Service	619-443-7867
Black Gold Industries	619-477-7477
California Marine Cleaning	619-231-8788
Center Septic	760-749-0402
Curtis Dump Truck & Backhoe Services, Inc.	951-674-6156
Diamond Environmental Service	760-729-7409
Don's Hydroblasting & Pumping	619-766-4873
East County Septic Tank Pumping	619-443-4568
Essential Support Service	619-779-7703
GL Technologies	858-202-1408
Honey Bee Septic/Drain Service	760-734-1030
Jim's Appollo Septic Service	858-748-1165
JJ Septic Service	760-724-8511
JMB Sanitation	619-250-5444
Lake Cuyamaca Rec/Park	619-765-0515
Modern Septic Service	619-444-1131
National Construction Rentals	909-549-1900
NRC Environmental Services	619-235-3320
Patriot Environmental Services	619-449-9014
Ramona Septic	760-440-9255
Rightway	951-471-6256
Rosie's Rentals	619-964-0571
Safiro Portable Toilets	619-232-8606
Sludgebusters Septic Service	760-789-7054
So San Sanitation	626-363-2451
Spanky's Portable Service	760-731-5252
Sunrise Pumping Service	760-747-5997
T Waples Backhoe	760-789-5791
United Pumping Service, Inc.	626-961-9326
United Site Services	760-966-0023

Disclaimer: *The listing of a septic tank pumper on this list does not constitute an endorsement by the County of San Diego but only that the pumper is registered with the County of San Diego to pump and transport sewage in San Diego County*

County of San Diego

Department of Environmental Health

Land and Water Quality Division

www.sdcdeh.org

San Diego Office
5500 Overland Avenue, Suite 210
San Diego, CA 92123
(858) 565-5173

San Marcos Office
151 E. Carmel Street
San Marcos, CA 92078
(760) 471-0730

LICENSED CONTRACTORS

Updated July 25, 2014

Licensed Contractor	Phone Number	License Type*	License No.
A-Park Avenue Associates Inc.	951-676-3735	A, B	533754
Abbott Septic	760-744-9096	C36, C42	316965
Ace Excavating	619-441-4900	A	512581
Advantage Septic Systems	951-634-4842	C36, C42	853378
All Terrain Backhoe Service	760-535-6395	C42	880756
Alpine Drainage Systems Inc.	619-445-2150	C42	397304
Alpine Plumbing & Backhoe Inc.	619-445-5288	B, C36	520749
American Pipeline	619-445-0700	A, B, C42	353480
American Construction & Septic, Inc.	619-520-2041	A	905091
Arrow Pipeline Repair, Inc.	760-476-9388	A, C36	811046
B & J Landscaping, Inc.	760-767-4212	A	462781
Bill McNulty Plumbing	619-857-2548	C36	535389
Birdsell, Jim	760-765-0714	A	406468
Blackburn Drainage	619-766-4564 / 619-441-4949	A	462065
BMB Septic Co.	619-851-2511	C42	494826
Bob's Septic & Tractor Service	760-715-1734	C42	910672
Brandon's Backhoe Service	619-818-4337	A	820088
Bub Akans Septic Service	760-716-3379	C42	790436
Center Septic	760-749-0402	A	790472
CNH Equipment, Inc.	760-751-1727	A	749883
County Wide Septic Repair	619-922-4282	C42	890236
Crull Excavating and Grading	760-497-7876	A	961105
Dave Horn's Backhoe Service	760-723-4069 / 760-505-8625	A	773443
Deboer, James/Bonsall Grading	760-805-2640	A, B	371272
E Crist	619-995-0404	B	761203
East County Septic	619-443-4568	C42	797596
Eric Wolf Excavating	760-940-6138	A	841135
F&D Bennett	619-468-3379	A	631846
Fluegge Excavation	760-271-0683	A	827078
Goodman Backhoe	760-751-1430	A	886219
Honey Bee	760-734-1030	C42	913878
Honeycutt Inc.	619-443-1444	A, B	555489
JB Septic Systems	760-489-8271	C42	460804

Jim's Appollo Septic Service	760-533-7691	C42	949210
John Ickler Construction	760-789-9901	A, B	351726
Julian Backhoe Service	760-703-6244	A	646766
Katje Equipment	760-747-8832	C42	648864
Keserovich, Nick	760-728-9693	A	553208
Kopp Co.	760-749-9034 / 760-415-1583	A	524696
Lanik Enterprises	800-207-2505 / 951-676-7114	A, B, C42	458947
Leonard, Ken	619-894-7338	A	863563
LB Equipment, Inc.	619-988-0924	A	893494
McCarley Construction	760-749-9418	A	682520
McEwan Enterprises	760-505-6873	A	770792
McKenna, R.F. Construction	858-755-2290	A, C42	251974
McNulty Plumbing	619-262-5103	C36	535389
Modern Septic Service	619-444-1131	C42	956533
Mushet, Kenneth	760-765-1805	A	433489
Nashco Inc.	760-945-8985	A	646789
Palladino Trench & Septic	619-204-7063	B, C42	811195
R J C Plumbing and Mechanical, Inc.	619-255-0425	C36	978791
Reliable Backhoe & Septic Service	760-789-7054	A	496431
Richard Stanley Backhoe Inc.	760-765-1521	A	617955
RMD Grading	619-654-3488	A	846551
RP Engineers	619-518-4805	A, B	456678
S & G Septic Systems Inc.	760-728-1744	C42	799117
San Diego Septic Systems	619-478-9202	C42	835378
Septic Repair Service	619-561-2368	C42	849932
Septic Solutions	619-666-6437	C42	782200
Shive Custom Grading	760-789-2429	A	532154
Sludgebuster	760-789-7054	A	850757
StoneRidge General, Inc	619-399-6774	A, B	978452
Taylor Construction	760-297-0343	B, C36	823192
Tim O'Brien Tractor Work	760-728-1763	A	882100
Total Terrain Savvy, Inc.	760-533-1874	C42	916278
Villapando, Ralph	760-724-3704	C42	246973
Waples Backhoe	760-789-5791	A, B	786689
West Coast Engineering & Backhoe	760-420-6306	A	923724
W.G. Construction Inc.	619-401-8000 / 619-415-4538	A	921873
Wirschem, Lee	619-445-5522 / 619-559-1989	B, C42	468463

*License type

A – General Engineering Contractor
B – General Building Contractor
C36 – Plumbing Contractor
C42 – Sanitation System Contractor

Disclaimer: *The listing of a contractor on this list does not constitute an endorsement by the County of San Diego but only that the contractor had a valid license with the Contractors State License Board at the time of the listing. This list does not include all contractors licensed in the State of California to perform work on septic systems but only those contractors who requested to be placed on this list. It is recommended that you verify the current status of the contractor's license and the work allowed to be completed under that license by visiting the Contractors State License Board website at www.cslb.ca.gov. In addition, it is recommended that you obtain multiple quotes for proposed work prior to making your decision on which contractor to hire.*

Composting

Gardening Tips 'n Ideas

"Gardening tips and advice."

Composting Palm Fronds and Strappy Foliage

27 Aug 2009

2

Posted in *Gardening Tips* by *scrobins*

The toughest materials to compost are by far; palm fronds and strappy foliage plants. Their innate fabric always proves to be tougher than the bacteria and bugs that do the decomposing. And months later, when everything else has become unrecognisable, palm fronds and grass foliage remnants look like they've only just hit the compost heap.

Even trying to mulch them through a chipper shredder proves equally futile. The strands that make palm fronds up will usually wrap around the blade forcing the motor to seize and making you spend hours trying to unravel it again. Strappy foliage from plants such as cordylines, agapanthus and other grasses can be even worse and often most gardeners will resort to just binning the waste.
However, there is a way to compost this seemingly indestructible garden refuse. The first method is to let it dry out first. This may take some time but the palm fronds and strappy foliage need to be left until they are dry and brittle. Once this has been achieved then shredding them is a cinch – they will begin to breakdown like any other organic material after this point.

The second option is to chop the palm fronds by hand and then place in a container, covering them with compost tea. This will break the items down individually and within a few weeks. From there, they can be transferred back into the compost heap where they will continue their decomposition in a similar time frame to the rest of the materials.

Video

Categories

Gardening Tips

Growing Plants

Landscaping Ideas

Garden Furniture

Garden Shop

A third option is to dig a hole large enough to hold the palm fronds (cutting them in half or thirds prior is a help) and then covering with a non-composted manure – chicken or cow are best. Replace the soil over these and they shall break down within a few months.

So, as you can see, composting palm fronds and strappy foliage plants isn't impossible but it does require a little more effort.

Lowe's: Coming to an Australian Backyard Near You

How to Water Plants

Comments

Town Mouse August 27, 2009 at 12:35 pm

How interesting! I had no idea. We are lucky to have the city pick up our garden waste, but I'll tell Country Mouse, she might find it useful. Thanks!

REPLY

Bangchik August 27, 2009 at 10:37 pm

There are thatched houses in rural areas, using nipah or sago fronds as roof. They last for ages. That explains their resistance to decomposition. Great info, Stuart.
~bangchik

REPLY

Leave a Comment

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Name * Email * Website

Comment

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- Yvonne on Albany Woolly Bush – Adenanthos sericeus

Archives

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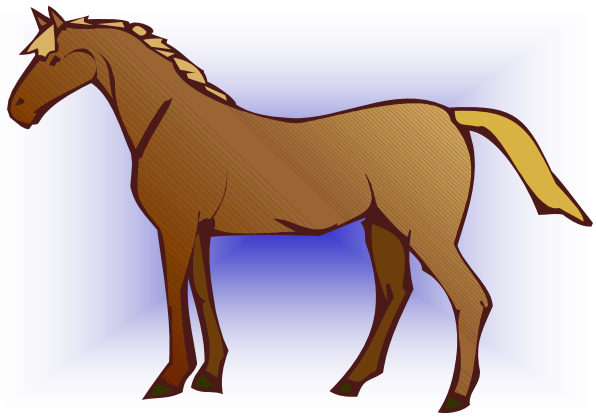
Composting Horse Manure

A Field Guide for Recycling Equestrian Waste

Why Should Horse Manure Be Composted?

Every horse owner knows that a horse can produce a verifiably *large* amount of manure each day (on average a horse will produce 50 pounds daily). Two common manure management practices include applying it directly to the landscape or having it hauled away. However, with a little time and energy, the manure can be turned into a wonderfully useful product that can enrich any garden or landscape.



The ***benefits*** of composting horse manure are many and include:

- Eliminates the breeding ground for flies
- Kills harmful parasites (including worm eggs), bacteria and weed seeds
- Reduces the volume of raw material by half
- Eliminates foul odors
- It is relatively inexpensive and simple to do
- The final product is an outstanding soil amendment and mulch that can be used in gardens, pastures and the landscape
- It reduces the possibility of contaminated runoff leaving the horse property
- It makes your property more attractive to your neighbors by eliminating unpleasant odors and pesky flies

What Is Composting?

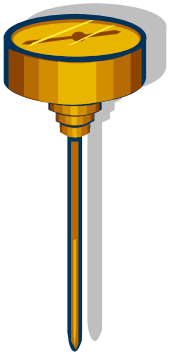
Composting is the *controlled* process of breaking down organic material into a final product called humus. Manure that is stockpiled and never managed will degrade to some extent, but the results are varied, often foul smelling and unpredictable. The organisms that digest the organic material are called microbes. If they are given optimal growing conditions, within two to four months mature compost will be available for use on your property!

The microbes in the compost system depend on four parameters for optimal digestion (and growth) rates; oxygen availability, moisture content, carbon to nitrogen ratio and the temperature within the compost system. These factors can all be easily monitored and managed to provide the microbes with the perfect conditions in which to grow, multiply and eat all the digestible material in the system.

Four Critical Parameters In The Compost System

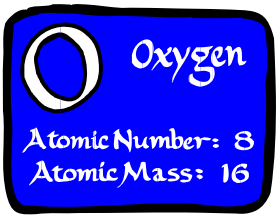
The following factors are important to monitor and control when creating and maintaining a healthy and active compost system.

Temperature



The interior of the compost system will heat up to 150º F (within several days of being turned). The heat is a result of the microbes increasing their metabolic (digestion and growth) rates within the compost system. The high temperatures reached in a healthy system sterilize the compost because pathogens, bacteria and weed seeds are killed. As the compost system ages and nears maturity, the internal temperatures will not rise as high or as quickly as it did earlier in the composting process. If the internal temperature does not rise within several days of the compost system being turned over there might be too little water in a newer system or, in an older system, the compost has reached maturity. Daily monitoring of the compost system's internal temperature will ensure that any potential problems are caught quickly.

Oxygen Saturation



Composting is an *aerobic* process, meaning that the microbes that digest the material require oxygen. When there is not enough oxygen levels in the compost system, the degradation process becomes *anaerobic* and other microbes decompose the material without the need of oxygen. Anaerobic decomposition emits a very foul, sulfur odor and unpredictable results. Aerobic decomposition, on the other hand, smells "earthy" and not unpleasant. In order to ensure that enough oxygen is available for the aerobic microbes, the compost system should be turned over frequently. The frequency of turning will be determined by the size of the compost pile and how long the compost has been maturing. Turning the compost system at least once every week is highly recommended. The more often a pile is turned, the faster the compost will mature.

Moisture Content

The moisture level of the compost mixture is vital to the microbes in the compost system. If the system is too wet, anaerobic conditions will result and foul odors and other problems will occur. If the system is too dry, decomposition will stop as the microbes will "shut down" until more moisture is added. A healthy compost mixture contains between 50 to 60% moisture (a handful of the compost mixture will be as moist as a wrung out sponge). If the mixture is too wet, add dry material and turn it more often. If it is too dry, add water while it is being turned over.

Carbon-to-Nitrogen Ratio

The macronutrients (food) consumed by the microbes in a compost system are carbon and nitrogen. The optimal C:N ratio is 25 to 30:1 by weight. Horse manure typically has a C:N ratio of 50:1. An ideal C:N ratio can be easily attained by simply adding the horses' bedding material to the compost mixture.

The Finished Product!

The compost has reached maturity when it is completely degraded and the internal temperature of the compost system does not spike upon being turned over. The mixture should be evenly textured and have an earthy smell. Generally, it should be mature within two to four months.

Starting A Compost System

Selecting a compost site

Before starting, carefully choose the location of the compost system as a properly situated system will save you time and work in the future! The site should be a high, level area that allows runoff to drain around it. Low areas, where water will drain, will turn the compost system into a soggy disaster. In order to prevent water pollution, the compost site should also be situated away from creeks and streams. Make sure the site is located near stalls and paddocks so manure and bedding can be easily and conveniently moved to the compost system

Building the compost bins

If you choose to use a compost bin system rather than compost piles (which are very effective as well), a two- or three-bin system can be constructed in one weekend. A two-bin system will allow you to fill one bin with manure and, once it's full, let it compost while the second bin is being filled. If you have several horses, a three-bin system will allow you to fill the first bin to capacity, compost it while the second bin is being filled and then compost the second bin while the third bin is being filled. By the time the third bin is full, the first bin should have reached compost maturity and be ready for use.

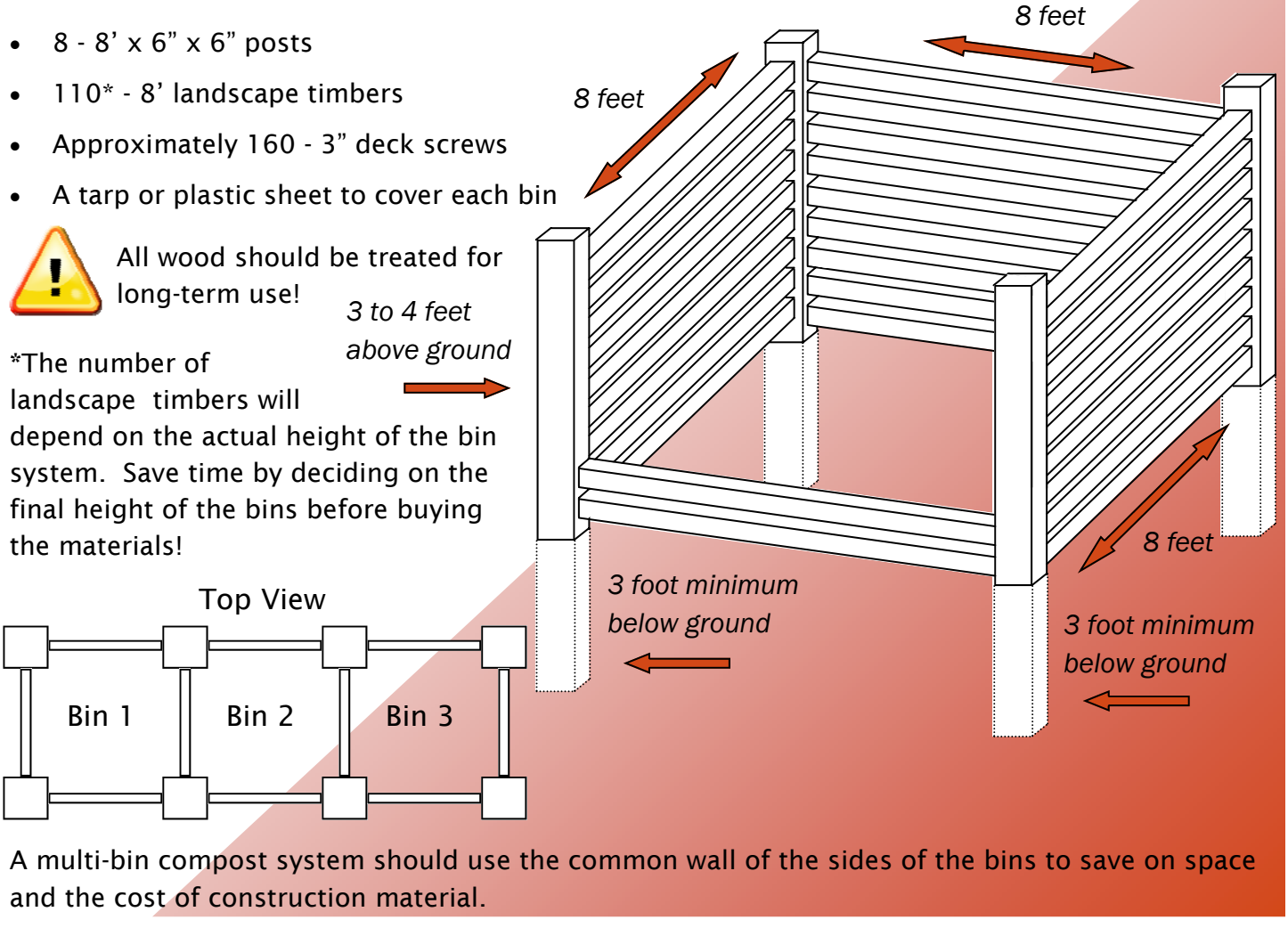
The bin design below is a recommendation and can be replicated for two or more bins.

Supplies for a three bin compost system:

- 8 - 8' x 6" x 6" posts
- 110* - 8' landscape timbers
- Approximately 160 - 3" deck screws
- A tarp or plastic sheet to cover each bin

All wood should be treated for long-term use!

*The number of landscape timbers will depend on the actual height of the bin system. Save time by deciding on the final height of the bins before buying the materials!



A multi-bin compost system should use the common wall of the sides of the bins to save on space and the cost of construction material.

Management Of The Compost System

Controlling the decomposing process will ensure that mature compost will be ready within two to four months. Frequently turning the compost mixture allows oxygen to permeate the system and speeds the composting process. Monitoring the moisture levels and adding water when necessary will ensure the microbes the perfect habitat in which to thrive and grow (and digest!). Tracking the internal temperature of the compost system often will enable you to catch any potential problems quickly and will also help you to determine when the compost is mature and ready to use in your gardens and landscape. Please refer to page two for the optimal temperature ranges, carbon-to-nitrogen ratios, and moisture and oxygen levels in a healthy and active compost system.

Using The Compost

Compost is a wonderful soil amendment as it contains many of the nutrients needed by plants to thrive. It also helps the soil retain moisture. Simply mix the mature compost into the soil of any garden or landscape and watch the plants flourish. Compost can also be used as a mulch.

Troubleshooting Guide

What's Wrong?	The Problem Is...	How to Fix It!
There is a bad odor	There is not enough oxygen in the mixture	Aerate the mixture by turning it over
There is a bad odor and the compost mixture is very wet	The mixture is too wet and there is not enough oxygen in the mixture	Mix in dry material (such as straw or other bedding) and ensure that the mixture is aerated properly
The middle of the compost mixture is dry	The mixture does not have enough water	Add more water to the mixture as it is being turned over
The compost mixture is damp, but it is only warm in the middle and nowhere else	The compost pile (or amount in the bin) is too small	Increase the size of the compost pile by adding more raw material and mixing it into the pile
The compost mixture is damp and there is no bad odor, but the internal temperature will not rise	The compost mixture does not have enough nitrogen	Increase the nitrogen levels in the mixture by adding more manure or other nitrogen sources (like green leaves and kitchen scraps)
The compost mixture is attracting flies, rodents and other pests	The compost is not mixed thoroughly (uneven mixture)	Make sure that the compost pile is mixed evenly

Resources

Cooperative Extension - The Cooperative Extension and County of San Diego's Farm and Home Advisors Office is an excellent resource to learn about composting. Contact the San Diego office at (858) 694-2845 or www.co.san-diego.ca.us/fha/index.html.

Resource Conservation Districts - Resource Conservation Districts are also a great place to find composting information. Mission RCD, in Fallbrook, CA, can be contacted at (760) 728-1332 or www.missionrcd.org.

Funding for this informational guide was provided by the County of San Diego.
This publication was developed by Mission Resource Conservation District.

Irrigation System Evaluation Report

Landscape Irrigation Report

Residential Property Evaluation Program

Identification Number: 05

Irrigation System Evaluation Date: 10-7-2014

Irrigated Area Summary

The surveyed landscaped area at this site consists of two hydrozones or groups of plant material. Area estimates for each are included in the table below. This does not include hardscape or unplanted areas.

Surveyed Landscaped Area by Hydrozone

	Area	
Hydro zone	**Sq-Ft**	**Acres**
Turf/Grass	5,706	0.13
Ground Cover/Shrub/Tree	17,126	0.39
Total	22,832	0.52

Area data calculated from: Hand measurements and satellite images.

Water Consumption and Weather Data

One mixed meter supplies the landscape water at this site. Water consumption data was available for the period of January 2012 to August 2014. The graphs in this report reflect the water use analysis up to April 2014, which was when the landscape irrigation was taken off of the municipal meter.

Weather data for this period was obtained from the Escondido CIMIS Station. The micro-climate at this weather station closely resembles the conditions that would be found at your location. The landscape coefficient of 0.50 was created using WUCOLS and the auditor's notes of the plant material at this specific site. The graphs below approximate when excess water use occurred during this period.

Potential Water and Cost Savings

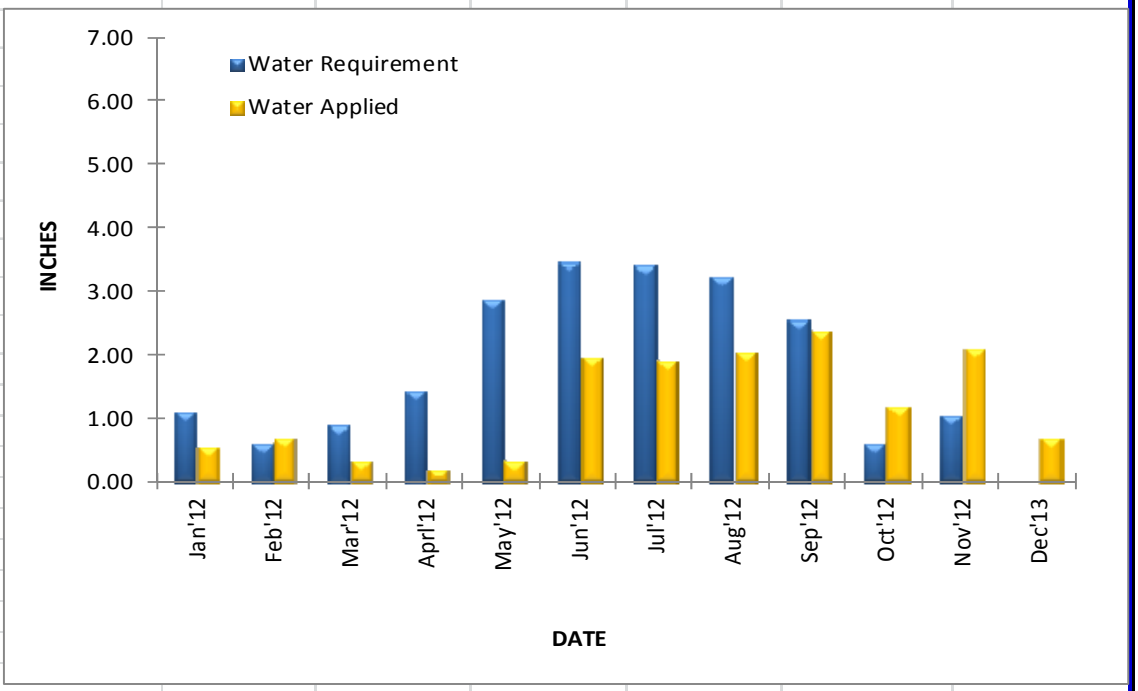
If you review the graphs below it is clear over and under watering is taking place. It appears that changes to the landscape irrigation are not being made as frequently as possible. Adjustments to the irrigation schedule should be made as the weather changes seasonally, at a minimum four times a year. Weather based irrigation controllers can help with the adjustments and it may be something to consider adding to the irrigation system. Also, making the changes listed below will help deliver more water to the intended plant material, resulting in more efficient watering and less run-off.

The graphs below approximate when excess water use occurred during this period.

Irrigation Water Use Analysis - Landscape @ 0.50Kc

2012

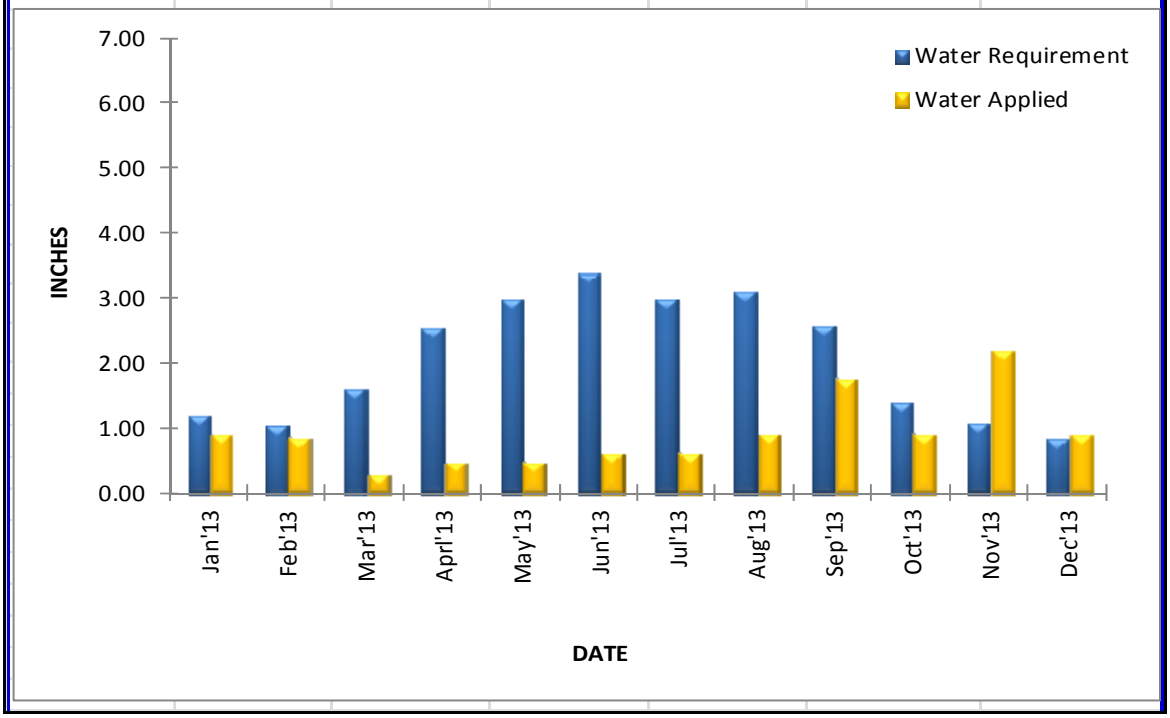
CIMIS Station:	**153 Escondido**					
Water Unit:	**1000**	Gallons				
DU	**57%**		Leaching		**0%**	
Date	Water Units	(Eto X Kc) ETc	Adjusted ETc	Rainfall	Inches of Irrigation	Percent of ETc
Jan'12	8	1.31	1.10	0.31	0.6	51
Feb'12	10	1.40	0.63	1.17	0.7	113
Mar'12	5	1.97	0.92	1.59	0.4	39
Aprl'12	3	2.41	1.46	1.43	0.2	15
May'12	5	3.12	2.88	0.37	0.4	12
Jun'12	28	3.50	3.50	0.00	2.0	57
Jul'12	27	3.42	3.42	0.00	1.9	56
Aug'12	29	3.25	3.25	0.00	2.1	63
Sep'12	34	2.63	2.58	0.07	2.4	93
Oct'12	17	1.92	0.61	1.98	1.2	198
Nov'12	30	1.25	1.03	0.32	2.1	206
Dec'13	10	0.77	0.00	1.38	0.7	0
Year Totals	206	26.9	21.4	8.6	14.6	68
Acre Feet =	0.6					
Gallons =	206000				Irrigated Acres =	0.52



Irrigation Water Use Analysis - Landscape @ 0.50Kc

2013

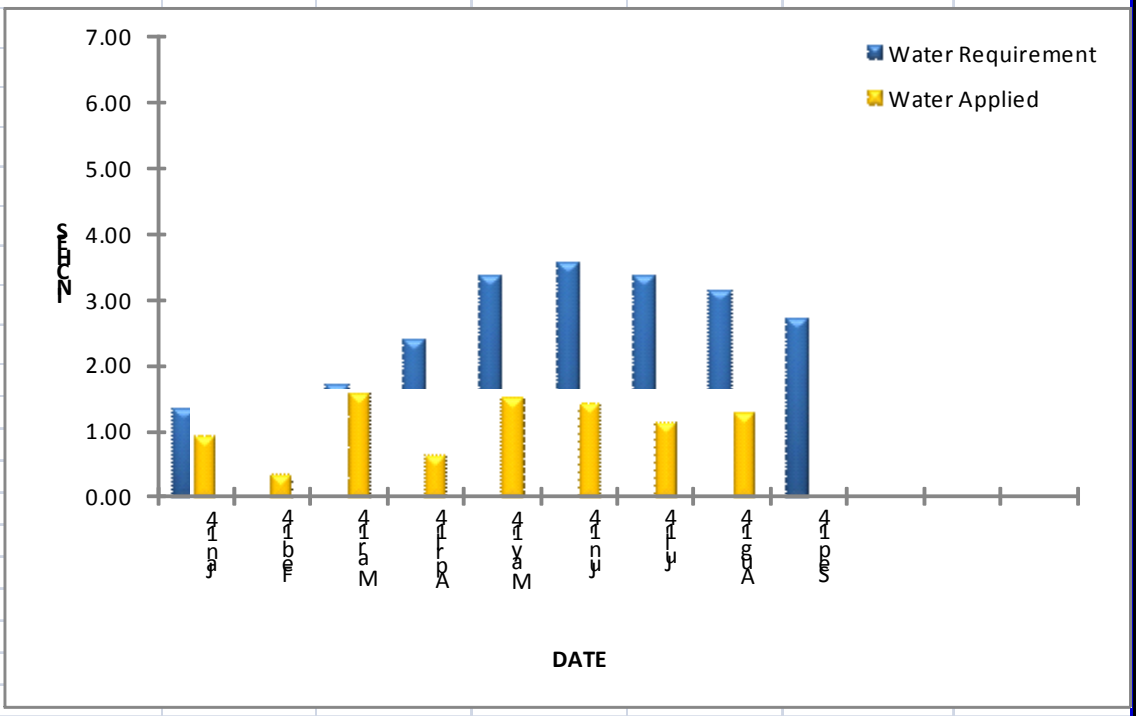
CIMIS Station:	**153 Escondido**					
Water Unit:	**1000**	Gallons				
DU	**57%**		Leaching		**0%**	
Date	Water Units	(Eto X Kc) ETc	Adjusted ETc	Rainfall	Inches of Irrigation	Percent of ETc
Jan'13	13	1.22	1.20	0.02	0.9	77
Feb'13	12	1.43	1.03	0.60	0.8	82
Mar'13	4	2.18	1.61	0.86	0.3	18
Aprl'13	7	2.58	2.57	0.01	0.5	19
May'13	7	3.18	3.00	0.28	0.5	17
Jun'13	9	3.42	3.42	0.00	0.6	19
Jul'13	9	3.03	3.00	0.04	0.6	21
Aug'13	13	3.10	3.10	0.00	0.9	30
Sep'13	25	2.61	2.61	0.00	1.8	68
Oct'13	13	1.92	1.38	0.82	0.9	67
Nov'13	31	1.21	1.08	0.19	2.2	203
Dec'13	13	1.23	0.84	0.58	0.9	109
Year Totals	156	27.1	24.8	3.4	11.0	44
Acre Feet =	0.5					
Gallons =	156000				Irrigated Acres =	0.52



Irrigation Water Use Analysis - Landscape @ 0.50Kc

2014

CIMIS Station:	**153 Escondido**					
Water Unit:	**1000**	Gallons				
DU	**57%**		Leaching		**0%**	
Date	Water Units	(Eto X Kc) ETc	Adjusted ETc	Rainfall	Inches of Irrigation	Percent of ETc
Jan'14	13	1.41	1.32	0.13	0.9	70
Feb'14	5	1.31	0.33	1.48	0.4	108
Mar'14	22	2.04	1.68	0.54	1.6	93
Aprl'14	9	2.75	2.37	0.57	0.6	27
May'14	21	3.35	3.35	0.00	1.5	44
Jun'14	20	3.56	3.56	0.00	1.4	40
Jul'14	16	3.39	3.35	0.06	1.1	34
Aug'14	18	3.19	3.14	0.07	1.3	41
Sep'14	0	2.71	2.71	0.00	0.0	0
Year Totals	124	23.7	21.8	2.9	8.8	40
Acre Feet =	0.4					
Gallons =	124000				Irrigated Acres =	0.52



Findings and Recommendations

Equipment problems identified during the on-site inspection and recommendations for addressing the problems are as follows:

Incorrect Irrigation Schedule

Problem Description: Water consumption history indicates overwatering has occurred during many months of previous years.

Recommendation: Modify the controller's programming to reflect changing weather patterns (rain versus non-rain seasons) and plant needs (high versus low water use requirements). If they are not already on site, purchasing weather based irrigation controllers can help to reduce the amount of labor involved in modifying the controller's programming. Rebates for weather based controllers can be found at www.socalwatersmart.com.

Plants with Mixed Water Needs in Same Hydrozone

Problem Description: Plant species, some with high and some with low water use requirements, are located within the same hydrozone (irrigation zone).

Recommendation: Ensure that within a single irrigation zone, the plant species palette have similar water use requirements. This means that the low-water-use shrubs at your property should be watered separately from the high-water-use turf and are not irrigated by the same station using the same valve.

Spray Deflection

Problem Description: Water delivery was blocked by overgrown, unclipped bushes or plant material.

Recommendation: Where possible, trim plant material or raise, lower or move sprinkler heads to reduce spray interception problems.

Sunken Sprinklers

Problem Description: Sprinkler heads were low, had improper radius, or spray arcs were out of alignment.

Recommendation: Adjust sprinkler heads to minimize direct overspray to hardscape and improve distribution uniformity. This may require the sprinkler heads to be raised, lowered, tilted or straightened. The radius of spray coverage may need to be lengthened or shortened and/or the arc of spray may need to be adjusted.

Underutilized and/or Large Turf Areas

Problem Description: Turf areas that are not utilized for recreation are not an efficient use of water as turf grasses are a high-water-use plant material. The turf area in the backyard was dead as the irrigation to this section had been shut off.

Recommendation: Most turf grasses require higher applications of water than shrub/plant material. Replace any unused or small and oddly shaped turf areas with shrubs or low-water-use plant species. Not only will this reduce the water needs for your site, it will reduce the

amount of water to lost irrigation runoff. The front yard has a large turf area that could benefit from removal and replacement with low-water use plants.

Mixed Irrigation Equipment Types

Problem Description: Irrigation heads types (spray, drip, bubblers or rotating nozzles) were observed on the same irrigation station and resulting in decreased irrigation system efficiency. Watering plants with drip, fixed spray head, and/or rotor heads on the same station is not advisable or economical. Spray heads can put out three times or more the amount of water as drip and rotor head, resulting in overwatering.

Recommendation: Improve system uniformity, and overall irrigation efficiency, by matching sprinkler head types within irrigation stations. Select one type of irrigation sprinkler type per station and adjust the spray head placement, if necessary, to provide head to head coverage.

Low Sprinkler Drainage

Problem Description: After some valves were shut down, water drained from the lowest head on the lateral line.

Recommendation: Install sprinkler bodies equipped with check valves on irrigation lines to prevent drainage from the irrigation system after the cycle has been completed.

Irrigation Controllers Not Utilized to Fullest Potential

Problem Description: The irrigation controller is not being utilized to its fullest potential as weather parameters (including precipitation amounts) and plant water use requirements (based on daily weather patterns) are not reflected in the irrigation scheduling.

Recommendation: Weather data from a CIMIS station should be utilized to schedule irrigations. If this is not realistic, a new weather based irrigation controller can be installed, which automatically schedules irrigations according to weather conditions. For traditional, non-weather based irrigation controllers, the watering schedule should be programmed to reflect the correct season. A winter schedule will be 50% (at least) of the summer irrigation schedule. The Seasonal Adjust % feature on the controller will allow a percentage adjustment to be made to all the stations on one program. This will save time in program changes and reduces overwatering.

Additional comments/recommendations from Irrigation System Evaluation:

Comments/recommendations of site conditions observed during the irrigation system evaluation are summarized below:

- Station #1: Should be converted to drip irrigation.
- Station #2: Should be converted to drip irrigation.
- Station #5: Needs to have one spray head capped off.
- Station #6: Should remove turf and transplant citrus to sunny location.
- Station #7: Convert all spray heads to drip irrigation.
- Station #12: Eventually will need to add additional spray heads to get coverage as shrubs will grow larger.
- Six stations did not work with controller as wires some wires had been cut.

- Programming default was set at 7 days, 10 minutes per station.

Site Photographs

The following photographs show typical problems and observations noted during the site inspection. These problems are listed in the "Findings and Recommendations" Section of this report.

Photo 1: A single rotor sprinkler irrigates this areas (Station #2). The same area also has drip irrigation running to it, but the valve is shut off.

Photo 2: Drip already in place to shrubs in a driveway planter.

Photo 3: Mixed sprinkler heads on the same valve is never suggested.

Photo 4: Watering the clay slope with spray heads will require cycled irrigation times with short runtimes.

Photo 5: Watering the clay slope with spray heads will require cycled irrigation times with short runtimes.

Photo 6: Large area turf that may benefit from removal and replaced with low water use plants.

Photo 7: Single sprinkler head for entire valve. Cap off sprinkler or use the valve for another area.

Photo 8: Most of the shrubs on the property were low water use and were watered with drip irrigation.

Appendix D

Example of Follow-Up Evaluation Report

Residential Evaluation Report – RPEP 07

Table of Contents

Property Overview Map
Existing Conditions on 1-15-2016

Date: 3-1-2016

Residential Property Evaluation Program #: 07
Approximate Acres: 0.77
Land Use: Spaced Rural Residential
Hydrologic Subarea Name and Number: Gavilan, 902.22
USGS Quad: Temecula SW
County, State: San Diego County, CA

Field Office: Escondido Service Center
Agency: Mission RCD
RCD District: Mission RCD
Assisted By: Bethany Principe

0 10 20 40 60 80 Feet

N
W E
S

D-2

Residential Follow-Up Evaluation Plan Map

Date: 3-1-2016

Residential Property Evaluation Program #: 07
Approximate Acres: 0.77
Land Use: Spaced Rural Residential
Hydrologic Subarea Name and Number: Gavilan, 902.22
USGS Quad: Temecula SW
County, State: San Diego County, CA

Field Office: Escondido Service Center
Agency: Mission RCD
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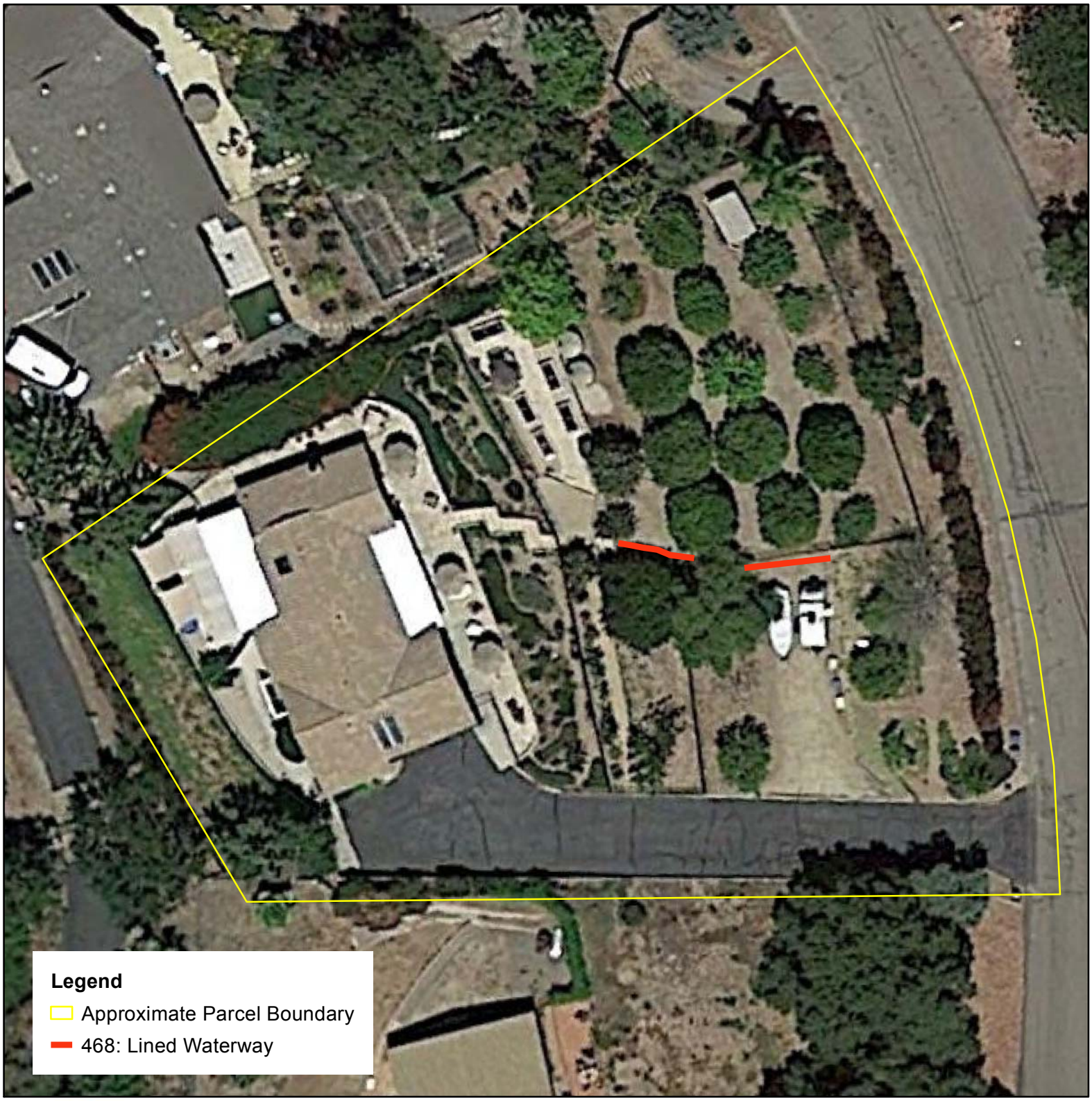

0 10 20 40 60 80 Feet

N
W E
S

D-3

BETHANY PRINCIPE
MISSION RCD BIOLOGIST

Residential Follow-Up Evaluation Plan

Residential Property Evaluation Program
Identification Number 07

OBJECTIVE(S)

The objectives for the property include increasing the health and vigor of the landscape and orchard plants and to structure the property so that, if necessary, resource concerns can be easily addressed and managed.

Practice 468: Lined Waterway or Outlet, Rock Lined Waterway DA <25 ac.

Practice Summary:
This practice is a waterway or outlet having an erosion-resistant lining of concrete, stone, synthetic turf reinforcement fabric, or other permanent material. Conditions of where this practice applies include concentrated runoff, steep grades, wetness, prolonged base flow, seepage, or piping in such that a lining is needed to control erosion.

Operation and Maintenance:
Regular inspection and maintenance is required to ensure optimal efficiency of the practice.

Field	**Planned Amount**
1	39 Ft.
Total	39 Ft.

Landscape Follow-Up Irrigation Report

Residential Property Evaluation Program

Identification Number: 07

Irrigation System Evaluation Date: 1-15-2016

Irrigated Area Summary

The surveyed landscaped area at this site consists of two hydrozones or groups of plant material. Area estimates for each are included in the table below. This does not include hardscape or unplanted areas.

Surveyed Landscaped Area by Hydrozone

	Initial Area (10-20-2014)		Follow Up Area (1-15-16)	
Hydro zone	Sq-Ft	Acres	Sq-Ft	Acres
Shrubs	5,812	0.13	5,812	0.13
Fruit Trees	7,222	0.17	7,222	0.17
Total	13,034	0.30	13,034	0.30

Area data calculated from: Hand measurements and satellite images.

Water Consumption and Weather Data

One mixed meter supplies the landscape water at this site. Water consumption data was available for the period of January 2013 to December 2015and used for this analysis.

Weather data for this period was obtained from the Escondido CIMIS Station. The micro-climate at this weather station closely resembles the conditions that would be found at your location. The landscape coefficient of 0.53 was created using WUCOLS and the auditor's notes of the plant material at this specific site. The graphs below approximate when excess water use occurred during this period. *To make the annual water use comparison graphs more realistic, the indoor water usage was estimated to be 50 gallons per day. This total was then subtracted from the total monthly water usage amounts for the analysis*

Potential Water Savings

During the time period of January 2013to April 2014, no potential savings were identified as the current irrigation schedule is under the plants' water needs. However, improvements to the irrigation system would increase its efficiency and increase the health and crop production of the trees.

The graphs below approximate the water applied and the water usage needs of the plants.

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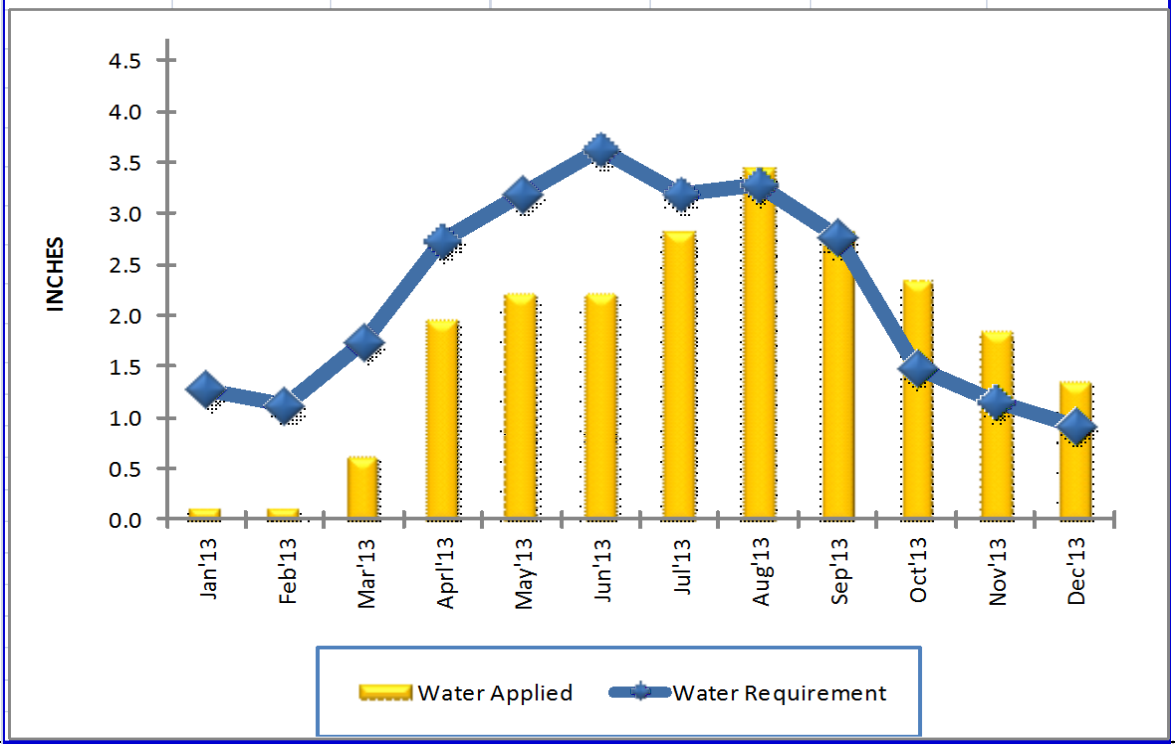
Irrigation Water Use Analysis

2013

CIMIS Station:	Escondido				Crop Factor:	0.53
Water Unit:	1000	Gallons			Usage:	3
DU	0%		Leaching		0%	

Date	Water Units	ETc	Adjusted ETc	Rainfall	Inches of Irrigation	Percent of ETc
Jan'13	1	1.29	1.27	0.02	0.1	10
Feb'13	1	1.52	1.12	0.6	0.1	11
Mar'13	5	2.31	1.74	0.86	0.6	35
Aprl'13	16	2.73	2.73	0.01	2.0	72
May'13	18	3.37	3.19	0.28	2.2	69
Jun'13	18	3.63	3.63	0	2.2	61
Jul'13	23	3.22	3.19	0.04	2.8	88
Aug'13	28	3.29	3.29	0	3.4	105
Sep'13	23	2.76	2.76	0	2.8	102
Oct'13	19	2.04	1.49	0.82	2.3	156
Nov'13	15	1.28	1.15	0.19	1.8	160
Dec'13	11	1.30	0.92	0.58	1.4	147
Year Totals	178	28.7	26.5	3.4	21.9	83
Acre Feet =	0.5					
Gallons =	178000				Irrigated Acres =	0.30

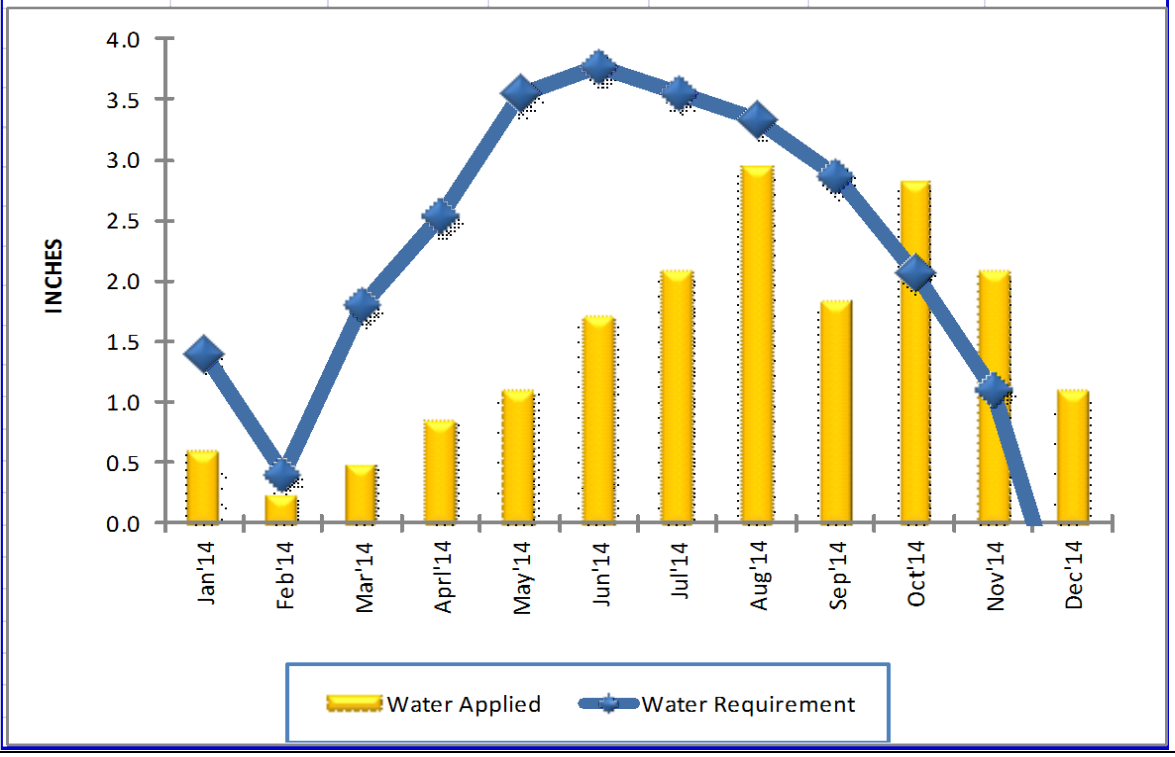


Irrigation Water Use Analysis

2014

CIMIS Station:	Escondido				Crop Factor:	0.53
Water Unit:	1000	Gallons			Usage:	3
DU	0%		Leaching		0%	

Date	Water Units	ETc	Adjusted ETc	Rainfall	Inches of Irrigation	Percent of ETc
Jan'14	5	1.49	1.41	0.13	0.6	44
Feb'14	2	1.38	0.41	1.48	0.2	60
Mar'14	4	2.16	1.80	0.54	0.5	27
Apr'14	7	2.91	2.53	0.57	0.9	34
May'14	9	3.55	3.55	0	1.1	31
Jun'14	14	3.77	3.77	0	1.7	46
Jul'14	17	3.59	3.55	0.06	2.1	59
Aug'14	24	3.38	3.33	0.07	2.9	88
Sep'14	15	2.87	2.87	0	1.8	64
Oct'14	23	2.08	2.08	0.01	2.8	136
Nov'14	17	1.58	1.10	0.72	2.1	189
Dec'14	9	0.77	-1.03	2.73	1.1	107
Year Totals	146	29.5	25.4	6.3	17.9	71
Acre Feet =	0.4					
Gallons =	146000				Irrigated Acres =	0.30

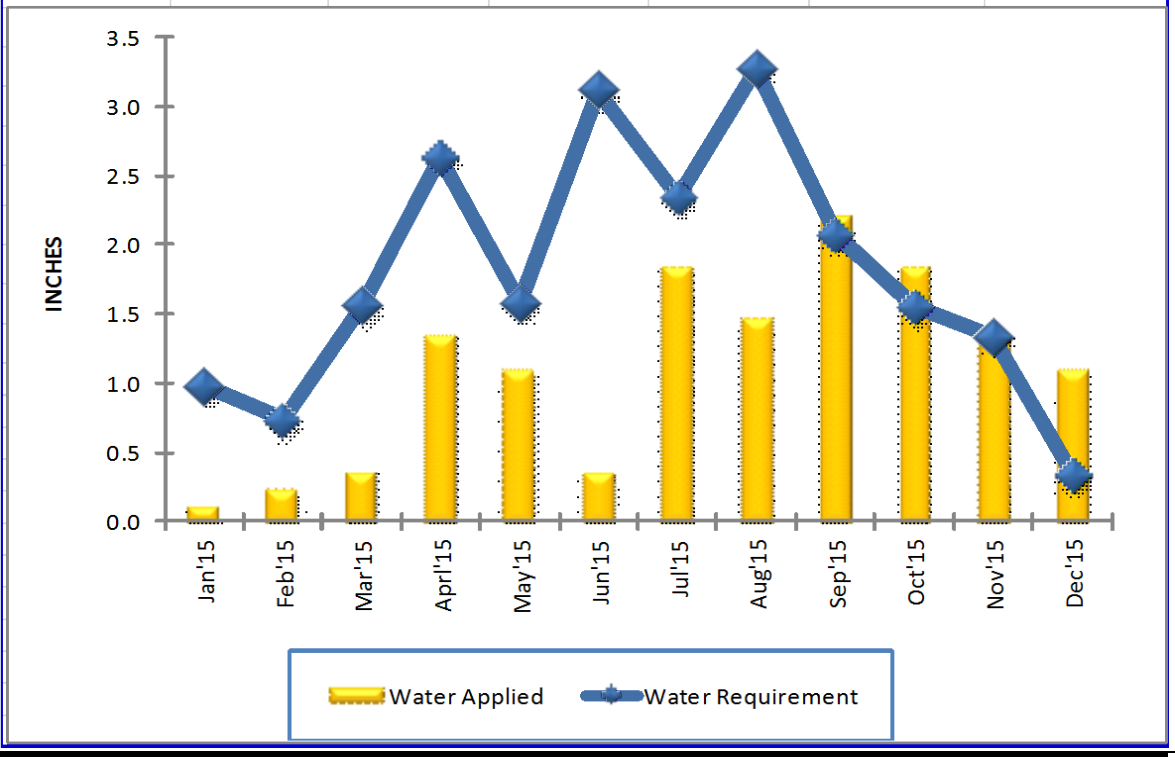


Irrigation Water Use Analysis

2015

CIMIS Station:	Escondido				Crop Factor:	0.53
Water Unit:	1000	Gallons			Usage:	3
DU	0%		Leaching		0%	

Date	Water Units	ETc	Adjusted ETc	Rainfall	Inches of Irrigation	Percent of ETc
Jan'15	1	1.29	0.98	0.47	0.1	12
Feb'15	2	1.35	0.74	0.92	0.2	33
Mar'15	3	2.53	1.56	1.47	0.4	24
Aprl'15	11	2.84	2.63	0.32	1.4	51
May'15	9	2.44	1.58	1.3	1.1	70
Jun'15	3	3.31	3.12	0.29	0.4	12
Jul'15	15	3.15	2.35	1.22	1.8	78
Aug'15	12	3.27	3.27	0	1.5	45
Sep'15	18	2.67	2.07	0.91	2.2	107
Oct'15	15	1.98	1.55	0.65	1.8	119
Nov'15	11	1.56	1.34	0.33	1.4	101
Dec'15	9	1.06	0.35	1.08	1.1	318
Year Totals	109	27.5	21.5	9.0	13.4	62
Acre Feet =	0.3					
Gallons =	109000				Irrigated Acres =	0.30



Findings and Recommendations

Initial site visit equipment problems identified during the on-site inspection, recommendations for addressing the problems, and their status on the follow-up site visit are as follows:

High/Low Pressure

Problem Description: Sprinklers were operating at pressures higher or lower than manufacturer recommendations.

Recommendation: Check and adjust operating pressures of the irrigation systems so that the sprinklers are operating within the manufacturer's recommended range, usually 30-55 dynamic pressure (psi) for spray heads and 20 dynamic pressure (psi) for drip. This may require the installation of pressure regulators at strategic locations within the systems. Nozzle sizes should be matched to head spacing, sprinkler spray patterns and flow rate capacity of the irrigation pipelines.

Follow-Up Site Visit Status: Still need to be addressed.

Incorrect Irrigation Schedule

Problem Description: Water consumption history indicates overwatering has occurred during many months of previous years.

Recommendation: Modify the controller's programming to reflect changing weather patterns (rain versus non-rain seasons) and plant needs (high versus low water use requirements). If they are not already on site, purchasing weather based irrigation controllers can help to reduce the amount of labor involved in modifying the controller's programming.

Follow-Up Site Visit Status: Somewhat corrected.

Leaks

Problem Description: Leaks in the irrigation system were observed. The leaks are resulting in excess water being used during irrigation times.

Recommendation: Fix the leaks in the irrigation system to help reduce the amount of water used during irrigation cycles. Frequent inspection of the irrigation system (when it is running) will help identify areas of the irrigation system that might need maintenance.

Follow-Up Site Visit Status: Corrected.

Plants with Mixed Water Needs in Same Hydrozone

Problem Description: Plant species, some with high and some with low water use requirements, are located within the same hydrozone (irrigation zone).

Recommendation: Ensure that within a single irrigation zone, the plant species palette have similar water use requirements. This means that the low-water-use shrubs at your property should be watered separately from the high-water-use turf and are not irrigated by the same station using the same valve.

Follow-Up Site Visit Status: Still needs to be addressed.

Mixed Irrigation Equipment Types

Problem Description: Irrigation heads types (spray, drip, bubblers or rotating nozzles) were observed on the same irrigation station and resulting in decreased irrigation system efficiency. Watering plants with drip, fixed spray head, and/or rotor heads on the same station is not advisable or economical. Spray heads can put out three times or more the amount of water as drip and rotor head, resulting in overwatering.

Recommendation: Improve system uniformity, and overall irrigation efficiency, by matching sprinkler head types within irrigation stations. Select one type of irrigation sprinkler type per station and adjust the spray head placement, if necessary, to provide head to head coverage.

Follow-Up Site Visit Status: Still needs to be addressed.

Low Sprinkler Drainage

Problem Description: After some valves were shut down, water drained from the lowest head on the lateral line.

Recommendation: Install sprinkler bodies equipped with check valves on irrigation lines to prevent drainage from the irrigation system after the cycle has been completed.

Follow-Up Site Visit Status: Still needs to be addressed.

Misting

Problem Description: Sprinklers were operating at pressures higher than manufacturer recommendations and resulting in a "misting" rather than the intended spray coverage.

Recommendation: Regulate pressure to within manufacturer's specifications, usually 35-55 dynamic pressure. This can be done by adding a single brass pressure regulator on the irrigation mainline upstream of the first valve assembly or installing plastic regulators on individual valves where the pressure is beyond the operating threshold.

Follow-Up Site Visit Status: Still needs to be addressed.

Additional comments/recommendations from Irrigation System Evaluation:

- Dynamic irrigation pressure was measured at 72 psi. The MP rotor high efficiency nozzle is designed to run at 40 psi. The grove misters need to be at 20-30 psi. I highly recommend installing a pressure regulator to get the pressure within manufacturer ranges. This can be achieved by using an inline set pressure regulator such as made by Senninger Irrigation. These regulators can be installed anywhere on the lateral line before the first outlet. It is worth noting that for every 10 pounds of pressure over the manufacture ranges, you use about 5% more water than required.
- Consider upgrading the controller to a weather based irrigation controller. WBIC's come with sensors that take daily weather readings and automatically adjust station run times accordingly. WBIC's can save up to 30% a year. Rebates are available at www.socalwatersmart.com.

Site Photographs

The following photographs show typical problems and observations noted during the follow-up site inspection. These problems are listed in the "Findings and Recommendations" Section of this report.

Photo 1: Dynamic irrigation pressure reading of 72 psi.

Photo 2: Misting caused by high pressure.

Photo 3: An inline pressure regulator can be installed after the isolation ball valve.

Practice 468
Lined Waterway

NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

LINED WATERWAY OR OUTLET

(Ft.)

CODE 468

DEFINITION

A waterway or outlet having an erosion-resistant lining of concrete, stone, synthetic turf reinforcement fabrics, or other permanent material.

PURPOSE

This practice may be applied as part of a resource management system to support one or more of the following purposes:

- Provide for safe conveyance of runoff from conservation structures or other water concentrations without causing erosion or flooding
- Stabilize existing and prevent future gully erosion
- Protect and improve water quality

CONDITIONS WHERE PRACTICE APPLIES

This practice applies if the following or similar conditions exist:

1. Concentrated runoff, steep grades, wetness, prolonged base flow, seepage, or piping is such that a lining is needed to control erosion
2. Use by people or animals precludes vegetation as suitable cover.
3. Limited space is available for design width, which requires higher velocities and lining.
4. Soils are highly erosive or other soil or climatic conditions preclude using vegetation only.

CRITERIA

General Criteria Applicable to All Purposes:

Capacity. The maximum capacity of the waterway flowing at designed depth shall not exceed 200 ft^3/s. The minimum capacity shall be adequate to carry the peak rate of runoff from a 10-year, 24-hour frequency storm. Velocity shall be computed by using Manning's Formula with a coefficient of roughness "n" as follows:

Lining	"n" Value
Concrete	
Trowel finish.....	0.011– 0.015
Float finish…….....	0.013 - 0.016
Shotcrete..... .	0.016 – 0.025
Flagstone..... .	0.020 – 0.025
1/ Riprap - (Angular Rock)	$n = 0.047(D_{50}\,S)^{0.147}$
Synthetic Turf Reinforcement Fabrics and Grid Pavers	Manufacturer's recommendations

1/ Applies on slopes between 2 and 40% with a rock mantle thickness of 2 x D_{50}

where:

D_{50} = median rock diameter (in.),
S = lined section slope (ft./ft.) ($.02 \leq S \leq 0.4$)

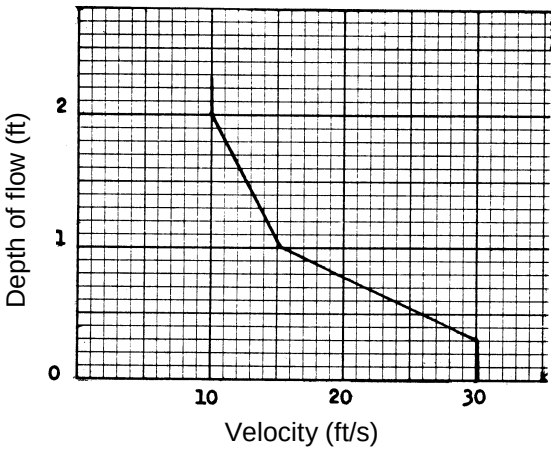


Figure 2. Maximum velocity versus depth of flow for concrete-lined channels

Velocity. Maximum design velocity and rock gradation limits for rock riprap-lined channel sections shall be determined using National Engineering Handbook (NEH), Part 650, Engineering Field Handbook, Chapter 16, Appendix 16A, or NEH 654.14C, unless a detailed design analysis appropriate to the specific slope, flow depth and hydraulic conditions indicate that a higher velocity is acceptable.

Maximum design velocity for concrete-lined sections should not exceed those using Figure 2.

Maximum design velocity for synthetic turf reinforcement fabrics and grid pavers shall not exceed manufacturer's recommendations.

Stable rock sizes and flow depths for rock-lined channels having gradients between 2 percent and 40 percent may be determined using the following detailed design process. This design process is from **Design of Rock Chutes** by Robinson, Rice, and Kadavy.

For channel slopes between 2% and 10%:

$$D_{50} = [q\,(S)^{1.5}/4.75(10)^{-3}]^{0.53}$$

For channel slopes between 10% and 40%:

$$D_{50} = [q\,(S)^{0.58}/3.93(10)^{-2}]^{0.53}$$

$$z = [n(q)/1.486(S)^{0.50}]^{0.6}$$

where:

D_{50} = Particle size for which 50% (by weight) of the sample is finer, in.

S = Bed slope, ft./ft.

z = Flow depth, ft.

n=Manning's roughness coefficient

q = Unit discharge, $ft^3/s/ft$

Avoid channel slopes between 0.7 and 1.3 of the critical slope except for short transition sections. Supercritical flow shall be restricted to straight reaches. Design guidance on the use of this equation is available in NEH 654.14C

Waterways or outlets with supercritical flow shall discharge into an energy dissipator to reduce discharge velocity to less than critical.

Side slope. The steepest permissible side slopes, horizontal to vertical, shall be:

Nonreinforced concrete:
Hand-placed, formed concrete
Height of lining, 1.5 ft or less .....Vertical
Hand-placed screeded concrete or mortared in place flagstone
Height of lining, less that 2 ft .....1 to 1
Height of lining, more than 2 ft .....2 to 1
Slip form concrete:
Height of lining, less than 3 ft .....1 to 1
Rock riprap .....2 to 1
Synthetic Turf Reinforcement Fabrics …2 to 1
Grid Pavers……..1 to 1

Cross section. The cross section shall be triangular, parabolic, or trapezoidal. Cross section made of monolithic concrete may be rectangular.

Freeboard. The minimum freeboard for lined waterways or outlets shall be 0.25 ft above design high water in areas where erosion-resistant vegetation cannot be grown adjacent to the paved or reinforced side slopes. No freeboard is required if vegetation can be grown and maintained.

Lining thickness. Minimum lining thickness shall be:

Concrete.....4 in. (minimum thickness shall be 5 in. if the liner is reinforced).

Rock riprap.....Maximum stone size plus thickness of filter or bedding

Flagstone.....4 in., including mortar bed

Synthetic Turf
Reinforcement Fabrics
and Grid Pavers……Manufacturer's
Recommendations

Lining Durability. Use of non-reinforced concrete or mortared flagstone linings shall be made only on low shrink-swell soils that are well drained or where subgrade drainage facilities are installed.

Related structures. Side inlets, drop structures, and energy dissipators shall meet the hydraulic and structural requirements for the site.

Outlets. All lined waterways and outlets shall have a stable outlet with adequate capacity to prevent erosion and flooding damages.

Geotextiles. Geotextiles shall be used where appropriate as a separator between rock, flagstone, or concrete linings and soil to prevent migration of soil particles from the subgrade, through the lining material. Geotextiles shall be designed according to AASHTO M288, Section 7.3., NEH 654.14D,or NRCS Design Note 24, Guide for the Use of Geotextiles.

Filters or bedding. Filters or bedding shall be used where appropriate to prevent piping. Drains shall be used to reduce uplift pressure and to collect water, as required. Filters, bedding, and drains shall be designed according to NEH Part 633, Chapter 26. Weep holes may be used with drains if needed.

Concrete. Concrete used for lining shall be proportioned so that it is plastic enough for thorough consolidation and stiff enough to stay in place on side slopes. A dense durable product shall be required. Specify a mix that can be certified as suitable to produce a minimum strength of 3,000 pounds per square inch.

Contraction joints. Contraction joints in concrete linings, if required, shall be formed transversely to a depth of about one-third the thickness of the lining at a uniform spacing in the range of 8 to 15 feet. Provide steel reinforcement or other uniform support to the joint to prevent unequal settlement.

Site and Subgrade Preparation. Proper site preparation is necessary to provide a stable, uniform foundation for the waterway lining. The site should be graded to remove any rutting or uneven surfaces and to provide good surface drainage throughout the construction period and the design life of the waterway or outlet. Proof rolling can be used to identify soft pockets of soil, additional rutting, or other soil conditions that require removal, and replacement by compacted soil to provide a uniform surface for base, subbase, or concrete liner.

CONSIDERATIONS

Streambank Soil Bioengineering. Trees, shrubs, forbs and grasses can be incorporated into or adjacent to the lined portions of the channel. This may improve aesthetics and habitat benefits as well as reduce erosion potential. Plantings are especially beneficial where the channel transitions to natural ground. However, such plantings are not appropriate in all circumstances. Guidance on the use of plantings is available in NEH 654.14I and NEH 654.14K.

Fish and Wildlife Resources. This practice may impact important fish and wildlife habitats such as streams, creeks, riparian areas, floodplains, and wetlands.

Aquatic organism passage concerns (e.g., velocity, depth, slope, air entrainment, screening, etc.) should be evaluated to minimize negative impacts. Swimming and leaping performance for target species should be considered.

Important fish and wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the lined waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of the grassed portion of the lined waterways so they do not interfere with hydraulic functions and roots do not damage the lined portion of the waterway. Mid- or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat.

Plant selections that benefit pollinators should be incorporated into the design. Waterways with these wildlife features are more beneficial when connecting other habitat types: e.g., riparian areas, wooded tracts, and wetlands.

Other Considerations.

Filter strips established on each side of the waterway may improve water quality.

Consideration should be given to livestock and vehicular crossings as necessary to prevent damage to the waterway. Crossing design shall not interfere with design flow capacity.

Reinforcement of concrete liners should be considered where high pore water pressures exist in the subgrade, movement of the subgrade may occur, or in reaches where failure would endanger public safety or property.

Cultural Resources and Endangered Species

This practice is likely to occur in areas where Cultural Resources or Endangered Species habitat may be found. Follow NRCS Planning Policy to address these concerns.

PLANS AND SPECIFICATIONS

Plans and specifications for lined waterways or outlets shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

As a minimum the plans and specifications shall include:

- A plan view of the layout of the lined waterway or outlet.
- Typical cross section of the lined waterway or outlet.
- Profile of the lined waterway or outlet.
- Disposal requirements for excess soil material.
- Site specific construction specifications that describe the installation of the lined waterway or outlet. Include specification for control of concentrated flow during construction.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to and reviewed with the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity and outlet stability.

Lining damaged by machinery or erosion must be repaired promptly.

Inspect lined waterways regularly, especially following heavy rains. Damaged areas shall be repaired immediately. Remove sediment deposits to maintain capacity of lined waterways.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover. Control noxious weeds. Do not use as a field road. Avoid crossing with heavy equipment.

REFERENCES

AASHTO M288. Standard Specification for Geotextile Specification for Highway Applications.

National Engineering Handbook, Part 654, Stream Restoration Design, August 2007.

National Engineering Handbook, Part 650, Engineering Field Handbook: Chapter 16, Streambank and Shoreline Protection.

National Engineering Handbook, Part 633, Soil Engineering: Chapter 26 – Gradation Design of Sand and Gravel Filers.

Robinson, K.M., C.E. Rice, and K.C. Kadavy. 1998. Design of Rock Chutes.Transactions of ASAE, Vol. 41(3): 621-626.

USDA, NRCS Guide for the Use of Geotextiles. Design Note 24 (210-VI-DN-24, 1991).

USDA, NRCS, Pollinator Conservation. http://www.plant-materials.nrcs.usda.gov/news/features/pollinatorconservation.html (accessed August 20, 2009.)

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

468 - LINED WATERWAY OR OUTLET

I. SCOPE

The work shall consist of grading and shaping a waterway to the lines and grades as shown on the drawings, and includes furnishing and placing a lining of the type and thickness as specified.

II. MATERIALS

Concrete, when specified, will be placed in conformance with the requirements of Construction Specification 900 – Concrete (3000 psi).

Rock riprap, when specified, rock will be placed in conformance with the requirements of Construction Specification 907 - Rock Riprap.

Other materials, when specified other materials will be placed in conformance with the requirements of Special Construction Specifications to be attached to the drawings.

Geotextile fabric, when specified will conform to the required of Construction Specification 905 - Geotextile Fabric.

III. SITE PREPARATION

The foundation area shall be cleared of all trees, stumps, roots, brush, boulders, sod, debris, and other objectionable materials. All topsoil shall be removed and stockpiled until the needed for spreading over areas requiring vegetative cover. Removal operations shall be done in such a manner as to avoid damage to other trees and property.

IV. FOUNDATION

To shape the required cross-section, excavation shall be to the lines and grades as shown on the drawings, or as staked in the field. Subgrade shall be firm and free of water. Any earthfill required to bring subgrade to grade, shall be placed in layers not exceeding 8-inches, and compacted to the same density as the adjacent undisturbed material.

V. PLACEMENT

Placement of the lining materials shall be conformance of the Construction Specification as shown on the Practice Requirement sheet, and as shown on the drawings.

VI. VEGETATIVE COVER

Unless otherwise specified, a protective cover of vegetation shall be established on the disturbed area. The planting of vegetative materials shall conform to the requirements of Practice Specification 342, Critical Area Planting.

VII. SPECIAL MEASURES

Measures and construction methods shall be incorporated as needed and practical, that enhance fish and wildlife values. Special attention shall be given to protecting visual resources and maintaining key shade, food and den trees.

VIII. CONSTRUCTION OPERATIONS

Construction operations shall be done in such a manner that erosion and air and water pollution are minimized and held within legal limits. The owner, operator, Contractor or other persons will conduct all work and operations in accordance with proper safety codes for the type of construction being performed with due regards to the safety of all persons and property.

The completed job shall be workmanlike and present a good appearance.

U.S DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
CALIFORNIA

PRACTICE REQUIREMENTS
FOR
468 - LINED WATERWAY OR OUTLET

For: Residential Property Evaluation Program Identification Number: 07

Job Location A residential property in the Rainbow Creek watershed

County San Diego RCD Mission RCD Farm/Tract No. _____

Referral No. _____ Prepared By Bethany Principe Date 3-1-2016

IT SHALL BE THE RESPONSIBILITY OF THE OWNER TO OBTAIN ALL NECESSARY PERMITS AND/OR RIGHTS, AND TO COMPLY WITH ALL ORDINANCES AND LAWS PERTAINING TO THIS INSTALLATION.

Installation shall be in accordance with the following drawings, specifications and special requirements. NO CHANGES ARE TO BE MADE IN THE DRAWINGS OR SPECIFICATIONS WITHOUT PRIOR APPROVAL OF THE NRCS TECHNICIAN.

1. Drawings, No. On Evaluation Plan Map

2. Practice Specifications 468 , _____ , _____

3. Type of Lining _____ Thickness _____ (inches)(mils)

4. Elevation of turnout in relation to field elevation: _____

5. Special Requirements: Assistance from the NRCS engineer should be obtained for this practice.

6. Special Maintenance Requirements: _____

PRACTICE APPROVAL:

Job Classification: (Ref: Section 501 NEM)

Show the limiting elements for this job. This job is classified as, Class _____III_____

Limiting elements:	Units
Drainage area	acres
Capacity	10 cfs

Design Approved by:_____ Date:_____

LANDOWNER'S/OPERATOR'S ACKNOWLEDGEMENT:

The landowner/operator acknowledges that:

a. He/she has received a copy of the construction drawings and specification, and that he/she has an understanding of the contents, and the requirements.

b. He/she has obtained all the necessary permits.

c. No changes will be made in the installation of the job without prior concurrence of the NRCS technician.

d. Maintenance of the installed work is necessary for proper performance during the project life.

Accepted by:_____ Date:_____

PRACTICE COMPLETION:

I have made an on site inspection of the site (or I am accepting owner/contractor documentation), and have determined that the job as installed does conform to the drawings and practice specifications.

Completion Certification by:

/s/_____ Date _____

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

468 – LINED WATERWAY OR OUTLET

OPERATION AND MAINTENANCE

For: Residential Property Evaluation Program Identification Number: 07

Job Location A residential property in the Rainbow Creek watershed

County San Diego RCD Mission RCD Farm/Tract No.

Referral No. Prepared By Bethany Principe Date 3-1-2016

A properly operated and maintained lined waterway or outlet is an asset to the farm. This lining facility was designed and installed to provide erosion protection for the waterway or outlet. The estimated life span of this installation is at least 15 years. The life of this installation can be assured and usually increased by developing and carrying out a good operation and maintenance program.

This practice will require you to perform periodic operation to maintain satisfactory performance. Here are some recommendations to help you develop a good operation and maintenance program:

GENERAL RECOMMENDATIONS

- Maintain adequate drainage of foundations.
- Maintain widths of soil berms or banks. Avoid use of tillage equipment that accelerates soil removal.
- Drain all lined waterways or outlets when not being used. Immediately repair any cracks or breaks in the lining, and if settlement is present, investigate cause before repair.
- If livestock are present, prevent their access to linings and provide other drinking water facilities.
- Remove any blockage (sediments, debris, foreign material etc.) that restrict flow capacity.
- Immediately repair any vandalism, vehicular or livestock damage.
- Inspect for damage from rodents or burrowing animals. Repair any damage. Take appropriate corrective actions to alleviate further damage.
- Remove woody vegetation and perennials from areas adjacent to lining,
- Repair spalls, cracks and weathered areas in concrete surfaces.
- Repair or replace rusted or damaged metal and paint and apply paint as a protective coating.
- Avoid crossings of equipment or vehicles except at designated areas.

SPECIFIC RECOMMENDATIONS FOR YOUR LINED WATERWAY OR OUTLET

Regular inspection and repair of the waterway will help ensure the effectiveness of the practice.

CONTACT YOUR LOCAL NATURAL RESOURCES CONSERVATION SERVICE OFFICE FOR ANY ADDITIONAL TECHNICAL ASSISTANCE YOU MIGHT NEED FOR IMPLEMENTATION OF THIS OPERATION AND MAINTENANCE PLAN FOR YOUR LINED WATERWAY OR OUTLET.

Appendix E

List of Best Management Practices

Recommended and Implemented

List of Recommended and Implemented BMPs to prevent, control and manage sediment, stormwater runoff and erosion on Residential Property Evaluation Program participating properties in the Rainbow Creek Watershed.

Best Management Practice	Action	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Critical Area Planting	Install	Ac.	0.73	0.57	78%
Diversion	Install	Ft.	0	72	100%
Hedgerow	Install	Ft.	21	0	0%
Lined Waterway	Repair or Maintenance	Ft.	158	126	80%
Lined Waterway	Install	Ft.	440	385	88%
Mulch - Organic	Install	Ac.	1.27	1.63	128%
Mulch - Inorganic	Install	Ac.	0.03	0.01	33%
Roof Runoff Structure - Dissipater	Install	No.	1	0	0%
Access Road - Build Up Road	Install	Ft.	50	50	100%
Access Road - Regrade/Reshape	Install	Ft.	320	0	0%
Heavy Use Area Protection - Organic	Install	Ac.	0.19	0.14	74%
Heavy Use Area Protection - Inorganic	Install	Ac.	0.07	0.01	14%
Open Channel	Install	Ac.	0.02	0.01	50%
Structure For Water Control - Dissipater	Install	No.	6	1	17%
Structure For Water Control - Culvert	Repair or Maintenance	No.	5	7	140%
Structure For Water Control - Water Bar	Install	No.	5	0	0%
Underground Outlet	Repair or Maintenance	No.	3	2	67%
Underground Outlet - Pipe	Install	Ft.	90	90	100%
Underground Outlet - Dissipater	Install	No.	2	1	50%

Best Management Practice	Action	Unit	Recommended Amount	Implemented Amount	Implemented (%)
Water and Sediment Control Basin	Install	No.	1	0	0%
Water and Sediment Control Basin	Repair or Maintenance	No.	1	1	100%
Wildlife Structure - Owl Box	Install	No.	1	2	200%
Wildlife Structure - Raptor Perch	Install	No.	7	0	0%
Berm	Install	Ft.	0	33	100%
Silt Barriers	Install	Ft.	0	58	100%
Silt Barriers	Install	No.	0	8	100%
Sand Bag	Remove	Ft.	20	20	100%
Ditch/Diversion	Fill In	Ft.	95	95	100%
Pile of Dead Vegetation	Remove	No.	6	6	100%
Retaining Wall	Install	Ft.	0	190	100%
Straw Wattle	Install	Ft.	0	357	100%
Accumulated Sediment Behind Silt Barrier	Remove	No.	1	1	100%

Appendix F

Photographs of Before and After

Best Management Practices Implementation

Photographs of Before and After Best Management Practices Implementation

Left Photo: A 36 inch culvert inlet was filled in with soil by the previous owner to create an unpermitted water catchment basin. The over-flowing excess runoff was resulting in erosion across the access road and destabilizing the downstream slope. The photograph on the left shows the culvert inlet partially unearthed by the Residential Property Evaluation Program participant and new property owner. Photo taken during the initial site visit.

Left Photo: The 36 inch culvert inlet headwall was constructed to prevent further erosion across the access road and concrete steps and retaining wall were installed directly upstream to stabilize the waterway. The BMPs implemented were structure for water control - culvert stabilization and retaining walls. Photo taken during the follow-up site visit.

Right Photo: A lined waterway (lined with cobble sized rocks) was installed directly upstream of the 36 inch culvert's inlet. Sediment that is accumulating in the waterway will be removed and the upstream source of the sediment (an access road used and maintained by SDG&E) will need to be modified to prevent sediment movement from the road site. The BMP implemented was a lined waterway. Photo taken during the follow-up site visit.

Above Photo: A bare slope experiencing sediment loss, which enters the lined waterway and empties into a tributary of Rainbow Creek that is located directly downstream of the property. Photo taken during the initial site visit.

Below Photo: The exposed and vulnerable area has been mulched with wood chips and compost and planted with native, low-water use plants to help prevent and control sediment loss. The BMPs implemented were mulching and critical area planting. Photo taken during the follow-up site visit.

Above Photo: A bare slope experiencing erosion, with the sediment flowing onto the driveway and into a lined waterway that empties into a tributary of Rainbow Creek located directly downstream of the property. Photo taken during the initial site visit.

Below Photo: The exposed and vulnerable area has been mulched with wood chips and compost and planted with native, low-water use plants to help prevent and control sediment loss. The high-water use lawn has been replaced with mulch and low water use plants as well. The BMPs implemented were mulching and critical area planting. Photo taken during the follow-up site visit.

Above Photo: Heavy use area (stairs) experiencing sheet erosion and sediment loss. Photo taken during the initial site visit at top of stairs looking towards bottom of stairs.

Below Photo: The exposed and vulnerable area has been protected with wood chips and straw to help prevent and control sediment loss. The BMP implemented was heavy use area protection. Photo taken during the follow-up site visit at bottom of stairs looking up towards the top of the stairs.

Above Photo: Heavy use area (dirt parking area) experiencing sheet, rill and rut erosion and sediment loss. The owner has attempted to keep the sediment on the parking area and off the driveway with straw wattles (now degraded). Photo taken during the initial site.

Below Photo: The exposed and vulnerable area has been protected with gravel to help prevent and control sediment loss. The BMPs implemented were heavy use area protection and a lined waterway. Photo taken during the follow-up site visit .

Above Photo: The bare slope in the tree orchard was experiencing sheet and rut soil erosion. Photo taken during the initial site visit.

Below Photo: The rut formed by erosion was filled with gravel to form a lined waterway, which prevents further erosion and sediment loss. The surrounding area was seeded with an annual grass and the crop residue (leaves and small twigs) are no longer removed, but stay on the ground to prevent sheet erosion and sediment loss. The BMPs implemented were a lined waterway, mulching with crop residue and critical area planting. Photo taken during the follow-up site visit.

Left Photo: Photo taken looking up hill at a dirt access road (on the right), which is experiencing sheet, rill and rut erosion from stormwater runoff and erosion on the outboard slope (on the left) caused by the outlet location of a roof runoff structure (gutter) pipe. Photo taken during initial site visit.

Left Photo: The access road has been protected with a straw mat. The uphill access road slope (on the right) has been protected with a straw wattle. An extension pipe from the outlet of the roof runoff structure has been extended and it now outlets into a drainage creek and natural rock dissipater. The BMPs implemented were heavy use area protection, straw wattle and underground outlet and dissipater. Photo taken during follow-up site visit.

Right Photo: A view of the access road, from above the access road, shows the straw mat, straw wattles and mulch that were placed to help prevent and control any erosion on the slopes and access road. The BMPs implemented were heavy use area protection, straw wattles, and mulching. Photo taken during follow -up site visit.

Above Photo: A slope experiencing erosion and sediment loss, with the sediment flowing into the lined waterway which empties into Rainbow Creek. The degraded sand bags were the property owners' attempt to control the sediment lost from the slope and the citrus grove directly uphill. Photo taken during the initial site visit looking uphill.

Below Photo: The lined waterway was reinforced and a retaining wall was installed to catch the sediment flowing from the uphill property. Sand bags were also installed to act as silt barriers. The slope was allowed to grow weeds in order to help prevent erosion, as well. The BMPs implemented lined waterway maintenance, retaining wall, silt barriers and critical area planting. Photo taken during the follow-up site visit.

Above Photo: A slope experiencing erosion and sediment loss, with the sediment flowing into the lined waterway which empties into Rainbow Creek. The degraded sand bags were the property owners' attempt to control the sediment lost from the slope and the citrus grove directly uphill. Photo taken during the initial site visit looking downhill. This is the same site and BMP as picture on the previous page.

Below Photo: The lined waterway was reinforced and a retaining wall was installed to catch the sediment flowing from the uphill property. Sand bags were also installed to act as silt barriers. The slope was allowed to grow weeds in order to help prevent erosion, as well. The BMPs implemented lined waterway maintenance, retaining wall, silt barriers and critical area planting. Photo taken during the follow-up site visit.

Appendix G

Dry and Wet Weather Load Reduction Calculations

For Participating Properties

Dry and Wet Weather Load Reduction Calculations

The Dry and Wet Weather Load Reduction Calculator estimates for the Residential Property Evaluation Program after implementation of Best Management Practices. Nine properties participated in the Program.

Property 01

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	34,764	11,547	33%
Total Nitrogen (kg/year)	8.0	2.7	34%
Total Phosphorus (kg/year)	0.11	0.04	34%
TSS (kg/year)	13	4.2	34%
Fecal Coliform (MPN/year)	1.15E+09	3.90E+08	34%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	14,865	0	0%
Total Nitrogen (kg/year)	1.9	0.0	0%
Total Phosphorus (kg/year)	0.48	0.00	0%
TSS (kg/year)	766	0	0%
Fecal Coliform (MPN/year)	2.03E+10	0.00E+00	0%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	49,629	11,547	23%
Total Nitrogen (kg/year)	9.8	2.7	27%
Total Phosphorus (kg/year)	0.60	0.04	6%
TSS (kg/year)	778	4.4	0.6%
Fecal Coliform (MPN/year)	2.14E+10	3.90E+08	2%

Property 02

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	53,383	370	0.7%
Total Nitrogen (kg/year)	15	0.048	0.3%
Total Phosphorus (kg/year)	0.21	0.0012	0.6%
TSS (kg/year)	15	0.23	1%
Fecal Coliform (MPN/year)	1.32E+09	1.26E+07	1.0%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	60,068	109	0.2%
Total Nitrogen (kg/year)	5	0.008	0.2%
Total Phosphorus (kg/year)	0.87	0.002	0.2%
TSS (kg/year)	1,408	5	0.3%
Fecal Coliform (MPN/year)	3.07E+10	7.67E+07	0.2%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	113,451	479	0.4%
Total Nitrogen (kg/year)	19	0.056	0.3%
Total Phosphorus (kg/year)	1.08	0.003	0.3%
TSS (kg/year)	1,423	5	0.3%
Fecal Coliform (MPN/year)	3.20E+10	8.93E+07	0.3%

Property 03

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	134,089	17,226	13%
Total Nitrogen (kg/year)	22.6	2.3	10%
Total Phosphorus (kg/year)	0.47	0.06	12%
TSS (kg/year)	47	11	22%
Fecal Coliform (MPN/year)	4.31E+09	5.80E+08	13%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	44,884	1,974	4%
Total Nitrogen (kg/year)	3.7	0.2	5%
Total Phosphorus (kg/year)	0.88	0.05	5%
TSS (kg/year)	1,412	130	9%
Fecal Coliform (MPN/year)	3.33E+10	1.95E+09	6%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	178,973	19,201	11%
Total Nitrogen (kg/year)	26	2.5	9%
Total Phosphorus (kg/year)	1.35	0.10	8%
TSS (kg/year)	1,459	140	10%
Fecal Coliform (MPN/year)	3.77E+10	2.52E+09	7%

Property 04

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	89,782	2,270	3%
Total Nitrogen (kg/year)	14.71	0.28	2%
Total Phosphorus (kg/year)	0.39	0.01	2%
TSS (kg/year)	26	1	4%
Fecal Coliform (MPN/year)	2.26E+09	7.72E+07	3%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	109,212	215	0.2%
Total Nitrogen (kg/year)	8.1	0.02	0.3%
Total Phosphorus (kg/year)	0.68	0.01	1%
TSS (kg/year)	1,146	19	2%
Fecal Coliform (MPN/year)	1.67E+10	4.07E+08	2%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	198,994	2,485	1%
Total Nitrogen (kg/year)	22.8	0.3	1%
Total Phosphorus (kg/year)	1.07	0.02	2%
TSS (kg/year)	1,172	20	2%
Fecal Coliform (MPN/year)	1.89E+10	4.84E+08	3%

Property 05

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	39,336	22,677	58%
Total Nitrogen (kg/year)	9.3	4.6	49%
Total Phosphorus (kg/year)	0.13	0.07	57%
TSS (kg/year)	14	10.0	69%
Fecal Coliform (MPN/year)	1.33E+09	7.71E+08	58%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	13,194	1,578	12%
Total Nitrogen (kg/year)	1.47	0.15	10%
Total Phosphorus (kg/year)	0.54	0.05	9%
TSS (kg/year)	855	120	14%
Fecal Coliform (MPN/year)	2.26E+10	2.05E+09	9%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	52,530	24,255	46%
Total Nitrogen (kg/year)	11	5	44%
Total Phosphorus (kg/year)	0.67	0.12	18%
TSS (kg/year)	869	130	15%
Fecal Coliform (MPN/year)	2.39E+10	2.82E+09	12%

Property 06

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	200,152	56,902	28%
Total Nitrogen (kg/year)	38.3	11.7	30%
Total Phosphorus (kg/year)	0.65	0.18	29%
TSS (kg/year)	67	20.7	31%
Fecal Coliform (MPN/year)	6.09E+09	1.93E+09	32%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	66,166	1,519	2%
Total Nitrogen (kg/year)	6	0.2	3%
Total Phosphorus (kg/year)	1.67	0.05	3%
TSS (kg/year)	2,674	100	4%
Fecal Coliform (MPN/year)	6.80E+10	2.43E+09	4%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	266,318	58,421	22%
Total Nitrogen (kg/year)	44	12	27%
Total Phosphorus (kg/year)	2.32	0.24	10%
TSS (kg/year)	2,741	120	4%
Fecal Coliform (MPN/year)	7.41E+10	4.37E+09	6%

Property 07

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	31,327	7,815	25%
Total Nitrogen (kg/year)	7.6	2.0	26%
Total Phosphorus (kg/year)	0.10	0.03	25%
TSS (kg/year)	12	2.8	24%
Fecal Coliform (MPN/year)	1.06E+09	2.63E+08	25%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	12,448	1,508	12%
Total Nitrogen (kg/year)	1.6	0.2	14%
Total Phosphorus (kg/year)	0.48	0.01	3%
TSS (kg/year)	757	26	3%
Fecal Coliform (MPN/year)	2.01E+10	6.43E+08	3%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	43,775	9,322	21%
Total Nitrogen (kg/year)	9.2	2.2	24%
Total Phosphorus (kg/year)	0.58	0.04	7%
TSS (kg/year)	769	29	4%
Fecal Coliform (MPN/year)	2.11E+10	9.06E+08	4%

Property 08

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	45,261	741	2%
Total Nitrogen (kg/year)	10.3	0.1	1%
Total Phosphorus (kg/year)	0.17	0.002	1%
TSS (kg/year)	13	0.5	4%
Fecal Coliform (MPN/year)	1.12E+09	2.52E+07	2%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	46,588	306	0.7%
Total Nitrogen (kg/year)	7	0.03	0.4%
Total Phosphorus (kg/year)	0.59	0.004	0.7%
TSS (kg/year)	920	10	1%
Fecal Coliform (MPN/year)	2.11E+10	1.59E+08	0.8%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	91,849	1,046	1%
Total Nitrogen (kg/year)	17	0.1	0.7%
Total Phosphorus (kg/year)	0.77	0.01	0.8%
TSS (kg/year)	933	10	1%
Fecal Coliform (MPN/year)	2.22E+10	1.84E+08	0.8%

Property 09

Dry Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	53,383	370	0.7%
Total Nitrogen (kg/year)	14.533	0.048	0.3%
Total Phosphorus (kg/year)	0.21	0.00	0.6%
TSS (kg/year)	15	0.2	1%
Fecal Coliform (MPN/year)	1.32E+09	1.26E+07	1.0%

Wet Weather Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	60,068	109	0.2%
Total Nitrogen (kg/year)	4.53	0.01	0.2%
Total Phosphorus (kg/year)	0.87	0.002	0.2%
TSS (kg/year)	1,408	4.7	0.3%
Fecal Coliform (MPN/year)	3.07E+10	7.67E+07	0.2%

Annual Estimates

Pollutant	Baseline Runoff/Loads of Parcel Inspected	Estimated Runoff/Load Reduction from BMPs	Estimated Percent Reduction
Runoff Volume (cubic feet/year)	113,451	479	0.4%
Total Nitrogen (kg/year)	19	0.1	0.3%
Total Phosphorus (kg/year)	1.08	0.003	0.3%
TSS (kg/year)	1,423	4.9	0.3%
Fecal Coliform (MPN/year)	3.20E+10	8.93E+07	0.3%