Slow it. Spread it. Sink it!

A Homeowner's Guide to Greening Stormwater Runoff

Practical and Eco-Friendly Ways to Protect Your Property and the Environment from the Effects of Stormwater Runoff

RESOURCE
CONSERVATION DISTRICT
OF SANTA CRUZ COUNTY

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STATEMENT OF PURPOSE

This manual has been developed for educational purposes by the Resource Conservation District of Santa Cruz County (RCD). The stormwater runoff improvement practices included in this guide are to be used as general guidelines and are not to be used as professional engineered specifications. Prior to implementation of ANY practices, seek technical assistance from a licensed professional engineer or landscape architect, and/or certified professionals in erosion and sediment control for specifications for these practices. Site-specific designs that address each individual site's needs and constraints are essential.

WHO WE ARE

The Resource Conservation District of Santa Cruz County (RCD) is a special district organized under state law. The RCD is also a public resource agency with no enforcement or regulatory functions. It works closely with the Natural Resources Conservation Service (NRCS) through a mutual agreement in responding to the soil and water management needs of Santa Cruz County land owners and users.

The NRCS, formerly the Soil Conservation Service (SCS), is a non-regulatory, federal agency in the U.S. Department of Agriculture (USDA) created to lead a national effort to prevent erosion and protect the nation's privately owned soils and water resources. NRCS provides free technical assistance through a variety of voluntary programs aimed at helping land users protect, enhance, and wisely use our nation's soil, water, and other natural resources.

Together, through this local partnership, local landowners receive many services including free on-site evaluations that address and other resources concerns, workshops and trainings related to greening stormwater runoff, cost-share and permitting assistance for qualified projects, and more.

ACKNOWLEDGEMENTS

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Note: Federal, state, and local regulations in California pertain to many of the subjects presented in this guide. Regulations change quickly, as do the technical methods and standards for environmental protection. Be sure to follow applicable regulations covering private land maintenance and related activities for your area. See the Resources Guide on page 47 for a list of contacts.

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DID YOU KNOW?

Something as simple as water from a downspout contributes to a number of unwanted consequences. Roofs and other impervious surfaces alter natural hydrology increasing the volume of stormwater runoff. This has a variety of impacts including streambank erosion and degraded wildlife habitat. Other unintended outcomes associated with accelerated stormwater runoff are potholes, damage to structures, beach closures, and in severe cases, land and mud slides. Fortunately there are simple low-cost things that we all can do to help decrease the volume of, and minimize the pollutants in, the runoff leaving our properties. And many have the added benefit of beautifying our landscapes! Read on.

DID YOU KNOW THAT THIS:

CAN CONTRIBUTE TO THIS:

SO WHY NOT TRY ONE OF THESE?

Here are just a few of the ideas you'll find in this guide to address stormwater runoff around your home.

Collect your roof water in a **RAIN BARREL**.

Cost: LOW
Installation difficulty: EASY
See page 24

Plant a **RAIN GARDEN** in your landscape.

Cost: LOW to MODERATE
Installation difficulty: EASY to INTERMEDIATE
See page 27

Install a **WATERBAR** on your driveway.

Cost: MODERATE
Installation difficulty: INTERMEDIATE
See page 35

Use **PERVIOUS PAVERS** when renovating your patio.

Cost: MODERATE - HIGH
Installation difficulty: INTERMEDIATE
See page 30

Introduction

Before Santa Cruz County and its incorporated cities became the developed, unique communities they are today, the diverse collection of habitats including redwood forests, oak woodlands, native grasslands, riparian areas, wetlands, and sand dunes were virtually undisturbed. Rivers and streams, capturing and conveying rainwater, flowed from the mountains to the Monterey Bay along sinuous unchannelized corridors. Intact wetlands functioned as natural filters and buffers from major storms. Under these pre-development conditions as much as 50% of rainwater **infiltrated** (soaked into) the soil replenishing groundwater supplies, contributing to year-round stream flows, and sustaining plants. Another 40% was released into the atmosphere through **evapotranspiration** (evaporation of surface and ground water plus water loss from plants). Only about 10% contributed to **stormwater runoff** (rainwater that flows over the land surface).

Our modern day urban centers and rural neighborhoods are made up of **impervious surfaces** (hardened surfaces that do not allow water to pass through) such as roofs, streets, and parking areas. When rain falls on these surfaces, it flows faster and in greater amounts than it would have under pre-development conditions significantly increasing runoff and decreasing infiltration and evapotranspiration. Runoff is typically conveyed by pipes, driveways, streets, and storm drains to creeks and rivers, where it can cause flooding, road damage, stream erosion, and landslides. Runoff also carries sediments and other pollutants to beaches and rivers making them unsafe for recreation and wildlife. Though it starts as relatively clean rainwater, runoff collects pollutants as it flows over the landscape. For example excess lawn fertilizers, pet waste, soap from car washing, oil and grease from leaking engines, zinc from tires, and copper from brakes are just some contaminants that have been found in runoff in the county. It is important to note that nearly ALL storm drains in Santa Cruz County empty into local waterways UNTREATED.

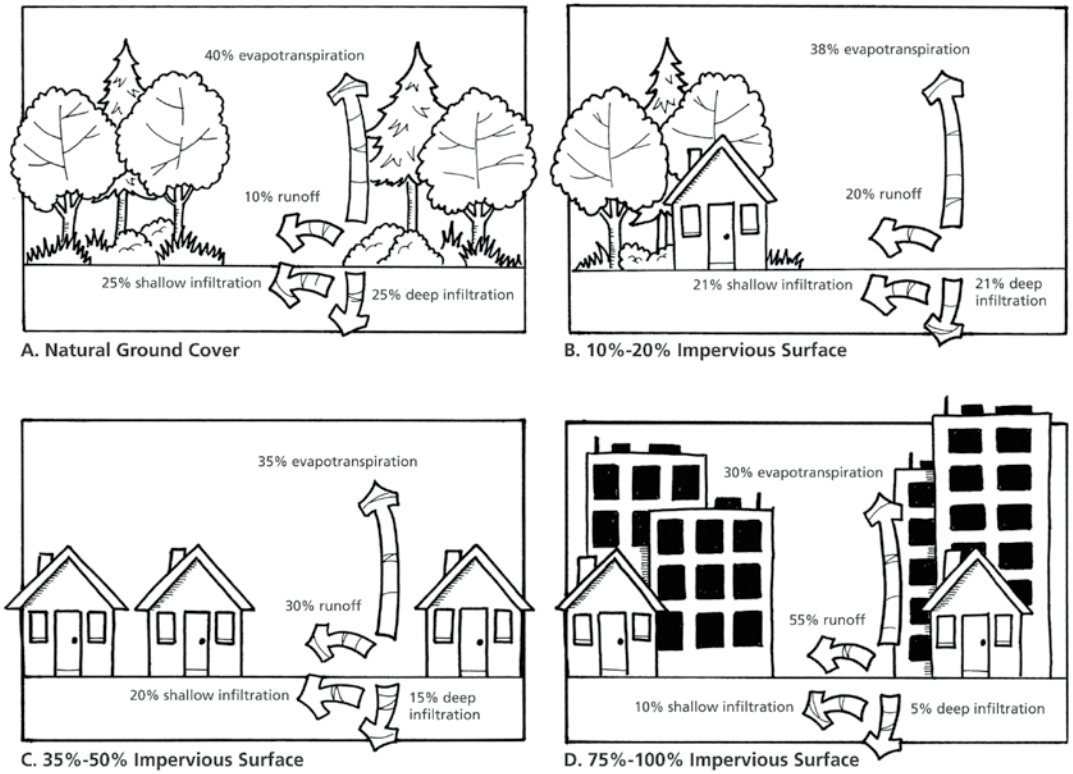


FIGURE 1: PERCENTAGE RUNOFF GENERATED FROM IMPERVIOUS SURFACES, ADAPTED FROM FISRWG 1998

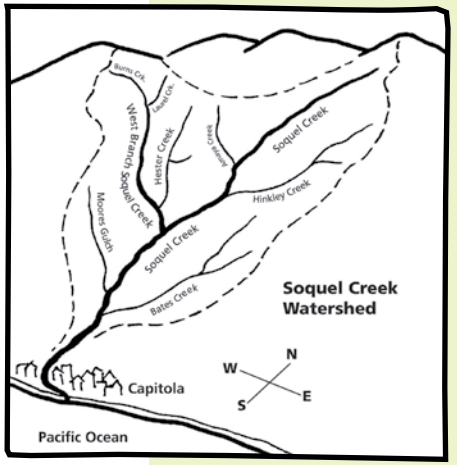
RUNOFF FROM THE SURROUNDING HOMES AND STREETS FLOWS THROUGH THIS STORM DRAIN...

...AND CONTINUES DIRECTLY TO THE SAN LORENZO RIVER IN FELTON.

One way to help reduce the negative impacts of runoff is by changing the way we approach new construction. However, since much of our county is already developed, a great benefit can be derived by addressing runoff from our existing homes. Just as with new construction, through good planning and designing we can accomplish the following:

- **Conserve our natural resources**
- **Clean up our creeks, streams, and the bay**
- **Create healthier homes**
- **Protect infrastructure and reduce flooding**

In addition to the information provided in this guide the Resource Conservation District of Santa Cruz County (RCD), in partnership with the USDA Natural Resource Conservation Service (NRCS) and other local organizations, offers free technical publications, educational workshops, on-site stormwater runoff evaluations, and cost-share assistance for implementing stormwater Best Management Practices (BMPs). For more information visit the RCD web site at www.rcdsantacruz.org.



DID YOU KNOW?

Just as a city, county, state, or even our personal property has boundaries, so does a watershed. We define a watershed as the land that contributes water to a given area. Watersheds are normally named after the river, creek, or stream that they drain to. For instance, residents of Felton are in the San Lorenzo River Watershed. If you live in Soquel Village or Capitola, you are in the Soquel Creek Watershed. All of the rainfall and runoff from a home drains into the watershed where it is located, eventually replenishing critical groundwater resources or flowing to the Monterey Bay.

CHAPTER 1

UNDERSTANDING AND EVALUATING STORMWATER RUNOFF AROUND YOUR HOME

Most counties and cities in California are required by law to develop and submit a Stormwater Management Plan (SWMP) to the state. A SWMP must detail specific actions or practices, called Best Management Practices (BMPs) that will be implemented to minimize the effects of stormwater runoff. An example of a BMP is slowing runoff by temporarily storing it in a rain barrel or other containment system where it can used to water plants or metered out over the landscape once the rains have passed. Another example is allowing runoff to sink into the ground by directing it to landscape vegetation where sediment can be filtered out and contaminates reduced through biore-mediation (use of plants and microorganisms to biologically break down and thereby remove pollutants). Low Impact Development (LID) is another common term normally referred to in larger scale developments that incorporate "green" stormwater management practices. Although new construction will likely soon be required to utilize BMPs and LID, many buildable areas of the county are already developed. It is, therefore, essential that we each do our part to implement stormwater BMPs.

This guide will focus on BMPs that you can do at home. The BMPs are not complicated. They are geared toward residential homes or small developments and the underlying concepts behind them follow a simple mantra: Slow it. Spread it. Sink it!

- **Slow the runoff down**
- **Spread it out in planters, gardens, or over other pervious surfaces - do not confine runoff to pipes**
- **Sink it back into the ground!**

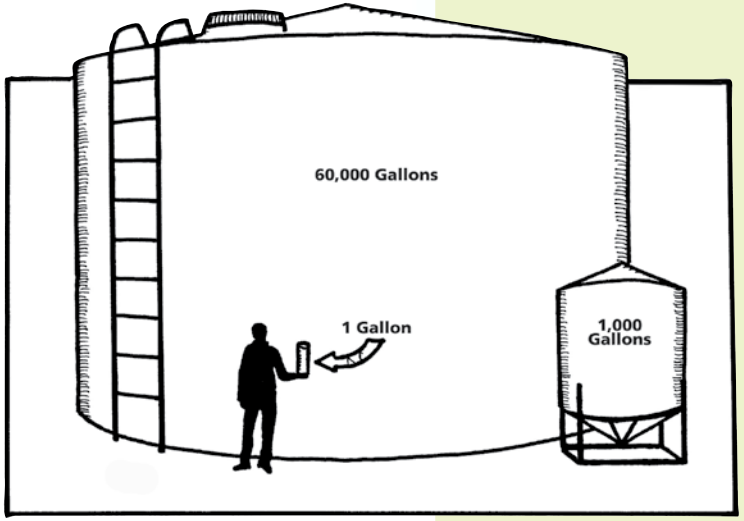
This chapter divides your property into five major areas or "zones" that can contribute to runoff: 1) roofs, 2) elevated structure, 3) walkways and patios, 4) driveways and parking areas, and 5) bare soils and landscapes. It exam-ines each zone for common problems related to runoff and suggests potential solutions. The end of the chapter provides instructions for a simple do-it-yourself evaluation of your property to assist you in choosing BMPs that suit your specific needs.

ROOFS

Your roof likely generates the most runoff from your home. While the majority of roofs are outfitted with gutters and downspouts, some are not, so protection measures for either possibility are discussed. Regardless of which system you use, all eaves and downspouts should be routed away from sensitive areas such as septic system leachfields, hillsides, and building foundations.

NON-GUTTERED ROOFS

If it is not possible to install gutters because of cost or other issues, you will need to protect the ground below the eaves which is referred to as the drip-line. Runoff from eaves can cause significant erosion and the resulting moisture can damage foundations and cause unhealthy mold to develop.



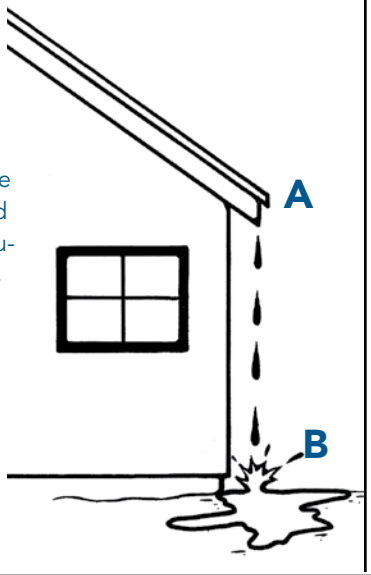
DID YOU KNOW?

It takes only one inch of rain falling on a typical 1500-square-foot roof to generate approximately 1,000 gallons of runoff. Annual rainfall in Santa Cruz County ranges from 20 to 60 inches depending on where you live (residents at higher elevations generally receive higher amounts of rainfall). This means that in one winter, your roof alone could shed between 20,000 and 60,000 gallons of water as runoff!

POTENTIAL PROBLEMS

A Non-guttered roofs can cause problems along the drip-line of your home

B Water from a non-guttered roof can cause erosion, damage structures and foundations, and contribute to downstream pollution. Ponding near foundations can also cause unhealthy mold to develop.



Repairing mold and water damage

BMP SOLUTIONS

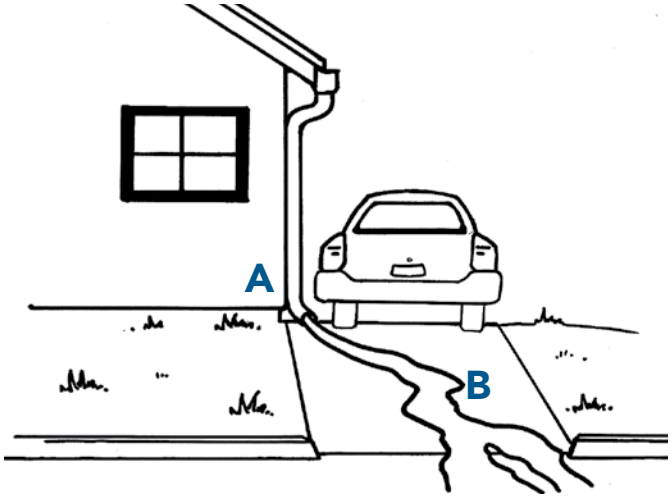
A Adding gutters and downspouts works to direct water to a safe location away from bare soil and buildings (see page 20).

B Vegetated or rock drip-line protection SLOWS runoff thus reducing erosion and promoting Infiltration. It is also designed so that the ground slopes away from the home's foundation (see page 22)

GUTTERED ROOFS

Gutters and downspouts are an excellent choice for handling roof runoff; however, they must be properly sized, managed, and maintained to prevent damage to property and the environment. Undersized gutters clog and overflow more frequently which can damage foundations. Directing downspout runoff toward impervious surfaces like driveways is common but can contribute to downstream flooding, surface water pollution, potholes and other issues. ALWAYS avoid sending runoff towards hillsides, septic system leachfields, and buildings where they could cause significant damage to your property.

POTENTIAL PROBLEMS



A The downspout is directed toward an impervious (concrete) driveway that drains to the street. The resultant runoff may damage roads, exacerbate downstream flooding, or carry pollutants to nearby waterways.

B This driveway is constructed of impervious materials (concrete), and all of the runoff is directed toward the street. The resultant runoff may damage roads, exacerbate downstream flooding, or carry pollutants to nearby waterways.

Runoff from residential homes can carry pollutants to local steams that can be harmful to wildlife.

BMP SOLUTIONS

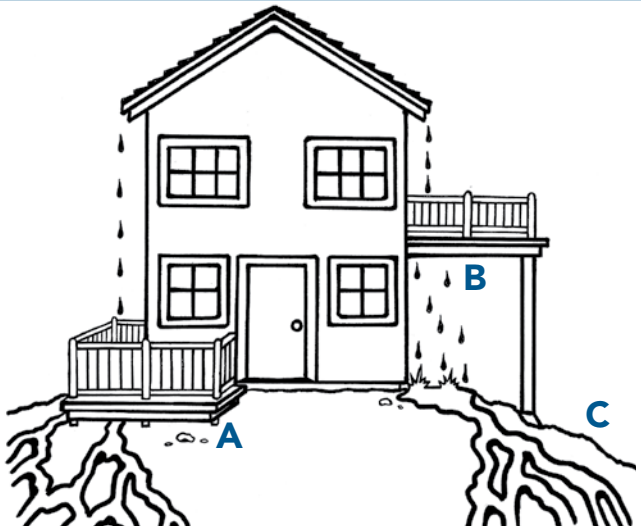
A Rain barrels, downspout diverters, and rain gardens are all potential solutions for treating downspout runoff by SLOWING water down and SPREADING it out (page 24 and 26).

B See Driveways and Parking Areas (page 15).

ELEVATED STRUCTURES

The area underneath decks, outdoor stairs, and other elevated structures where water impacts the ground is called the drip-line. Significant soil loss, damage to supporting structures, or worse can occur if this area is not adequately protected. Where signs of erosion are present such as soil loss or uneven ground from water flow, it is important to take protection measures. Locations with over a 50% slope are particularly vulnerable and may require treatments designed and installed by a qualified licensed professional.

POTENTIAL PROBLEMS



A Low decks may prohibit the addition of protective ground cover, leaving bare soil to erode.

B The runoff from high decks impacts the soil with greater force than low decks. It can cause structural damage to supports and contribute to sediments and other pollutants entering nearby storm drains and streams.

Visible erosion under a deck is common.

C Runoff on steep slopes with bare soils can cause significant erosion and even landslides. Ground covers such as rock and mulch are hard and can easily wash away.

BMP SOLUTIONS

A Adding drain rock or vegetation to the perimeter SLOWS and SPREADS water limiting the transport of sediment (pages 22-23)

B Adding drain rock SLOWS runoff and safeguards the drip-line area under elevated surfaces. Mulch around the perimeter adds extra protection to the surrounding bare soil (pages 22-23).

C Terracing or retaining walls may be added to sloped areas to keep rock or other mulch in place and protect hillsides (pages 36-37)

DID YOU KNOW?

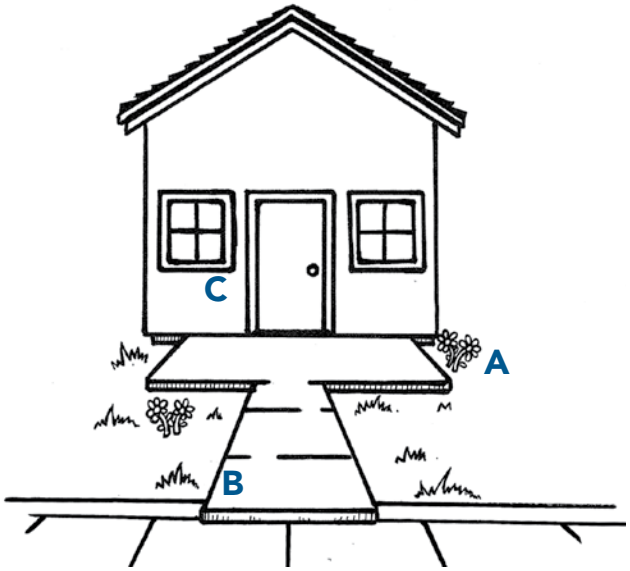
It's important to scoop your poop! Roundworms, E. coli, and Giardia are just a few of the many harmful microorganisms that can be transmitted from pet waste to humans. Some can last in your yard for as long as four years if not cleaned up. Children who play outside and adults who garden are at greatest risk of infection. Pet waste is also one of the causes of bacterial contamination of creeks in Santa Cruz County. The American Pet Products Manufacturers Association claims four in 10 U.S. households have at least one dog. That equates to over 140,000 dogs within the county and incorporated cities! Holy pooch! That's a lot of poop. Let's work to keep our families healthy and waterways clean. The solution is safe and easy: 1. Scoop the poop;

2. Put it in a bag (recycled or biodegradable bags are the best option);
3. Place it in the trash; and
4. Wash your hands.

WALKWAYS AND PATIOS

Walkways and patio areas often become conduits for runoff. For existing paved paths or patios look for areas of standing water or visible signs of erosion where the path or patio surface meets the soil. Does your walkway drain to the street or toward your house? When constructing a new walkway or patio always consider where it will drain. Angle it toward a vegetated area or try one of the new porous materials that will reduce runoff and promote infiltration.

POTENTIAL PROBLEMS



A Foot traffic, even in low use areas, can inhibit plant growth and leave bare soil to erode.

B Walkways or other hard surfaces that drain to the street increase runoff causing problems downstream.

C Hard durable surfaces such as patios are often constructed of concrete or other impervious materials that don't allow runoff to infiltrate.

Residential runoff that drains to the street contributes to localized flooding.

BMP SOLUTIONS

A Mulch, gravel, or wood chips work well in low-traffic areas and allow for more runoff to SINK into the ground (page 32).

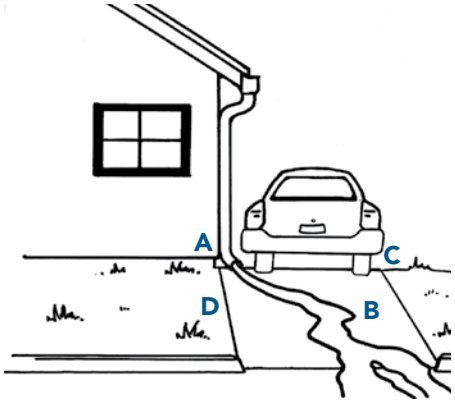
B Turf block works well for allowing water to SINK into the soil in medium-traffic areas or driveways with separate parking areas (page 30).

C Use paver stones for high-traffic areas and patios. For areas with excess runoff, use plant borders to allow more water to SINK into the ground (pages 30 and 33).

DRIVEWAYS AND PARKING AREAS

Traditionally driveways have been constructed to divert runoff directly to the street. That runoff can carry with it a variety of pollutants, such as oil and grease, soaps from car washing, leaked antifreeze and more. Your driveway also acts as a conduit for large volumes of roof runoff. Concentrating large volumes of water that outlet to the street increases the chances of potholes, flooding, and erosion. Check to see where your driveway water goes and locate the nearest storm drain. There are now many alternatives available to replace impervious concrete and a variety of BMPs for addressing runoff on your driveway or parking areas. For a more thorough discussion on road and driveway treatments, please obtain a copy of the Private Roads Maintenance Guide for Santa Cruz County published by the Resource Conservation District of Santa Cruz County. The guide is available online at www.rcdsantacruz.org or through the RCD office in Capitola.

POTENTIAL PROBLEMS



A The downspout is directed toward an impervious (concrete) driveway that drains to the street. The resultant runoff may damage roads, exacerbate downstream flooding, or carry pollutants to nearby waterways.

B This driveway slopes toward the street and creates runoff potentially contributing to flooding, erosion, and pollutants in nearby storm drains and streams.

C This driveway is constructed of impervious materials (concrete), and all of the runoff is directed toward the street. The resultant runoff may damage roads, exacerbate downstream flooding, or carry pollutants to nearby waterways.

D Driveways that do direct water runoff away from the street can still contribute to erosion if the area collecting the runoff is not properly protected or maintained.

Driveways can act as conduits for excess amounts of runoff that can damage roads.

BMP SOLUTIONS

A See Guttered Roofs on page 12.

B An asphalt berm (like a small speed bump) known as a waterbar can be added to existing driveways to SLOW and SPREAD runoff to vegetated or rocked infiltration areas (page 35).

C Pervious concrete (pictured) or other materials such as paver stones or turf block, allow water to SINK into the soil decreasing runoff (page 31).

D A rocked or vegetated swale lining the edge of a road or driveway reduces erosion potential by SLOWING runoff and then SINKING it back into the soil or directing it to a safer outlet (page 29).

DID YOU KNOW?

We have all heard that cars contribute to air pollution. But, did you know they can also play a part in water contamination? Soap from car washing, oil and grease from leaking engines, zinc from tires, and copper from brakes can all end up in the water where we play, fish, live, and even drink! Keeping cars properly maintained, using commercial car washes, washing vehicles on lawns or gravel parking areas, recycling oil and antifreeze, recycling used batteries, keeping tires properly inflated, and simply driving less will all contribute to cleaner water for everyone!

BARE SOILS AND LANDSCAPES

Bare soils and sloped areas are the parts of any landscape which are most vulnerable to the impacts of runoff. Without a protective cover of vegetation, duff (decaying leaves and needles), or mulch (wood chips, etc.), these areas erode and increase runoff. Erosion reduces soil fertility, can compromise support structures for decks and buildings, and in extreme cases leads to catastrophic events such as landslides. Erosion on bare soils can be identified by uneven soil surfaces, depressions in the soils that create small gullies, and any sign that indicates soil loss. If water is flowing across bare soil anywhere on your property, at least some soil is being carried away (eroding). Since vegetation plays an important role in preventing soil loss, it is important to use plants adapted to your site. Some plants such as certain kinds of ivy or ice plant can actually hinder the stability of sloped areas due to poor root structure or added weight.

POTENTIAL PROBLEMS

A Bare soils are highly susceptible to erosion.

B In steeply sloped or hilly areas soil erosion is not only harmful to the environment, but can pose a serious through to life and limb when land movement occurs.

C Moderately sloped areas are also prone to erosion and can cause damage to surrounding structures if they become unstable.

Bare soils are susceptible to erosion and increase runoff which delivers sediments and other pollutants to streets and storm drains and eventually to local waterways.

BMP SOLUTIONS

A Mulch protects soil from direct rain impact and SLOWS runoff across bare soils (page 32).

B Retaining walls help hold sloped areas in place and SLOW runoff. They also add beauty to a landscape and can double as benches and planter boxes (page 36).

C Using carefully chosen vegetation can help SLOW and SPREAD runoff in order to prevent soil erosion on hillsides. Ceanothus (pictured) is one example of a shrub that does well in areas with full sun and requires little to no summer water once established (page 33).

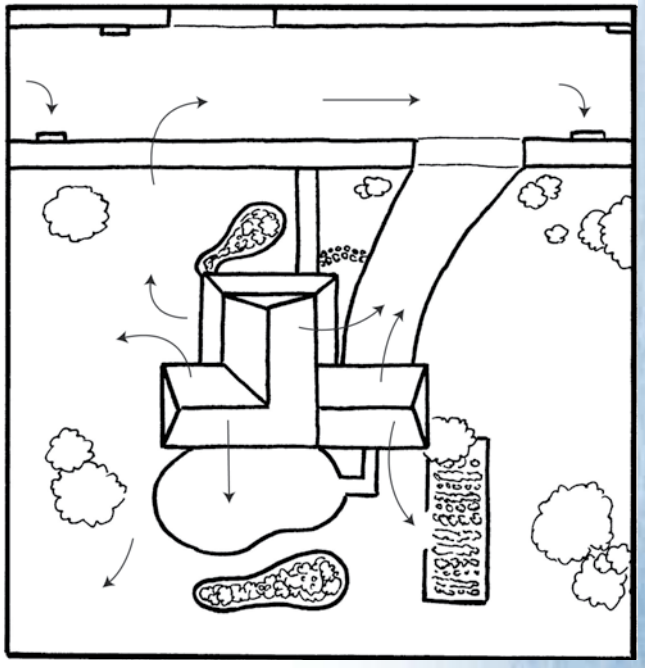
DO-IT-YOURSELF STORMWATER RUNOFF EVALUATION

To discover where you can implement BMPs that draw on the fundamentals of "slow it, spread it, sink it," we recommend that you conduct a simple do-it-yourself evaluation of your property. The evaluation consists of a walk around your property on a rainy day to record observations of the 5 zones and how runoff is currently handled, where runoff is going, and where there might be potential for installing BMPs. The kids can even don their rubber boots and join you!

1) TOOLS. Below is a list of items you will need:

- rain gear
- a clipboard with scratch paper
- a simple sketch of your property
- a pencil (ink may run if it gets wet)
- an umbrella (to keep the paper dry)
- camera

2) SKETCH YOUR PROPERTY. Your sketch will be used to record observations about where the runoff comes from and flows to. The sketch can be very simple. It should include property boundaries, an outline of your house and foundation, outbuildings, driveways, areas of bare soil and any major vegetation (trees, lawns, etc.). Also note how close you are to the nearest stream, storm drain, or ditch that carries water away from your property. If you aren't sure, see if you can find it on your walk! If you need assistance, it is always good to take photographs when water is flowing! You can then schedule an appointment with an RCD staff member to help you evaluate your runoff using your recorded observations and photographs.



3) WALK YOUR PROPERTY. Once you've gathered all of the tools and completed an initial property sketch, head outside on a rainy day for the stormwater evaluation walk. For the most accurate results, do not choose the first storm of the season or go out during the first few minutes of rain. Wait until there have been at least one or two good rain events (more than a ½ inch). Go out during a subsequent storm once you see water flowing on your property. During the walk, you can record stormwater runoff observations by drawing arrows that follow the direction of water movement on your property (see sample drawing). You can also record potential locations where you might apply the BMPs listed in chapter 2. For example, if you have a downspout that currently drains to a driveway, look around and note locations where you might direct the runoff to a rain garden or hook up a rain barrel.

4) KNOW YOUR SOILS AND RAINFALL RATES! This is one of the most critical pieces of information you need. Soil maps are available through the local RCD and NRCS offices and online at www.rcdsantacruz.org/Resources/soil_surveys.html. However, it is highly recommended that you consult a professional for an evaluation of the soils at your location. Soils with poor infiltration rates are NOT RECOMMENDED for many of the BMPs described in this guide. A rainfall map is also available through the local RCD office.

5) EVALUATE YOUR RESULTS. Using your results and the BMP descriptions in chapter 2, you can determine what practices you might want to employ to beautify your landscape, protect your property, reduce flooding, and help improve local water quality. Contact your local RCD (page 47) office for additional assistance with choosing the right BMPs.

CALL BEFORE YOU DIG!

Underground Service Alert (USA) is a FREE service available to anyone planning a project that entails digging. It is simple and easy to use. Before calling USA, outline your digging location with white chalk paint or another medium clear enough to enable USA underground facility members to determine the area of digging. Two working days BEFORE you start your project, call 811 or 1-800-227-2600. USA will contact the appropriate agencies to come and mark any utilities that interfere with your project location. For more detailed information, visit USA North online at www.usanorth.org.

CHAPTER 2

BEST MANAGEMENT PRACTICES FOR STORMWATER RUNOFF AROUND YOUR HOME

Disclaimer: The Best Management Practices (BMPs) described in this guide are provided exclusively for general educational and information purposes. The guide is intended to help landowners consider their current runoff practices and to identify concerns and potential solutions. Any BMP should be installed with the consultation of an experienced professional who can address specific site conditions. This chapter outlines a number of well-established practices along with recently introduced options for managing stormwater runoff.

Managing stormwater on your property is not a new idea. Most residential homes were constructed using the runoff methods of the era in which they were built. For the past 50 years, that approach has been to direct runoff away from the property as quickly as possible using pipes and pavement. While largely effective, we now recognize that this approach only shifted problems downstream. We are now experiencing the consequences of those methods in a variety of ways including increased potential for flooding, damage to public and private property, stress on our water supplies, and degradation of our local waterways and habitats. The **Best Management Practices or BMPs** (practices thought to be the most practical and cost-effective) recommended in this guide move away from the old "pipe it and pave it" model and toward the slow it, spread it, sink it approach: Slow the water down, spread the water out, and sink the water into the land. That notion is at the heart of these practices and is a simple mantra you can use to address the runoff on your own property. The following chapter includes information on a variety of BMPs. Find the one that best fits your needs, your pocketbook, and your unique site conditions. Following this chapter is a must-read section on difficult locations and site constraints. While this guide presents great ideas, it is critical to recognize when and where they are NOT appropriate.

Before embarking on any new project please remember:

1. In many cases a simple **change in management** of your current system may be all that is needed to minimize negative impacts of stormwater runoff. Each BMP includes details on maintenance. It is important to recognize that each BMP requires ongoing maintenance to remain effective, and to factor this maintenance into your plans. If you already use one of the listed BMPs, please review the maintenance section for tips on getting the most out of your existing features.

2. **Vegetation** plays several important roles in the function of BMPs, which may include:
   - Slowing down water and physically removing sediments
   - Helping to stabilize slopes through their root structure and reduction of rain impact on the soil
   - Biological removal of nutrients and other pollutants (bioremediation)
   - Improving soil infiltration

3. **Structural practices** are usually more expensive to install and maintain and place a greater strain on resources and the environment. Structural practices should only be used when management changes or vegetation is not an option.

4. **ALWAYS check with applicable regulatory agencies to determine if a permit is necessary for any project**. Examples of projects for which a permit may be required include building a retaining wall, installing a large cistern, sending runoff to a creek or stream, and directing water to a neighboring property. For a list of resource agency contacts see page 47.

5. **CALL BEFORE YOU DIG!** Call 811 or 1-800-227-2600 for assistance from Underground Service Alert (USA). See expanded information to the left.

BENEFITS

- Conserves water
- Creates wildlife habitat
- Improves landscape aesthetics
- Reduces peak flows or runoff timing
- Reduces erosion
- Protects infrastructure

COST

- $ Low cost
- $$ Medium cost
- $$$ High cost

INSTALLATION DIFFICULTY

- E Easy
- M Moderate
- C Complex

The **Best Management Practices (BMPs)** described in this chapter include general information on the benefits of each practice, an estimated cost range of low to high, and a level of difficulty for installation by the homeowner. It is additionally noted where using a qualified licensed professional is highly recommended.

Potential benefits include the following:

Conserves water: Water can we conserved through capturing rainwater, using plants with low water needs OR directing runoff water to areas where it can be stored in the soil for later use by plants

Creates wildlife habitat: When installing BMPs that use vegetation, choosing appropriate plants can create habitat for local wildlife and act as natural pest control.

Improves landscape aesthetics: Many of the BMPs in this guide can actually beautify your landscape

Reduces peak flows or facilitates runoff timing: Peak flows occur when runoff reaches its highest point. By changing the timing of our residential runoff, we can reduce peak flows and mitigate flooding potential.

Reduces Erosion: Practices that reduce erosion limit the loss of top soil and reduce the volume sediments entering local streams.

Protects infrastructure: These practices help reduce runoff that could damage structures, foundations, or public infrastructure such as roads.

Gutters and Downspouts

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USES: ROOF RUNOFF

Santa Cruz County and the incorporated cities may have specific requirements for installing gutters and downspouts. Since requirements often change, we have provided general guidelines, but you should contact your respective planning/building department for more detailed information. See the resources on page 47 for agency contact information.

NEW INSTALLATIONS OR RETROFITS

Properly sized gutters and downspouts are crucial for proper performance. While installation is fairly simple, calculating the correct size system for your roof can prove more difficult. You will need to know your roof area and pitch or slope and your location's annual rainfall. We recommended contacting the RCD or a local qualified professional to assist with calculating correct gutter and downspout sizes.

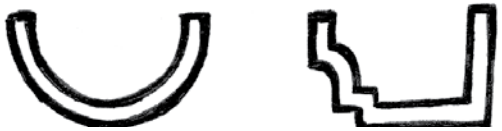
Also consider where your downspouts drain. Wherever possible and safe, divert downspouts AWAY from impervious surfaces such as concrete driveways, walkways, or compacted soils and instead direct them to well vegetated areas of your property to allow runoff to SINK into the soil. This decreases water volume on streets and in storm drains and reduces the potential for downstream flooding.

General guidelines for selecting and installing gutters and downspouts or improving capacity:

GUTTERS

Select gutters at least 5 inches wide. Use materials made from galvanized steel (29 gauge minimum) or aluminum (.025 inch minimum). To enhance flow, slope gutters according to the manufacturer's recommendations (commonly 1/16 inch to 1/8 inch per 1 foot of sectional gutter; or 1/16 to 1/8 inch per 10 feet of seamless gutters). Tilt the gutter forward keeping the front 1/2 inch lower than the back. For straight runs exceeding 40 feet, use expansion joints at connections. Select elbows with 45, 60, 75 or 90 degree angles, as needed.

GUTTER PROFILES

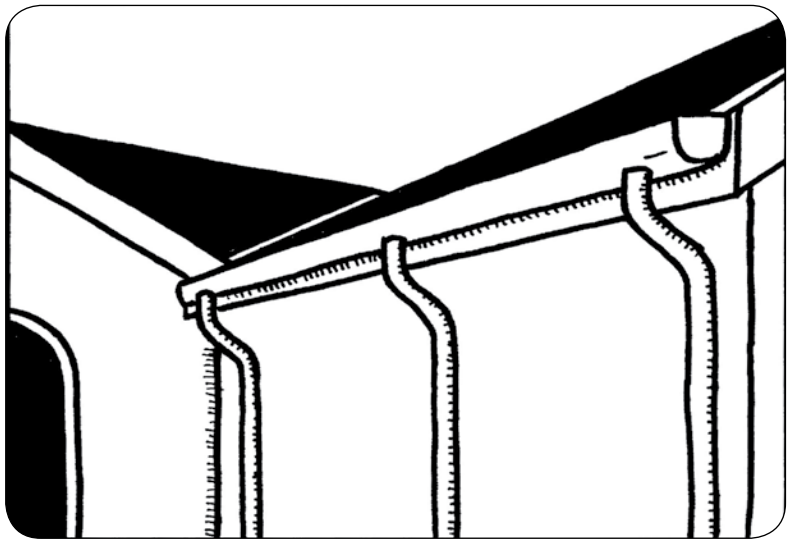


Half Round Ogee

Gutters not only come in different sizes, they come in different shapes too. It's important to understand that the shape of your gutter determines the amount of water it can handle from your roof during a storm. Ogee shaped gutters, for example, can handle more water than rounded gutters. However the ogee gutter's sharp edges and corners can collect sediment and debris.

DOWNSPOUTS

Space downspouts from 20 to 50 feet apart. Adding additional downspouts can increase capacity where necessary and help SLOW water down and SPREAD it out. Do not exceed 45-degree angle bends. Where needed use 4-inch-diameter extensions (flexible or rigid) to convey water to infiltration areas such as rain gardens and swales or to other safe outlets away from structures and steep slopes. All downspouts and pipes that outlet onto surfaces without substantial vegetation cover should use one of the outlet protection BMPs described on page 26. Do not direct downspout outlets to driveways or other impervious surfaces unless there are no safe alternatives. Instead, route them to vegetated areas.



Adding an additional downspout helps reduce the volume and velocity of runoff at any given point reducing the potential for erosion.

MAINTENANCE: Setting up a maintenance schedule is one of the easiest and most cost-effective solutions to many roof runoff issues. Clean your gutters at the beginning of each rainy season and as needed throughout the winter. In areas with dense trees or vegetation, trim trees and vines away from gutters to maintain a minimum 24-inch clearance zone. Add gutter guards to reduce debris buildup. You can also add a drip-line treatment (page 23-24) below gutters that clog often. Check your system for leaks, damaged parts, rust, and evidence of past erosion. Make sure to check hidden outlets under decks or staircases that might be forgotten.

Always check and clean gutters after severe storms.

DO

- Direct runoff to a rain garden or swale.
- Collect runoff in a rain barrel or cistern.
- Check and clean gutters after severe storms.

DON'T

- Release water onto bare soil.
- Direct runoff to steep slopes or foundations.
- Send runoff onto a neighbor's property.

DID YOU KNOW?

A RAIN CHAIN can be used instead of a downspout. Rain chains ('kusari dio' in Japanese) have been used for hundreds of years in Japan. Not only are they visually appealing, they also provide some runoff reduction through evaporation and spillage. When installing rain chains, make sure to take the same precautions for outlet protections as you would with standard downspouts. For more information visit a local retailer or www.rainchains.com.

Drip-Line Protection

USES: BELOW ROOF EAVES, UNDER DECKS OR ELEVATED STRUCTURES

A drip-line is the area below any elevated surface that receives runoff. For roofs it is the ground below eaves that do not have gutters installed. For decks and other elevated surfaces it is the area underneath where water drips through (e.g., the area between and below the deck boards). Drip-line BMPs create a barrier to protect exposed soil and reduce erosion. The protective cover also SLOWS runoff and allows it to SINK back into the soil. This is critical in areas where runoff-induced erosion could reduce the effectiveness of support structures and footings. Drip-line protection is also a great addition where gutters frequently overflow due to large amounts of debris

VEGETATION PROTECTION FOR DRIP-LINES

Roof drip-lines: Homeowners can establish and maintain mature vegetation below their roof drip-lines. If there is existing vegetation (such as turf or a bordered planter bed), simply maintain these areas. Examples of adequate drip-line vegetation include the following:

- Healthy grass or turf that has been established directly up to the foundation of your home
- Plants, shrubs, or flower beds that are completely bordered by wood, rock, or turf with mulch between vegetation covering any bare soil

Contact the RCD, the local native plant society (NPS), native plant nursery, or a qualified professional for assistance with plants well-adapted to your specific location. See page 47 for contact information.

Deck/stair drip-lines: Where adequate sunlight is available, planting hardy ground cover, grasses, or other low growing vegetation is a good low-cost option for protecting soil from erosion beneath decks and stairs. Use drought tolerant plants that do not require supplemental watering once established to prevent additional runoff or water near a structure. If you have structures on your property that are low to the ground and are inaccessible underneath, try planting around the perimeter.

MAINTENANCE: Periodic mowing, pruning, and replacement of plants is needed. Inspect the foundation to ensure water is not saturating or eroding structure or foundation. Keep fertilization to a minimum as it can contribute to excess nutrients in runoff. If you do fertilize, always carefully follow the manufacturer's instructions and never apply in excess or prior to forecasted rain.

DO

- Use California natives or drought tolerant plants.
- Keep plants well pruned to allow adequate ventilation.
- Keep soil a minimum of 6 inches below siding.
- Minimize fertilization to prevent water contamination.
- Try organic fertilizers and pest controls.

DON'T

- Plant invasive species such as perwinkle (Vinca Major) or ivy.
- Plant highly flammable vegetation.
- Allow irrigation water to drain to your driveway, the street, or onto bare soil.

HARDSCAPE PROTECTION FOR DRIP-LINES

Roof drip-lines: Wood chips, mulch, or gravel can be used to protect soil from erosion and promote infiltration into soils with high permeability (sandy soils). Install gravel or mulch under the drip-line at a minimum depth of 3 inches. This treatment must extend 6 inches inside the eave and a minimum of 12 inches beyond the eaves of a single-story roof, 18 inches beyond the eaves of a two-story roof, and 24 inches beyond the eaves of a three-story roof. This treatment prevents erosion and allows runoff to infiltrate. Three-quarter inch to one and a half inch washed drain rock is an adequate size to prevent the rock from being moved by rainfall; however, you can use any kind of rock you would like to achieve desired aesthetic effects on your property. Installing non-woven geotextile fabric beneath the rock and then bordering the rock with wood or other material will reduce maintenance and increase effectiveness. You also need to ensure that the ground slopes slightly (1-2%) AWAY from the structure for a minimum of 5 feet.

Deck/stair drip-lines: To protect the soil under elevated decks, stairs, and walkways from erosion, install a three-inch layer of drain rock under the entire footprint of the structure and extend one foot past its edge. If you have structures on your property that are low to the ground and are inaccessible underneath, install a three-inch layer of rock or other mulch approximately twelve inches wide around the outside perimeter of the structures. This treatment will slow runoff velocity and reduce erosion potential. It is only necessary to install drain rock under and around these structures if there is not adequate vegetation established. Installing non-woven geotextile fabric beneath the rock and then bordering the rock with wood or other material will reduce maintenance, help control weeds, and increase effectiveness. You also want to ensure that the ground slopes slightly (1-2%) AWAY from the structure for a minimum of 5 feet.

MAINTENANCE: Periodic replacement of gravel or mulch will be needed. Inspect the foundation to ensure that water is not saturating or eroding either the structure or the foundation.

DO

- Use existing rock or mulch from your property.
- Use rock from a local quarry.
- Make sure rock is washed.

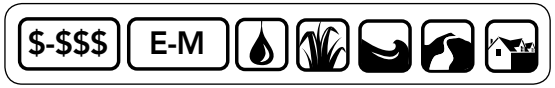
DON'T

- Use rock under three-quarter inch in size.
- Allow runoff to flow TOWARD the house or structure.

DID YOU KNOW?

Sediment and debris that collect in the corners and edges of gutters support the growth of bacteria and other organisms that could contaminate rainwater. Because rounded gutter systems have fewer edges than their square-cornered counterparts, they provide cleaner water for rainwater catchment systems.

Rainwater Collection Systems

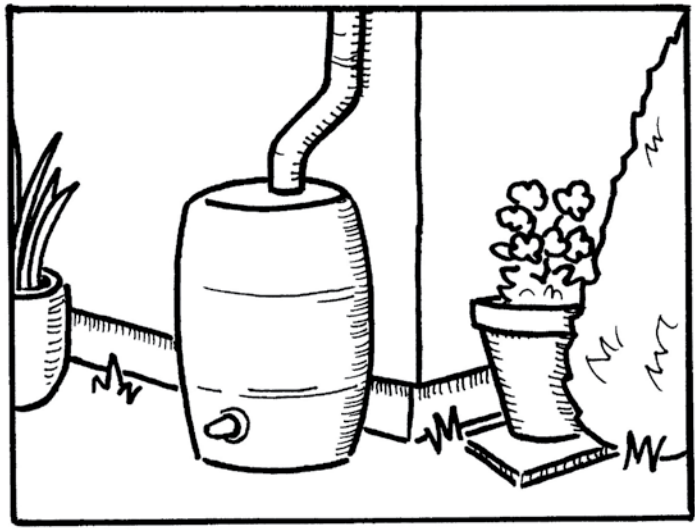


USES: COLLECT AND STORE WATER FROM ROOFS

Rainwater collection is an excellent opportunity to SLOW water down by temporarily storing it. Captured water can be reused for irrigation or other non-potable options or metered off slowly after storm events to allow for infiltration and reduced flooding.

RAIN BARRELS are small- to medium-sized containers placed outside buildings and connected to roof downspouts to collect runoff for later use in non-potable applications. Rain barrels have many advantages in urban settings. They take up very little space, are inexpensive, and easy to install. Rain barrels conserve water and reduce the volume of runoff moving off-site.

MAINTENANCE: Rain barrels require regular draining after rainstorms and removal of leaves and debris collected on screens. Always check that the overflow is clear and directed to an appropriate location.



DO

- Use water regularly (e.g., water indoor plants).
- Use gravity to your advantage.
- Use multiple barrels where possible.
- Keep covered to eliminate debris and mosquito breeding.

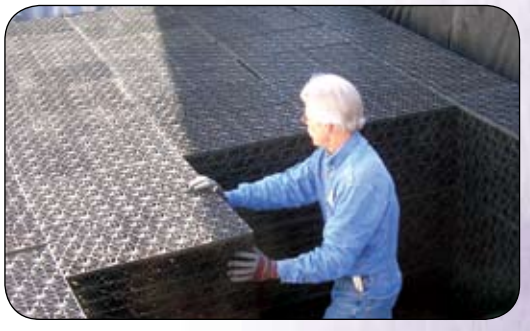
DON'T

- Allow access for mosquitos, rodents, children, pets, or debris.
- Use for drinking.
- Capture water from roofs with excessive debris (e.g., leaves, pine needles, or bird droppings.)

WATER TANKS (CISTERNS) are manufactured water storage containers for non-potable use in residential, commercial, or industrial applications. Water tanks can be installed both above and below ground. Some tanks come as sectional pieces that can be put together to fit different space constraints. Tanks can be used with most guttered roofs to collect runoff and reduce runoff volume. Both water tanks and rain barrels can be used without pumping devices, instead relying on gravity flow. However, depending on the desired use for the water, a pump may be necessary for best performance.

Larger tanks can be designed to also function as privacy screens, fences, or small retaining walls. Tanks can also be hidden under decks or serve as the foundation for play structures or other landscape features. Get creative!

Underground tanks are excellent options for areas with limited space. However, do not install underground systems beneath the path of vehicles or heavy machinery traffic unless they have been engineered for that purpose. Extra precautions may be needed when placing tanks in locations with high water tables or saturated clay soils. Contact an experienced licensed professional for tank installations under these conditions.



Underground systems can be customized to fit various shapes and sizes using these modular RainBoxes.

Basic components of a rainwater collection system:

- Catchment surface
  This is normally a roof, but there are other options.
- Gutters and downspouts
  Round gutters are recommended because they are less likely to collect sediment in corners and edges. This sediment can then support bacteria growth.
- Screening of tanks or barrels and downspout openings
- First-flush device
  Although recommended, this is optional.
- Water tanks
  There are various options including manufacturing on-site.
- Water tank vent
- Overflow device
  This should be equal to or larger in diameter than the inflow pipe to avoid backup.
- Faucet and valve
- Filters and pumps (optional)

MAINTENANCE: Remove accumulated sediment and debris annually and inspect all components such as gutters and downspouts regularly. The inside the tank must also be inspected. Look for system leaks and cracks. Check all connections and hoses for wear and all screens or mesh for debris accumulation and holes. Make sure overflow is clear and directed to an appropriate location. Inspect all seams for leaks. Follow all manufacturers' recommended maintenance for any storage device.

DO

- Obtain necessary permits for tanks over 5,000 gallons.
- Secure tanks with straps for protection from earth movement.
- Use gravity to your advantage wherever possible.
- Keep underground tanks a minimum of ¼ full at all times to prevent collapsing of certain tank types.

DON'T

- Place tanks on steep hillsides.
- Place water tanks below ground unless they are approved for this use.
- Collect water from cedar or highly degraded roofs.
- Collect roof water from areas prone to large amounts of debris (leaf litter, etc.)

Outlet Protection

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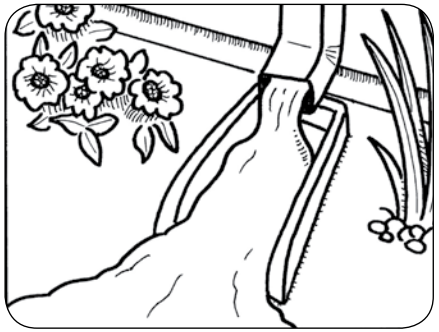
USES: DOWNSPOUT, PIPE, OR CULVERT OUTLETS

One of the most overlooked parts of a drainage system is the outlet of downspouts and pipes. Outlets should not release water onto bare soil or to an area prone to erosion. On the other hand, discharging water onto hardened impervious surface eliminates infiltration and increases the velocity of water that is directed to streets and streams creating a new set of challenges. All outlets that drain onto soils or other erodible surfaces should have some type of outlet protection. The BMPs below work to SLOW water down and/or SPREAD it out so it can SINK back into the soil.



SPLASH GUARD

SPLASH GUARDS are simple devices that reduce the initial force of the water at the outlets and allow it to SPREAD out into an area of vegetation or an appropriate infiltration area and SINK back in to the soil.

A HOSE ADAPTER is a neat option that allows a standard garden hose to connect directly to a downspout. The hose can then be moved to different locations of your yard when it rains. It is perfect for watering trees or keeping any one area from becoming too saturated by allowing the water to SPREAD out through the landscape.

ROCK DISSIPATORS are placed at outlets to SLOW runoff by reducing the initial impact of concentrated, high velocity runoff. For downspout outlets there are several easy creative options like filling a large plant container (it must have drain holes) with pebbles or placing rock on the ground surrounded by a wood border (similar to a rock drip-line). Large containers (1/2 wine barrels are an inexpensive option) with established plants and a thick layer of mulch (wood chips or gravel) also work well. Make sure that the drainage from under the pots flows away from your foundation.

For culverts or outlets with drain pipes over 8" in diameter, rock must be properly sized to prevent movement and placed with filter fabric underneath. Angular rock is typically recommended for high velocity flows because it locks in place and has a greater capacity to slow the water than rounded rock or broken concrete which tends to have some smooth edges. Rock should be carefully laid by hand forming an evenly lined depression or basin with no spaces between the rocks. It is highly advisable to contact a licensed qualified professional for design assistance.

Generally speaking, work done at any outlets that drain directly into a waterway will need a permit. Contact the RCD for permitting assistance or see page 47 for a list of agencies.

DO

- Direct downspouts to vegetated areas or rock dissipators.
- Protect ALL outlets on your property.

DON'T

- Allow water to pond near foundations.
- Direct water to driveways or other impervious surface that drain directly to the street.

Rain Gardens

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USES: ROOF, WALKWAY, DRIVEWAY, OR PARKING AREA RUNOFF

A **rain garden** is a specialized landscape design that captures stormwater runoff from roofs, driveways, or other impervious surfaces and allows water to SINK back into the ground. It uses plants to remove pollutants and improve infiltration allowing water to soak back into the ground. In soils with low permeability this system may be used to temporarily store water (not completely infiltrate) and remove pollutants before they enter a waterway.

A rain garden design can be as simple as a shallow depression filled with plants that can flourish in both moist and dry conditions. The required size, shape, and depth of the garden depend on how much water you are trying to capture. For large amounts of runoff or areas with insufficient infiltration, there are a full spectrum of engineered features, such as specialized soil mixtures, an aggregate base, and subsurface drains that can be added. These more complex designs are often referred to as bioretention cells.

Plant the center of the garden with species that tolerate wet conditions, such as native sedges and rushes. Around these, put plants suited to occasional standing water, like Yellow Monkeyflower (Mimulus guttatus) or California Aster (Aster chilensis). At the furthermost edges there are a variety of native evergreen and deciduous shrubs that prefer drier soil. Contact the RCD (page 47) or a local plant nursery knowledgeable in native and drought tolerant species for more suggestions. Rain gardens should be located at least 10 feet from your house and at least 40 feet from a septic system or steep slope. They should also be designed to drain within 48 hours to reduce the risk of standing water and mosquito breeding. Rain gardens are a beautiful way to protect your property from erosion and protect the water quality of local creeks. They can enhance the aesthetic value of a site; be used on small parcels of land, easements, and right-of-ways; and are easily incorporated into existing landscapes or open space.

MAINTENANCE: Routine maintenance is required and can be performed as part of the regular site landscaping program. Weeding and irrigation are essential in the first couple of months while plants become established. Annual pruning and mulching are recommended. Additional irrigation may be necessary during drought years. The use of native, site-appropriate vegetation reduces the need for fertilizers, pesticides, excessive water, and overall maintenance.

DO

- Use California native or drought tolerant plants as appropriate.
- Minimize fertilization to prevent water contamination and try organic options.

DON'T

- Site in soils with high water tables or clay soils without an overflow device.
- Place too close to your home's foundation.

Swales

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USES: ROOF, WALKWAY, DRIVEWAY, OR PARKING AREA RUNOFF; LOW TO MODERATELY SLOPED HILLSIDES

Swales are shallow channels designed to SLOW water down, SPREAD it out and allow it to SINK into the soil during low flows. Once saturated, they convey water to a safe outlet such as a rain garden (page 27) or other infiltration areas. They can be formed to fit almost all site conditions and landowner objectives. Depending on the existing landscape and available space, swales can have a meandering or nearly straight alignment. An advantage to a meandering swale is that its geometry maximizes the time water spends in the swale thus aiding the trapping of pollutants and sediments and infiltration. There are two types of swale systems: vegetated or rock-lined (sometimes called dry creek beds).

VEGETATED SWALES

Grassed swales are vegetated with native perennial grass species along the bottom and sides of the channel. The vegetation in the channel slows runoff, allows sediments to filter out, and can help remove nutrients. Bioswales are vegetated swales that use engineered media (usually a designed soil mix consisting of sand, loam soil and hardwood mulch) beneath the swale to improve water quality, reduce runoff volume, and control peak runoff rates. Although their functions are similar to grassed swales, bioswales have a greater capacity for water retention, nutrient removal, and pollutant removal. Adding gravel or other permeable material below the soil mixture further enhances infiltration.

DO

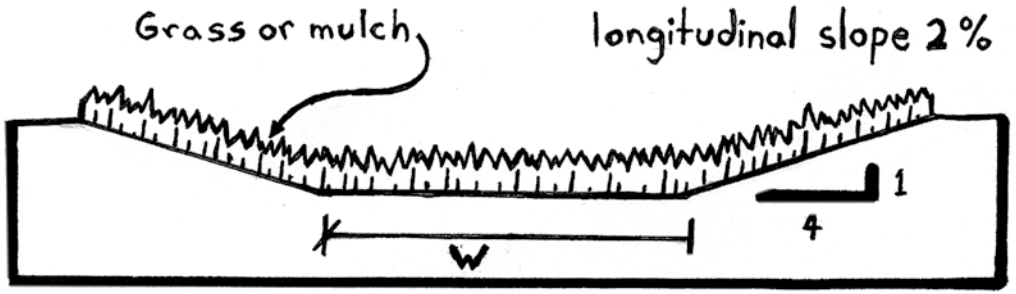
- Use California native plants or drought tolerant plants.
- Use fertilizer and pesticides only when necessary.

DON'T

- Walk or drive machinery directly in the swale as this will cause soil compaction.
- Place too close to your home's foundation.

When installing a swale, use a minimum 2% slope from beginning to end (longitudinal slope) to ensure that water is conveyed away from any structures and to a desired destination. Vegetation in the swale should be established before the first winter storms, so plant accordingly. Once saturated, swales function as conveyance structures carrying runoff to a rain garden, wetland, infiltration area, or other safe location. Swales are not recommended for areas that receive large amounts of sediment that can prematurely fill the swale and impede its functionality.

MAINTENANCE: Routine maintenance is required. Before a planted swale is densely vegetated, it is extremely vulnerable to erosion and must be protected with straw matting and other erosion control materials. Maintenance of a dense, healthy vegetated cover consists of periodic mowing (keep grass 2-4 inches high), weed control, reseeding of bare areas, and clearing of debris and accumulated sediment. The swales should be regularly inspected for pools of water, formation of gullies, and for uniformity in cross section width and longitudinal slope. When the uniformity is compromised it should be corrected quickly.



ROCK-LINED SWALES (DRY CREEK BEDS)

A rock-lined swale (or dry creek bed) uses rock instead of grass or other vegetation to safely infiltrate and convey runoff. Most are designed with rounded rock for an aesthetically pleasing landscape feature that mimics a creek bed.

When installing a swale use a minimum 2% slope from beginning to end (longitudinal slope) to ensure that water is conveyed away from any structures and to a desired destination. Non-woven geotextile fabric can be used underneath the rock.

MAINTENANCE: Periodically remove leaves and replace rocks moved by surface flow.

DO

- Use existing rock from your property if available.
- Use washed rock from a local quarry.
- Make sure the outlet does not cause erosion or clog
- Use non-woven geotextile fabric beneath the rock.

DON'T

- Install in soils with high water tables or saturated clay soils without an overflow device.
- Place too close to your home's foundation.
- Allow leaf litter to accumulate.

Pervious Hardscapes

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USES: WALKWAYS, PATIOS, PARKING AREAS AND DRIVEWAYS

There are many new types of pervious materials that allow runoff to pass through and SINK back into the soil. Some popular choices are paver stones, turf block and permeable asphalts and pavements. There are now pervious options for almost any application. Since the variety of options is growing rapidly, we will only discuss them generally. For specifics on installation and use, contact your local retailer or product manufacturer.

PAVER STONES/FLAG STONES

Paver stones are normally made of pre-cast brick, concrete, stone or other material and installed over a sand base. They come in various shapes and normally interlock and can form different shapes and patterns. Pervious pavers are designed to allow more runoff to SINK into the ground than traditional pavers. Each paver has a spacer that ensure the ideal distance between placed stones for maximum infiltration. Each piece is placed with gaps between to allow the infiltration of water. Flag stones are larger and may be placed directly on the soil. A low-growing ground cover may be planted between flag stones to allow for greater infiltration. Pavers can be used in high use area such as parking lots, patios and walkways.

MAINTENANCE: Keep the area clear of sediment to prevent clogging. Annual vacuum sweeping with a shop vac helps maintain permeability. The gaps between pavers may require occasional weeding or scorching and sand or gravel replenishment. Because pervious pavers are easily lifted and reset, they are easy to repair or replace.

DO

- Use only in gravelly sand, loamy sand or other pervious native soils.
- Plant vegetation in between or around pavers.

DON'T

- Use in areas with high sediment loads that can clog porous areas.

TURF BLOCK

Turf block (concrete blocks with holes) and similar products can be filled with sand or planted. They provide soil stability for driveways and walkways. Sometimes the pores are filled with gravel or cobble. They are not ideal for everyday parking, because of irrigation and maintenance demands, and if they are planted, long term parking inhibits sunlight required for plant growth.

MAINTENANCE: Planted turf block may require regular mowing (depending on plant choices) as well as irrigation, fertilization and weeding.

DO

- Choose low water grasses such as native fescues.
- Use only in gravelly sand, loamy sand or other pervious soils.

DON'T

- Use in high traffic areas or permanent parking areas.
- Aerate.

PERVIOUS PAVEMENT

Pervious pavements contain pore spaces that allow infiltration of runoff. The water seeps through the material to a rock base layer underneath and is naturally filtered through the underlying soil where pollutants are removed. There are different types of pervious (or porous) pavements including porous asphalt and pervious concrete. Soil must have permeability between 0.5 and 3.0 inches per hour to be considered for pervious concrete installations. The bottom of the rock base/reservoir should be completely flat so that runoff will be able to infiltrate through the entire surface. Pervious pavement should be located a minimum of 2 to 5 feet above the seasonally high groundwater table and at least 100 feet away from drinking water wells. Ideal uses include walkways, residential parking areas, and driveways.

Although installation is becoming easier and a more cost-effective alternative to traditional paving methods, appropriate construction techniques are necessary to ensure the effective performance of pervious pavements. Hiring a licensed contractor experienced in these materials is highly recommended and may even be required depending on the application.

MAINTENANCE: Keep clear of soil, rocks, leaves, and other debris. Vacuuming annually, using a shop vac or specialized vacuum for larger areas, may be necessary to remove debris from the surface of the pavements. Other cleaning options may include power blowing and pressure washing. Always follow the manufacturer's maintenance recommendations.

DO

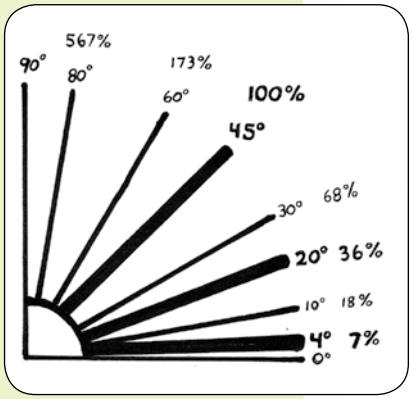
- Consult a professional to recommend a design customized to your site.
- Treat surrounding bare soil areas by planting or mulching.

DON'T

- Use in areas where there is a possibility of sand drifts.
- Seal or repave with non-porous materials.

DID YOU KNOW?

There is much confusion when referring to the "steepness" of slope. We sometimes find a slope measured in degrees and other times as a percentage such as a 20% slope. To figure out the percentage slope, you would use the rise over run formula. For instance a distance of one foot horizontally with a one foot rise over that distance would give you the formula 1/1 or 100% slope. The equivalent angle or degree would be a 45° angle. The chart below is an easy conversion table to calculate the equivalent % grade to degree of slope.



SLOPE GRADIENT CONVERSION TABLE

Ground Covers

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USES: TEMPORARY AND PERMANENT SOIL COVER, LOW USE WALKWAYS, AND SLOPE PROTECTION

Using mulches or vegetation to cover bare soil is a key ingredient to SLOWING down and thus preserving valuable top soil, preventing sediment from being carried downstream, and reducing the potential for erosion. Ground cover varieties include vegetation, wood chip, gravel, or other mulches. Mulches are a good choice for areas with LESS THAN a 33% slope. Vegetation works well on areas with LESS THAN a 50% slope.

MULCH (ROCK, WOOD CHIPS, OR OTHER MATERIALS)

Mulching is a simple and beneficial conservation practice you can use in your yard. Mulch is simply a protective layer of material that is spread on top of the soil. Mulches can be organic -- such as grass clippings, straw, bark chips, and similar materials -- or inorganic -- such as stones, brick chips, and recycled glass. Mulching has many benefits such as protecting soil from erosion, reducing compaction from the impact of heavy rains, conserving soil moisture, maintaining an even soil temperature, and preventing weed growth. It is also useful as temporary ground cover until supplemental vegetation becomes established.

MAINTENANCE: Organic mulch may need to be replaced annually. Removal of old mulch and plant debris each fall prevents growth of fungus and other unwanted pests and diseases. Keep any organic materials at least 6 inches from building siding. Gravel or rock should be raked regularly to prevent the buildup of organic materials.

DO

- Use recycled material whenever possible.
- Keep rock free of organic materials.

DON'T

- Use wood chips from diseased trees.
- Use straw mulch near stream channels.

VEGETATION/PLANTING

Plants cover and protect the soil. Once established, plants provide excellent long-term erosion control. Their roots knit together to hold the soil in place. Their leaves, needles and twigs reduce the impact of rain, and the organic matter they add to the soil improves water infiltration. A drip irrigation system provides slow delivery of water to plants, so water infiltrates with little or no runoff.

When selecting plants for a landscape, it is important to understand the site conditions. While most property owners select plant materials for their form and color, it is essential to know their solar, soil, and moisture requirements. Plants that do well in specific microclimates on a site are termed "site appropriate." For the purpose of improving stormwater runoff choose plants that improve infiltration, decrease runoff, filter pollutants, and help stabilize slopes. Contact the RCD (page 47) or a local plant nursery knowledgeable in native and drought tolerant species best suited for these functions.

Native plants (vegetation that grows naturally in particular climates or regions) are a great choice because of their performance, site enhancement, and life cycle cost benefits. Native plants typically are more cost-effective in the long run because they require less water and fertilizer, and they are more resistant to local pests and diseases than nonnative ornamentals. Costs are also reduced due to lower maintenance and replanting requirements. Additionally, native plants provide habitat for local/regional wildlife. If you choose nonnative plants, care should be taken to not plant invasive species as they tend to crowd out the native species. Contact the RCD (see page 47) for a list of plants that should be avoided.

MAINTENANCE: Routine maintenance is required and can be performed as part of the regular site landscaping program. Weeding and irrigation are essential in the first couple of months while plants become established. Annual pruning and mulching are recommended. Additional irrigation may be necessary during drought years. The use of native, site-appropriate vegetation reduces the need for fertilizers, pesticides, excessive water, and overall maintenance requirements.

DO

- Use California natives or drought tolerant plants that can endure periods of saturation.
- Keep plants well pruned near foundations and siding to allow adequate ventilation.
- Minimize fertilization or try organic options to prevent water contamination.

DON'T

- Plant invasive species such as perwinkle (Vinca) or certain ivys.
- Plant highly flammable vegetation near buildings.
- Allow irrigation water to drain to your driveway, the street, or bare soils.

Erosion Control Blankets (ECBs)

$-$$ | E-M

USES: BARE SOIL COVER AND SLOPE PROTECTION WHILE ESTABLISHING VEGETATION

Erosion control blankets are a good tool to improve the success rate of new plantings and can quickly add a layer of protection to bare soils. Some of the benefits of ECBs include reducing seed and soil loss, decreasing runoff volume and velocity, reducing top soil disturbance and loss, encouraging plant root developments and suppressing weeds.
It's important to choose the correct ECB for the site conditions (slope, runoff velocity, and purpose). Ask your local retailer or contact the RCD for assistance (see page 47) in choosing the correct blanket. We have included basic installation instructions, but ALWAYS follow the manufacturer's recommendations.

Before laying the blanket, prepare the soil surface making sure it is smooth to maximize soil-blanket contact. At the top of the slope, at least 2 feet from the crest, dig a 6" minimum ditch (called an anchor ditch). Line the ditch with the top of the ECB leaving enough to roll back over once the ditch is filled. Now fill the ditch back in over the ECB and wrap the extra over the top and secure with staples. Next, carefully roll the ECB vertically down the slope in the same direction as the water flows. Overlap the side edges of the contiguous blankets used by at least 4" and overlap the top and bottom edges of the blankets by at least 3". The uphill roll should overlie the downhill roll. Stake the blanket, at a minimum, horizontally every 2 feet and vertically every 3 feet. Stake at least every foot where an uphill and downhill blanket overlap. If the ground is soft, staples can be used to hold the blanket down. Otherwise, 4" nails and a washer should be used.

MAINTENANCE: Monitor for erosion until vegetation becomes established. Check for proper placement that could be disturbed by animals or a large storm event. Ensure that overlaps remain in place and correct as necessary.

DO

- Make sure to choose the appropriate ECB for the desired use and conditions.
- Use decomposable netting.

DON'T

- Walk on the ECB after it is place.
- Allow gaps between the blanket and the soil.
- Let concentrated runoff flow onto the ECB from above.

Cross Drains

$-$$ | E-M

USES: DRIVEWAYS, PRIVATE ROADS

Cross drains are used to SLOW water down by breaking up the impervious surface area into smaller sections. Smaller sections help divert the water to a point where it can SINK in to help combat the ill effects of driveway and road runoff. The BMPs described here can be installed on existing driveways and roads, both paved and unpaved. If you are constructing or reconstructing a road, other techniques such as outsloping can be used but are beyond the scope of this guide. Contact the RCD for a free copy of the Private Roads Maintenance Guide for more information on alternative techniques. See page 47 for contact information.

WATERBARS

Waterbars are used to break up runoff into small units so that it does not have enough energy to erode soils. They also divert water away from streets and allow it to infiltrate. On unpaved roads, an earthen waterbar, also known as a water break, consists of a shallow trench with a parallel berm or ridge on the downslope side which is angled down across the road. On these surfaces they can be constructed by hand, with a backhoe, or with a blade-equipped tractor. Optimal size of an earthen waterbar is 12 inches above the road surface and 6 inches below the road surface. Asphalt or cement waterbars can be smaller in size (6 inches) and thereby provide greater ease of access. Water bars should be installed at a 30 to 45 degree angle and in most cases the outlet of waterbars should be protected with rock dissipaters.

DO
- Install energy dissipators at all outlets.
- Install at 30 to 45 degree angles.

DON'T
- Direct runoff to erodible surfaces.
- Outlet water onto steep slopes.
- Direct water to a neighbor's property.

MAINTENANCE: Keep the outlets clear of debris and sediment so water drains freely. Inspect annually and make necessary repairs to earthen berms that break down over time and ensure there is no erosion.

SLOTTED CHANNEL DRAIN

A slotted drain installed across the width of your driveway is another option to address surface runoff. It consists of a metal-grated conveyance structure that transports water to a safe location. Decorative varieties are also available. Slotted channel drains are installed flush with the driveway surface, a feature that makes these conveyance devices more appealing for aesthetic reasons. The drain should be sloped no less than a ½ inch per foot of length to prevent clogging from sediment and debris. It should also be angled at 30-45 degrees. Although slotted channel drains may be installed on any driveway, they are recommended for driveways with slopes greater than five percent.

MAINTENANCE: Ensure that the grate is open before and during storm events (not covered by leaf litter). Check that the outlet is protected, non-eroding, and clear of debris and sediment so water drains freely.

DO
- Ensure the drain is large enough so that the majority of water enters the drain and doesn't flow over.
- Install energy dissipators at all outlets.
- Install at 30 to 45 degree angles.

DON'T
- Install channel drains in areas with large amounts of leaf debris.
- Outlet water onto steep slopes.
- Direct water to a neighbor's property.

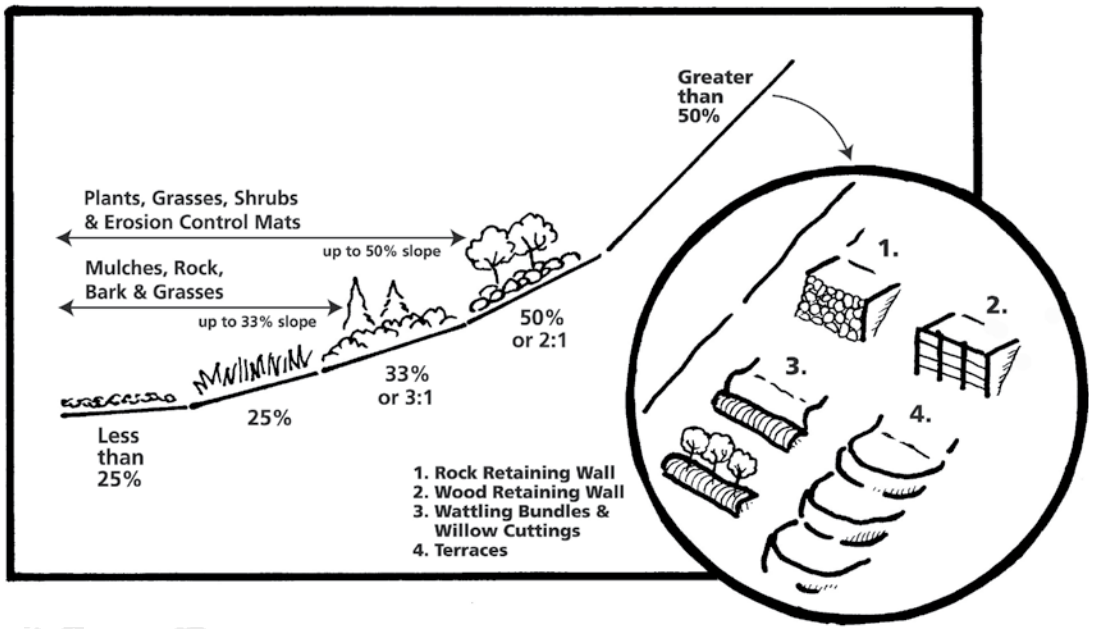
Retaining Walls and Terracing

$$-$$$ | M-C

USES: SLOPED AREAS

Protecting steep slopes is very serious! Improperly installed systems can pose a serious threat to life and property. We recommend that ALL retaining wall and terraced areas be designed and installed by a licensed qualified professional.

Retaining walls and terraces are used to reduce the gradient or slope and provide level or gently sloping areas for establishing vegetation. Retaining walls and terrace walls are constructed with boulders, treated timber, bricks and/or interlocking concrete blocks. (Walls over 3 feet high must be designed by an engineer). There are MANY different types of retaining walls, each with a different purpose, so always check with a qualified professional before embarking on any wall project for soil retention. A building permit and engineering expertise are required to build many retaining walls. Always check with your local planning department to determine if a permit is necessary for your project. Contact information can be found on page 47.



RETAINING WALLS

Rock retaining walls are an alternative to wood retaining walls and are often used next to a roadway or drainage way. They are freestanding walls built from rock 10 inches to 2 feet in diameter. A footing trench is dug along the toe of the slope, and the largest boulders are placed in the trench. Subsequent rocks are laid with at least three bearing points on previously laid rocks. The external face of the wall should incline slightly uphill, though the wall itself is freestanding and does not lean. As the wall is built, fill material is placed around and behind the rocks and packed in. Since the finished slope behind the wall will be flatter than before treatment, possibly a level terrace, it should be easier to establish all-important perennial plants on and above the wall.

Wood retaining walls can be used on slopes steeper than 50 percent and are often located between the base of a slope and an adjacent road, driveway or drainage way. Lumber and posts should be treated with an approved wood preservative (not creosote). Ensure proper drainage methods behind the wall are utilized. As always, vegetation should be established on the slope above the wall.

WILLOW CUTTINGS

Willow cuttings are used under very specific site conditions and are normally recommended only through the guidance of a qualified professional. Contact the RCD for more information (see page 47 for contact information).

TERRACES

Many materials are available for building terraces. Treated wood is easy to work with, blends well with plants, and is often less expensive than other materials. Interlocking concrete blocks are made specifically for walls and terraces and are more easily installed by a homeowner than other materials, such as fieldstone and brick. The steepness of the slope dictates wall height. Make the terraces in your yard high enough so the land between them is close to level. This soil surface should be carefully revegetated. Be sure the terrace material is strong and anchored well to stay in place through cycles of freezing, thawing, and heavy rainstorms. Large terraces should be tied back into the slope and properly drained. This takes expertise and equipment, so you may want to restrict the terraces you build to a foot or two in height. Get help from a professional to make sure higher walls stand up to the forces of gravity and water pressure in the soil.

DO

- Provide adequate drainage behind retaining walls.
- Use a qualified professional to design your wall.

DON'T

- Install without checking on permit requirements.
- Use creosote-treated wood.

CHAPTER 3
DIFFICULT SITES AND SITE CONSTRAINTS

There are a wide variety of soil types found in Santa Cruz County. When attempting to implement any BMP that increases the infiltration of water into the soil, it is critical that the soils have the capacity to handle the amount of water being directed to the area. Conducting a thorough analysis of your soils and ascertaining if a BMP will function in these soils are critical to the success of any project. In order to evaluate your soils look on the RCD web site at http://www.rcdsantacruz.org/Resources/soil_surveys.html. Be sure to verify that the soil conditions noted on the website are accurate by observing your own soils or by contacting the RCD or a qualified professional. Also make sure to look for areas of shallow parent material or infiltration limiting layers such as hardpans.

Frequently site conditions make it difficult or impossible to implement certain home drainage practices on your property. For example, sites that are on steep slopes, located in a wet area with a high water table, or soil conditions that have poor infiltration rates can be problematic. Below is a list of primary site constraints that you should consider when evaluating drainage practices for your home. Although there are many opportunities to control runoff on site, it is important to consult a professional to ensure that all options are thoroughly considered and to avoid unforeseen consequences.

STEEP SLOPES

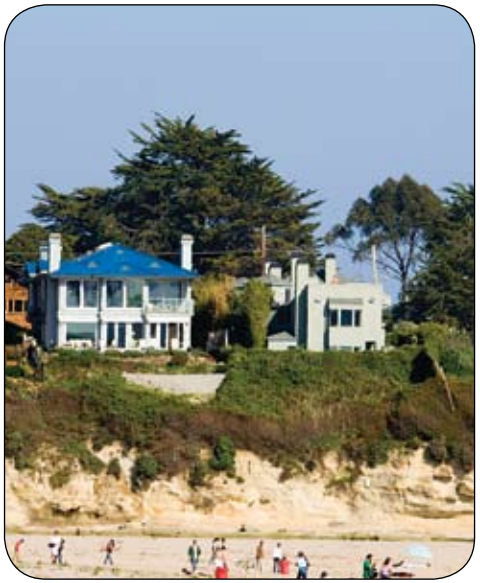
The severity of the slope plays a significant role in determining the practices that can be installed. Avoid installing practices on slopes that are greater than 50% without professional consultation. Use caution when installing practices on any steep slopes. By directing and infiltrating runoff to these sites you run the risk of saturating soils and promoting slumping and conditions that promote landslides. Out-letting drainage systems on steep slopes can also cause erosion that can lead to gully formation and even landslides. If your home is on or near steep slopes, please consult an expert before considering home drainage projects.

PREEXISTING EROSION PROBLEMS

In some cases, preexisting erosion problems may complicate the site and preclude the implementation of drainage practices. It is important to be aware of your current erosion issues and be sure that the drainage practices you implement will not make your drainage and erosion issues worse. Of particular importance is ensuring that you do not exacerbate current conditions by diverting flows into already dynamic systems. If your home has existing erosion problems, please consult an expert before considering home drainage projects.

GEOLOGICALLY HAZARDOUS SITES

The County of Santa Cruz administers the Geologic Hazards Ordinance. This ordinance identifies areas subject to hazardous conditions and notes these hazards on a series of hazard maps. These maps should be consulted to identify if your home is located within a hazard area. If your home is in one of these areas, please consult an expert before considering home drainage projects.



COASTAL BLUFFS

Coastal bluffs are inherently geologically unstable and prone to erosion. You should avoid placing any additional drainage on these sites whenever possible. Careful management of site drainage is probably the most cost-effective approach to minimizing bluff hazards. Even where circumstances dictate significant structural stabilization efforts, such as shoreline bulk heading or regrading of slopes, site drainage remains an essential component of the solution. Consult a drainage professional when designing drainage system for sites on coastal bluffs.

AREAS PRONE TO FLOODING

Under a widespread heavy rain scenario (accumulation of .30 inches of rain per hour or more), severe flooding is likely in low-lying areas within a basin. Based on the 100-year flood plain (FEMA Zone A), 11% of the developed parcels (8,359) and 5% of the roads (103 miles) within Santa Cruz County are located within or intersected by the 100-year flood plain. If your home is within a flood prone area, please consult an expert before considering home drainage projects.

LANDSLIDE ZONES

Santa Cruz County is extremely susceptible to landslides due to the topography and geological soil characteristics. Based on GIS survey analysis 7.5% of the developed parcels (5,523) and 11% of roads (233 miles) are within or intersected by known landslide-prone areas. Installing complex drainage practices that promote infiltration may also promote landslide activity if hill slopes become saturated. Designing drainage practices on these sites requires special care. To determine if your home is in a landslide area, consult the potential landslide area map that can be found on the County of Santa Cruz Web site. If it is located in a landslide zone please consult an expert before considering home drainage projects.

CHAPTER 4
LOCAL PROJECTS

RAINWATER TANKS

Location: Scotts Valley
Designer: Earthcraft Landscape Design
Installation: Superior Pump Company

Project Description:
This is a 30,000-gallon rainwater harvesting system that has reduced erosion, sedimentation, and peak flows into Granite Creek. It has also increased aquifer recharge and will provide for the owner's annual irrigation (drought tolerant plantings, large organic vegetable garden and orchard, etc.)

RAIN GARDEN/DRY CREEK BED

Location: Santa Cruz
Designer: Love's Gardens
Installation: Love's Gardens

Project Description: The rain garden and dry creek bed stopped flooding of the front path to the house and now keep water on-site. Runoff infiltrates and is stored in the soil for later use by drought tolerant plants and no longer carries potential pollutants from the street to the Monterey Bay.

BIORETENTION POND/RAIN GARDEN

Location: Watsonville
Designer: Ausonio Incorporated of Castroville

Project Description: The bioretention pond treats runoff and reduces peak flows from a small parking area at Smith and Vandiver, a company in Watsonville that makes and distributes shower, bath, and body care products.

VEGETATED SWALE

Location: Watsonville
Designer: DES Architects and Engineers

Project Description: The vegetated swales capture automobile-related pollutants in runoff from the upper parking lot at Pajaro Valley High School which is located in the coastal zone between Struve Slough and Hanson Slough in Watsonville. The intentional lack of curbs allows the water to flow directly into the swale.

VEGETATED SWALE/BIORETENTION

Location: Watsonville
Designer: Ifland Engineers

Project Description: The Strawberry Business Center in Watsonville uses a neat swale/bioretention system. The plants still need a bit of time to fill in the voids. This setup would work well for folks who want a xeriscape feature that doubles as a rainwater conduit. It was very easy to build and is also easy to maintain.

VEGETATED SWALE/BIORETENTION

Location: Boulder Creek
Designer: Central Coast Wilds
Installation: Central Coast Wilds

Project Description: This newly installed vegetated swale sits at the base of a slope above a retaining wall to help divert and infiltrate water on the slope. The gentle swale is surrounded by native Juncus effusus plants with native Aster chilensis on either side of that. The aster will eventually form a ground cover, but mulch is used to protect the bare soil until then.

SWALE/PREVIOUS HARDSCAPE

Location: Santa Cruz
Designer: Love's Gardens
Installation: Love's Gardens

Project Description: The original impervious concrete path was removed, and the pieces were used to create an urbanite path that allows water to infiltrate. Water that was draining to the street is now diverted to the path and into the landscape (see flexible black pipe extending from the soil bed at the start of the path). The use of native, drought tolerant plants in combination with the extra water now stored in the soil allowed the irrigation system to be removed thus conserving more water. All of these practices support cleaner water and reduced flooding by limiting runoff leaving the site.

UNDERGROUND WATER STORAGE/GROUNDCOVER

Location: Santa Cruz
Designer: Habitat Gardens
Installation: Habitat Gardens

Project Description: This rainwater storage system collects rainwater from two downspouts on the front of the house. The water passes through a debris filter and then into a 3,000-gallon underground water storage cistern. The water is used to irrigate the landscape providing nutrient-rich water to vegetation and local wildlife, as opposed to commercially treated water that can contain chlorine and other additives. The overflow from the cistern empties into the seasonal pond located on top of the cistern to allow for more rainwater storage. When the seasonal pond is full, it overflows down a seasonal creek bed or rock swale. The runoff that eventually makes its way to the street has been significantly reduced though infiltration.

GROUND COVERS/EROSION CONTROL BLANKETS

Location: Santa Cruz
Designer: Habitat Gardens
Installation: Habitat Gardens

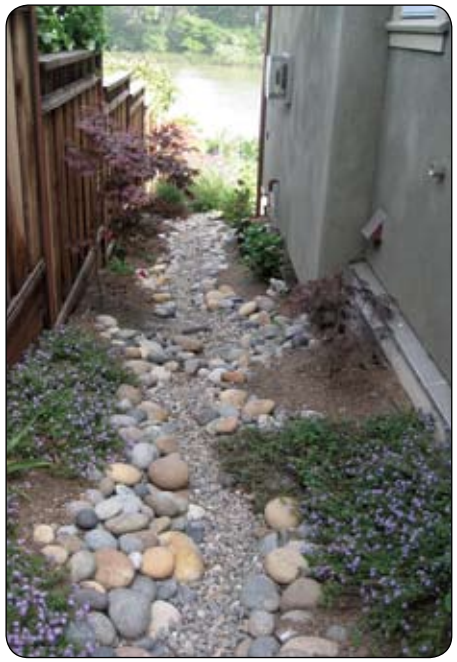
Project Description: This project used jute netting to help control erosion until the plants were established. Mexican Sage and jute netting covered with shredded redwood bark were used.

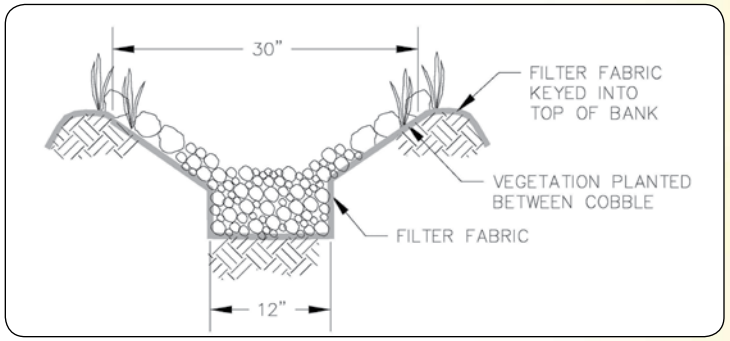


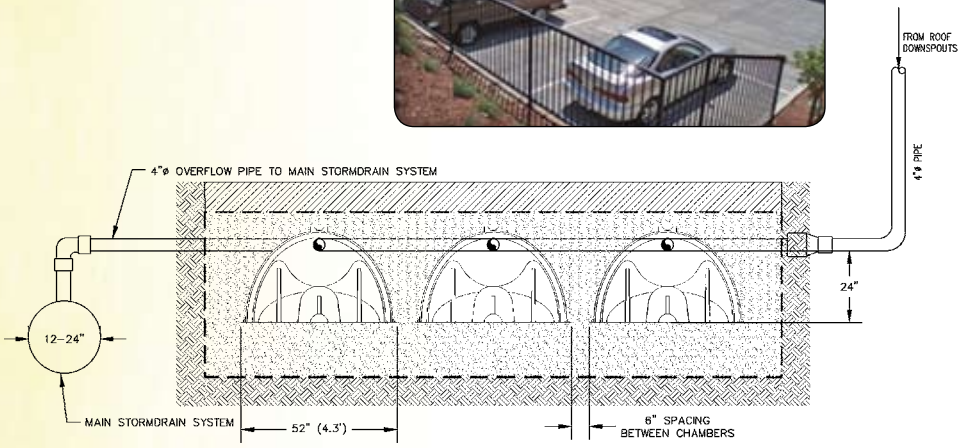
SWALE/BIOFILTER

Location: Soquel
Designer: Fall Creek Engineering
Installation: Homeowner

Project Description: The owner wanted to incorporate green stormwater techniques for the new ADU (Accessory Dwelling Unit or studio) roof as well as the existing house. As part of this project the driveway was replaced with pervious pavers. Runoff overflow from the pervious pavers, the existing house roof, and the new ADU roof were all directed towards a long dry swale/biofilter. This swale serves as an all weather pathway into the backyard and as a stormwater feature. This swale has been effective in reducing runoff from the site through means of infiltration and improves water quality through biofiltration.







PERVIOUS PAVEMENT/STORMWATER TREATMENT SYSTEM

Location: Watsonville
Designer: Fall Creek Engineering
Installation: Johnstone Moyer Inc.

Project Description: Parkhurst Terrace (Parkhurst) is a 5.89-acre parcel located in southern Santa Cruz County that converted an existing recreational vehicle park into a permanent occupancy, affordable residential development. A portion of the runoff was retained on-site using shallow infiltration chambers and porous pavement. Additional drainage from the roads, other paved areas, and from off-site areas was captured and conveyed in a storm sewer system. All site runoff that exits the site passes through a stormwater treatment system, which will serve to remove silt and grease at the lower portion of the system before the water enters the storm drain off-site. The reduction of impervious surfaces area and use of on-site retention systems reduced the discharge rate and volume of runoff that was flowing to the off-site drainage course along Freedom Boulevard.

GROUND COVERS

Location: Santa Cruz
Designer: Love's Gardens
Installation: Love's Gardens

Project Description: This small patio area is made of urbanite (broken concrete from the site) and recycled tumbled glass. It increases the pervious area and allows water to infiltrate.

DRY CREEK BEDS/RAIN CATCHMENT/DRIVEWAY STRIP

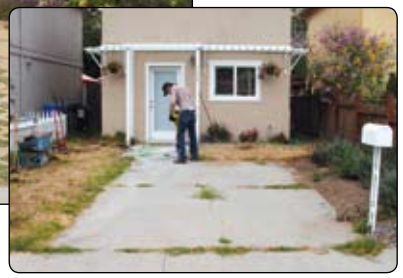
Location: Capitola
Designer: Raison Cain and Habitat Gardens
Installation: Creative Landscapes and Habitat Gardens

Project Description: This landscape is primarily a California native and edible landscape. There is a large rainwater-harvesting tank in the backyard that feeds the drip irrigation, vegetable bed, and garden hose. There are two drive strips in the driveway to reduce the need for concrete and allow California native grasses to grow in the center of the strip.
There are two seasonal creek beds or rock swales that collect rainwater from the downspouts to help mitigate stormwater runoff. The creek beds are lined with plants that help filter and slow down the water before it leaves the property. One of the rock areas that captures runoff is three feet deep and filled with cobble. This extra depth allows for more stormwater mitigation and percolation.

RAIN BARREL

Location: Santa Cruz
Designer: Love's Gardens
Installation: Love's Gardens

Project Description: A rain barrel on the second floor deck with a manual first flush diverter, overflow faucet to the garden, and gravity-fed faucet to a lower level manual valve is used to water the garden or house plants. The barrel is portable with an easy disconnect from the downspout. The barrel was made in 1987 and came from a vitamin manufacturer in Scotts Valley.



PERVIOUS HARDSCAPE DRIVEWAY/SITE APPROPRIATE LANDSCAPING

Location: Santa Cruz
Designer: Habitat Gardens
Installation: Habitat Gardens

Project Description: The concrete driveway was removed along with the existing lawns in both the front and backyard. Broken pieces of concrete from the driveway were used to make flagstone-like pathways and a small patio. The concrete was stained with environmentally friendly iron sulfate to give it a warm, rusty flagstone color. The new driveway is made of two pervious, turf block drive strips with thyme growing out of the turf blocks and in between the cracks of the steppingstones. Thyme is planted in between all the steppingstones, and the rest of landscape is very drought resistant with a wonderful mix of Mediterranean plants, succulents, California native plants, edible plants, and one fruit tree.

RESOURCES GUIDE

AGENCIES/NONPROFITS

Coastal Watershed Council
P.O. Box 1459
Santa Cruz, CA 95061
(831) 464-9200
www.coastal-watershed.org

Ecology Action
PO Box 1188
Santa Cruz, CA 95061-1188
(831) 426-5925
www.ecoact.org

Low Impact Development Center
California Branch Office
P.O. Box 747
San Luis Obispo, CA 93406-0747
(805) 540-9772
www.lowimpactdevelopment.org

Resource Conservation District of
Santa Cruz County (RCD)
820 Bay Avenue, Suite 128
Capitola, CA 95010
(831) 464-2950
www.rcdsantacruz.org

Save Our Shores
345 Lake Avenue, Suite A
Santa Cruz, CA 95062
(831) 462-5660
www.saveourshores.org

Surfrider Foundation
2222 East Cliff Drive #234
Santa Cruz, CA 95062
(831) 476-7667
www.surfridersantacruz.org

USDA-Natural Resources
Conservation Service (NRCS)
820 Bay Avenue, Suite 128
Capitola, CA 95010
(831) 475-1967
www.nrcs.usda.gov

LOCAL WATER PURVEYORS

Many of the water districts offer rebates for water saving techniques including rain catchment and low water use landscaping

Central Water District
P.O. Box 1862
Aptos, CA 95003
(831) 688-2767

City of Santa Cruz Water Department
212 Locust Street, Suites A-D
Santa Cruz, CA 95060
(831) 420-5200
www.ci.santa-cruz.ca.us/wt/

City of Watsonville Public Works
250 Main Street
Watsonville, CA 95076
(831) 768-3100
www.ci.watsonville.ca.us

Lompico County Water District
11255 Lompico Road
Felton, CA 95018
(831) 335-5200

Pajaro Valley Water Management Agency
36 Brennan Street
Watsonville, CA 95076
Ph: (831) 722-9292
www.pvwma.dst.ca.us

San Lorenzo Valley Water District
13060 Highway 9
Boulder Creek, CA 95006
(831) 338-2153
www.slvwd.com

Scotts Valley Water District
2 Civic Center Drive
Scotts Valley, CA 95066
(831) 438-2363
www.svwd.org

Soquel Creek Water District
5180 Soquel Drive
Soquel, CA 95073
(831) 475-8500
www.soquelcreekwater.com

PROFESSIONAL ASSOCIATIONS

California Landscape Contractors Association
1491 River Park Drive, Suite 100
Sacramento, CA 95815
(916) 830-2780
www.clca.org

CLCA can help you find a qualified and licensed landscape professional to assist with your home drainage needs.

California Native Plant Society
Santa Cruz Chapter
P.O. Box 1622
Santa Cruz, CA 95061
www.cruzcnps.org

Certified Professionals in Erosion and Sediment Control, Inc. (CPESC)
49 State Street
Marion, NC 28752-4020
(828) 655-1600
www.cpesc.org/cc-info/cc-dir-list.asp

*Link to CPESC professionals in California who can assist you with erosion and drainage concerns

Ecological Landscape Association
1257 Worcester Road #262
Framingham, MA 01701
(617) 436-5838
California chapter web site
www.ecolandscaping.org/ela-CA.html

Contact the local ELA chapter for information on regional landscape professional

The Monterey Bay
Green Gardener Program
P.O. Box 1188
Santa Cruz, CA 95061-1188
(831) 426-5925
www.green-gardener.org

MBGGP can help you find a certified green gardener

REGULATORY AGENCIES (COUNTY AND CITIES)

City of Capitola
420 Capitola Ave
Capitola, CA 95010
(831) 475-7300
www.ci.capitola.ca.us

City of Santa Cruz
Planning and Community Development
809 Center Street
Santa Cruz, CA 95060
(831) 420-5100
www.ci.santa-cruz.ca.us

City of Scotts Valley Building Department
1 Civic Center Dr.
Scotts Valley, CA 95066
(831) 440-5640
www.scottsvalley.org

City of Watsonville
250 Main St
Watsonville, CA 95076
(831) 768-3050
www.ci.watsonville.ca.us

County of Santa Cruz
Planning Department
701 Ocean Street
Santa Cruz, CA 95060
(831) 454-2580
www.co.santa-cruz.ca.us

REGULATORY AGENCIES (OTHER)

California Coastal Commission
(Central Coast District Office)
725 Front Street, Suite 300
Santa Cruz, CA 95060-4508
(831) 427-4863
www.coastal.ca.gov

California Department of Fish and Game (CDFG)
P.O. Box 47
Yountville, CA 94599
(707) 944-5500
www.dfg.ca.gov

*CDFG should be contacted for any work done within a stream or riparian corridor

National Marine Fisheries Service
(NOAA Fisheries)
777 Sonoma Ave.
Santa Rosa, CA 95404
(707) 575-6050
www.nmfs.noaa.gov

NOAA must be consulted when steelhead or salmon are potentially affected by an activity

Regional Water Quality Control Board
Central Coast (Region 3 – Covers Santa Cruz County)
895 Aerovista Place, Suite 101
San Luis Obispo, CA 93401
(805) 549-3147
www.swrcb.ca.gov

U.S Army Corps of Engineers
(ACOE)
333 Market Street, 8th Floor
San Francisco, CA 94195
(415) 977-8462
www.usace.army.mil

ACOE regulates the discharge of dredged or fill materials in most creeks, rivers, and wetlands

US Fish and Wildlife Service
(Region 8 – Covers Santa Cruz County)
2493 Portola Road, Suite B
Ventura, CA 93003-7726
(805) 644-1766
www.fws.gov

RESOURCE
CONSERVATION DISTRICT
OF SANTA CRUZ COUNTY

820 Bay Avenue, Suite 128 · Capitola, CA 95010
(831) 464-2950
www.rcdsantacruz.org