City of Rolling Hills INCORPORATED JANUARY 24, 1957

NO. 2 PORTUGUESE BEND ROAD
ROLLING HILLS, CA 90274
(310) 377-1521
FAX (310) 377-7288

**AGENDA** | **CITY COUNCIL** | **CITY OF ROLLING HILLS**
**Regular City Council Meeting** | **Monday, September 27, 2021** | **6:00 PM**

# SUPPLEMENTAL
# ADJOURNED REGULAR MEETING OF THE ROLLING HILLS CITY COUNCIL
# AND
# ADJOURNED REGULAR MEETING OF THE ROLLING HILLS PLANNING COMMISSION

The meeting agenda is available on the City's website. The meeting will be live-streamed on the City's website. Both the agenda and the live-streamed video can be found here:

https://www.rolling-hills.org/government/agenda/index.php

Hybrid virtual/in-person meetings are held pursuant to Executive Order N-29-20 issued by Governor Gavin Newsom on March 17, 2020. Members of the public may email comments to: cityclerk@cityofrh.net

**COUNCIL CHAMBERS:** 2 Portuguese Bend Road, Rolling Hills, CA 90274 (Face mask required for all in-person attendance)

**JOIN VIRTUALLY AT:**

https://us02web.zoom.us/j/82470994528?pwd=TlZ5WXlBL042RWphbkhyUjFvbE5UQT09

Meeting ID: 824 7099 4528 Passcode: 911552

**OR PARTICIPATE BY PHONE:**

Dial: 669 900 9128 / Meeting ID: 824 7099 4528

## 1. CALL TO ORDER

## 2. ROLL CALL

## PLEDGE OF ALLEGIANCE

## 3. OPEN AGENDA - PUBLIC COMMENT WELCOME

*This is the appropriate time for members of the public to make comments regarding the items on*

*the consent calendar or items **not** listed on this agenda. Pursuant to the Brown Act, no action will take place on any items not on the agenda.*

## 4. CITY COUNCIL AND PLANNING COMMISSION JOINT STUDY SESSION

4.A. GENERAL STORMWATER MANAGEMENT UPDATE: DIRECTION ON VISION AND GUIDING PRINCIPLES, AND WAY FORWARD.
**RECOMMENDATION: Provide directions to Planning Commission and staff.**
RainwaterHarvestingGuide_SUPPLEMENTAL.pdf

## 5. ADJOURNMENT

***Notice:***

*Public Comment is welcome on any item prior to City Council action on the item.*

*Documents pertaining to an agenda item received after the posting of the agenda are available for review in the City Clerk's office or at the meeting at which the item will be considered.*

*In compliance with the Americans with Disabilities Act (ADA), if you need special assistance to participate in this meeting due to your disability, please contact the City Clerk at (310) 377-1521 at least 48 hours prior to the meeting to enable the City to make reasonable arrangements to ensure accessibility and accommodation for your review of this agenda and attendance at this meeting.*

City of Rolling Hills INCORPORATED JANUARY 24, 1957

**Agenda Item No.: 4.A**
**Mtg. Date: 09/27/2021**

**TO:** **HONORABLE MAYOR AND MEMBERS OF THE CITY COUNCIL**

**FROM:** **MEREDITH ELGUIRA, PLANNING DIRECTOR**

**THRU:** **ELAINE JENG P.E., CITY MANAGER**

**SUBJECT:** **GENERAL STORMWATER MANAGEMENT UPDATE: DIRECTION ON VISION AND GUIDING PRINCIPLES, AND WAY FORWARD.**

**DATE:** **September 27, 2021**

**BACKGROUND:**
PRESENTATION

- Latest City Council decisions regarding stormwater compliance
- 85th Percentile and 24-hour stormwater compliance efforts
- Current low impact development (LID) and zoning requirements
- Examples
- Stormwater mitigation measures on private improvement projects compared with public improvement project

**DISCUSSION:**
DIRECTION ON STORMWATER MITIGATION MEASURES ON PRIVATE IMPROVEMENT PROJECTS

- Commission Comment, Council Comment, and Council Direction

**FISCAL IMPACT:**
None.

**RECOMMENDATION:**
Provide directions to Planning Commission and staff.

**ATTACHMENTS:**
RainwaterHarvestingGuide_SUPPLEMENTAL.pdf

# South BAY

## A Homeowner's Guide to Rainwater Harvesting



# TABLE OF CONTENTS


3 INTRODUCTION

- 3 Background: What is Rainwater Harvesting?
- 3 Who Should Use this Manual?

4 WHY HARVEST RAINWATER?

5 HOW TO HARVEST RAINWATER

- 5 Assess Your Property
- 5 Estimate Roof Area to be Disconnected and Runoff Volume to be Managed
- 6 Redirection Criteria Checklist and Safety Considerations
- 6 How to Measure a Slope: Rise-Over-Run

7 HOW TO REDIRECT A DOWNSPOUT TO A RAIN GARDEN OR OTHER PERMEABLE AREA

- 7 Before you Begin
- 7 Redirection Procedure

9 HOW TO DESIGN A RAIN GARDEN

- 9 What is a Rain Garden?
- 9 Before you Begin
- 9 Assess Potential Rain Garden Sites
- 10 Sizing Your Rain Garden
- 11 Choose Your Plant Palette
- 11 Plants for Southern California

13 HOW TO BUILD A RAIN GARDEN

15 HOW TO REDIRECT A DOWNSPOUT TO A RAIN BARREL

- 15 What is a Rain Barrel?
- 16 Before you Begin
- 16 Redirection Procedure

17 OTHER RAINWATER HARVESTING OPTIONS

18 RAINWATER HARVESTING SYSTEM MAINTENANCE

19 WHERE TO GO FOR MORE INFORMATION

20 GLOSSARY OF TERMS

21 PHOTO CREDITS


## ACKNOWLEDGEMENTS


This guide was developed collaboratively by the Cities of Hermosa Beach, Manhattan Beach, Palos Verdes Estates, Rancho Palos Verdes, Redondo Beach, Rolling Hills, Rolling Hills Estates, and Torrance along with the County of Los Angeles.

Many thanks to The Bay Foundation [SantaMonicaBay.org] and the City of Los Angeles for permission to use the concept, design and many of the diagrams and photographs for this guide. Much of the content of this guide is adapted from the City of Los Angeles Rainwater Harvesting Program – A Homeowner's How-To Guide November 2009 1st Edition, and a similar guide prepared by the Santa Monica Bay Restoration Foundation for Culver City.



# INTRODUCTION

## Background: What is Rainwater Harvesting?

Each year in LA County, enough fresh rainwater to meet the needs of 3.5 million people for a year is lost to the ocean. This Rainwater Harvesting Guide is designed to help homeowners learn to intercept and capture rainwater and put it to beneficial use on their property to avoid losing this valuable freshwater resource.

Many residential homes are fitted with rain gutters and downspouts which direct rainwater from roofs onto paved surfaces such as sidewalks, driveways, parking lots, and streets. From there the rainwater ends up in the storm drain, which carries it to nearby streams, lakes, rivers or directly to the ocean. In this guide, you will find instructions on how to redirect rainwater from roofs and paved surfaces to areas in your yard where it can soak into the soil or be collected in rain barrels and used to water plants. It explains how to convert a water-thirsty turf or landscaped area into a rain garden filled with California-friendly drought-tolerant plants that will look beautiful and attract local bees, birds and butterflies.

## Who Should Use this Manual?

This guidance manual will help homeowners implement simple rainwater harvesting projects at home. It contains "How-to" information for the homeowner interested in disconnecting downspouts to capture and use rainwater for watering gardens, trees and landscaping on a residential property. By following these step-by-step instructions homeowners can: (1) disconnect existing downspouts; (2) extend downspouts to areas that can percolate rainwater; (3) construct a rain garden; and/or (4) install a rain barrel. This Guide is not intended for use in addressing low impact development requirements on new/redevelopment projects--such projects require permitting and plan check review by your local Building & Safety office.

There are many additional advanced methods that can be used on a residential property to capture and utilize rainwater. Homeowners looking to implement additional rainwater harvesting methods or seeking supplemental "How-to" information should refer to the Other Rainwater Harvesting Options (page 17) and Where to Go For More Information section (page 19) provided at the end of this guide. The South Bay Rainwater Harvesting webpage has a wealth of information and can be visited by following the link provided in the Where to Go For More Information section.

Homeowners should consider consulting a contractor or a landscape designer to address site-specific drainage concerns or to implement more advanced rainwater harvesting methods. (Please see page 20 for a Glossary of Terms.)

# WHY HARVEST RAINWATER?

### To Practice Water Conservation

California has entered an era of increasing water scarcity, with reduced storage in snowpack caused by rises in temperature. Harvesting rainwater to water plants helps conserve potable water and will ultimately save money on your water bill.

### To Reduce Energy Demands

The California Department of Water Resources estimates that 12% of total energy use in California is related to water. Energy is required to pump water from underground aquifers or from other parts of California, treat water to make it drinkable, and distribute water to consumers. One inch of rain falling on 1,000 square feet of rooftop produces more than 600 gallons of water that can be used in the garden and landscape at no energy cost.

### To Reduce Street Flooding

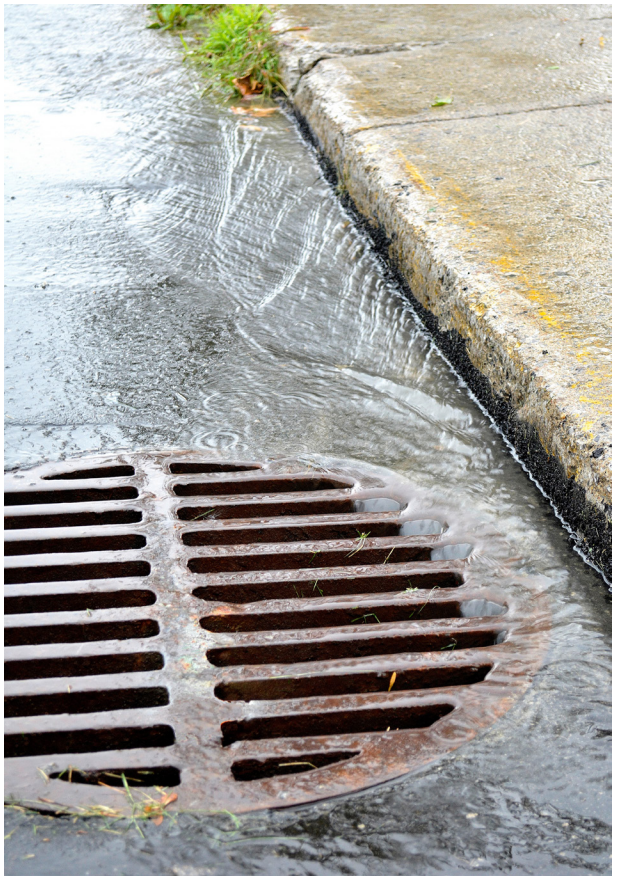
Redirecting downspouts to a rain garden instead of the street reduces the amount of rainwater flowing to the storm drain system which can alleviate localized flooding.

### To Recharge Groundwater Supplies

Approximately 45% of Southern California's drinking water comes from imported water. Los Angeles County has had to rely on water imported from the Sierra Mountains, the Central Valley and other states as our local water resources have dwindled. Harvesting rainwater and allowing it to percolate into the ground replenishes our local groundwater supplies reducing our dependence on imported water.

### To Protect Our Waterways and Ocean

When rainwater flows across roofs, sidewalks, driveways and streets, it picks up a variety of pollutants that are then carried to our local waterways and the ocean without treatment. This polluted runoff can harm aquatic ecosystems and threaten human health. By capturing rainwater that falls on roofs and paved surfaces, homeowners can reduce the amount of polluted runoff leaving their property, thus helping to improve the quality of our local waters.



*Redirecting downspouts to a rain garden can alleviate flooding by reducing the amount of rainwater flowing to the storm drain system (pictured here).*

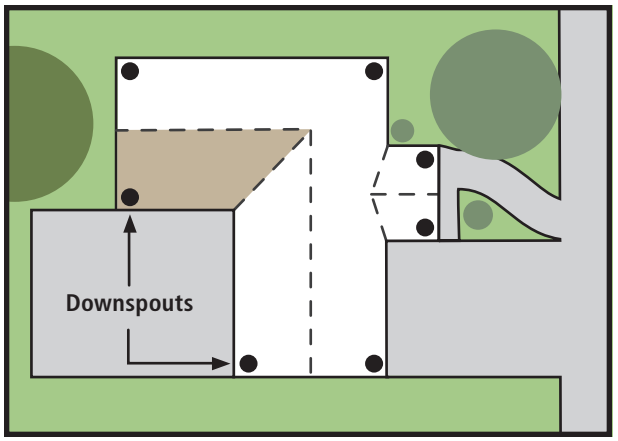
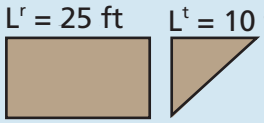



*Figure A: Example sketch of property*

**Example of Roof Area (RA) Calculation**

$L^r$ = 25 ft  $L^t$ = 10 ft

$W_r$, $W_t$ = 10 ft



**Roof Area = (Lr x Wr) + 1/2(Lt x Wt) =**

250 (square feet) + 50 (square feet) =
300 (square feet)

*Figure B: Example of Roof Area (RA) Calculation*

# HOW TO HARVEST RAINWATER

Some homes are not fitted with rain gutters, rather roof runoff is managed in a more natural way where it has opportunities to percolate and hydrate the landscape. If this is the case with your home, you may wish to jump to the section on How to Build a Rain Garden (page 9) for ideas about further enhancing the rainwater harvesting already happening on your property. If your home does have rain gutters, read on!

## Assess Your Property

Preparing a site sketch (Figure A) will help to identify downspouts to disconnect. Begin by drawing an outline of your home from a bird's eye view. Draw in your roof lines to depict different sections of the roof "footprint." Walk the perimeter and mark the location of all downspouts on your sketch. Note which downspouts are connected to rain gutters; these downspouts are good candidates for disconnection. If there is more than one downspout for a length of gutter, make sure to check the direction of flow to understand which downspout is receiving the most flow.

## Estimate Roof Area to be Disconnected and Runoff Volume to be Managed

Next calculate the square footage of the roof area draining to the downspouts you plan to disconnect—for a flat roof this is the actual roof area, for a sloped roof think of it as the bird's eye footprint or as the shadow cast by the roof when the sun is directly overhead (Figure B). Remember that different sections of your roof drain to different downspouts. Measure, or approximate, the square footage for each section of your roof that will drain to the downspouts you plan to disconnect. If multiple sections drain to a single downspout, find the area of each section individually and then combine them into one area. For a simple way to estimate your roof area, locate your home on Google Earth (earth.google.com) by typing your address into the site's search bar. You can then use the program's measuring tool to estimate the area of your roof. Note: Google Earth is compatible with iOS and Android mobile devices and on the web through the Google Chrome web browser.

To determine the volume of runoff to be harvested from the roof area that will be disconnected, use the equation below:

V = RA x 0.6 = _____ (gallons).
RA = roof area in square feet

This will yield the volume of runoff in gallons that will need to be managed by your rainwater harvest system to capture 1 inch of rainfall.

## Redirection Criteria Checklist and Safety Considerations

The following list of conditions should be met to safely redirect a downspout to a permeable area without damaging building foundations, flooding a basement, or impacting neighboring properties. Please check with your local Building and Safety office prior to construction of your rainwater harvesting project if your property has unique conditions, is situated on a hillside or is located in an area known to have expansive soils. Also, please check with your local Building and Safety office if your project may significantly alter drainage patterns on your property.

**Direct downspouts:**

- to areas sloping away from buildings,
- to stable vegetated areas where erosion or suspension of sediment is minimized,
- at least 3 feet away from public sidewalks,
- at least 5 feet back from property lines,
- at least 5 feet away from house foundations and crawl spaces, with at least a 2% slope away from the house,
- at least 10 feet away from basement walls, and
- onto gently sloped property (with slopes of 2 to 10%). See How to Measure a Slope in the next column.

**Never direct downspouts:**

- to areas above septic tanks,
- to areas that experience ponding,
- to areas that were filled with soil when the property was constructed, i.e., cut-and-fill areas, or
- within 5 feet of retaining walls.

## How to Measure a Slope: Rise-Over-Run

Tie a level string to two stakes pounded into the ground uphill and downhill along the slope. Make certain that the string attached to the uphill stake is even with ground level, then adjust the height of the string on the downhill stake using a leveling instrument (or the level tool on your cell phone).

Measure the distance between the stakes. This is the width (or run) shown in Figure C. Measure the distance from the string on the downhill stake to the ground. This is the height (or rise). Make certain that the height and width are measured in the same units.

Divide the height by the width to get the slope (rise over run). Multiply this by 100 to obtain the percent slope (Sample Slope % Calculation).

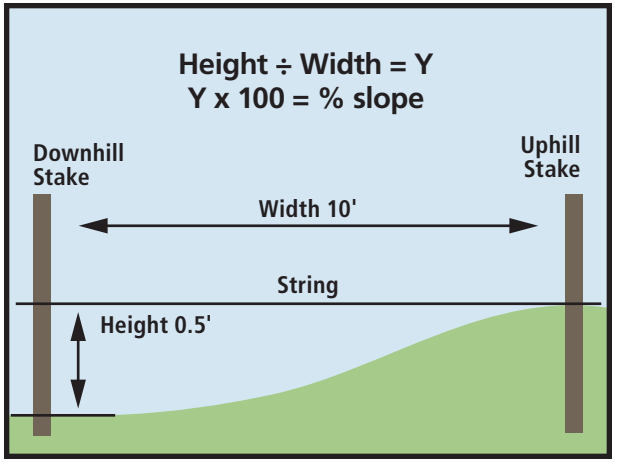



*Figure C: How to measure a slope (Not to scale.)*

**Sample Slope % Calculation:**
Height (0.5')/ Width (10') = 0.05
0.05 X 100 = 5%

# HOW TO REDIRECT A DOWNSPOUT TO A RAIN GARDEN OR OTHER PERMEABLE AREA

## Before You Begin

Assemble all the tools and materials you need. It's best to use durable, gutter-grade materials compatible with existing gutters, such as ABS Schedule 40 plastic or aluminum. Other materials such as corrugated black plastic, PVC pipe, or dryer hose can be used but tend to be less durable. For further assistance consult a home-and-garden specialist when purchasing materials. See Figure D for tools and materials you will need. Be sure to wear safety glasses.

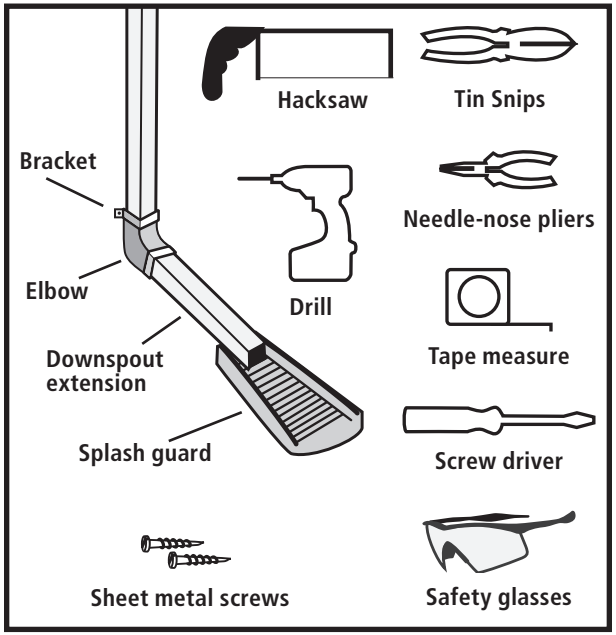
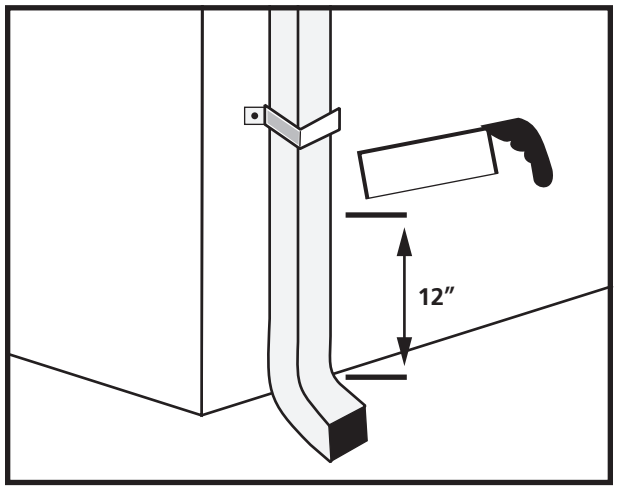



*Figure D. Tools and materials list and illustrations*



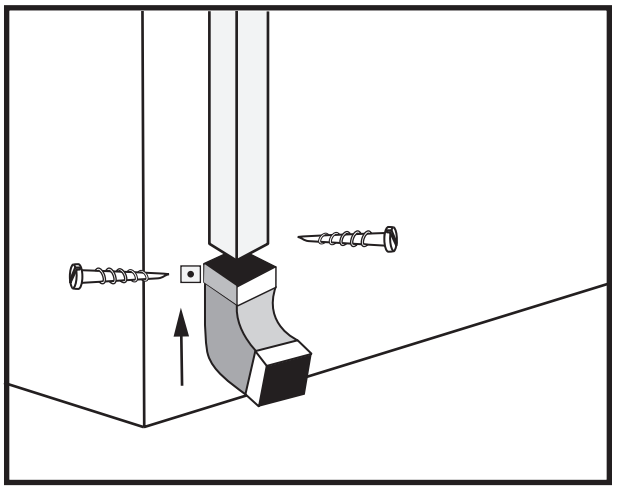

*Steps 1–2*

## Redirection Procedure

Redirecting a downspout to a permeable area is a relatively simple procedure. (Also see illustrations on page 8.)

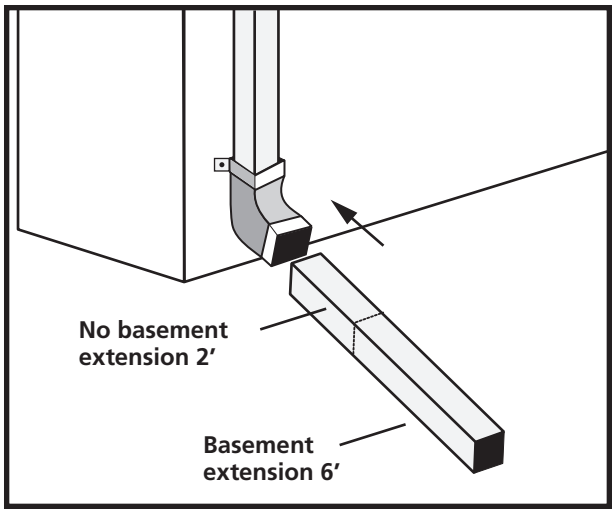
**Step 1:** Mark approximately 12 inches from the ground to the downspout--this height should work for up to a 6-foot extension. Cut the downspout higher for longer extensions.

**Step 2:** Using a hacksaw, cut the downspout at the mark. Remove the cut piece. You may need tin snips to smooth the material.



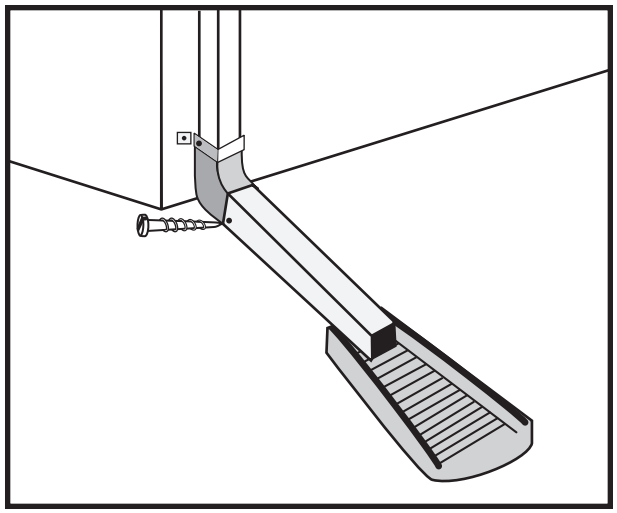
*Step 3*

**Step 3:** Attach the elbow over the downspout. If the elbow does not fit over the downspout, use crimpers or needle-nose pliers to crimp the ends of the cut downspout and slide it inside the elbow. Attach the elbow to the downspout with screws; it might help to pre-drill holes. For additional stability, consider securing the elbow to the building with a bracket.




*Step 4*

**Step 4:** Measure and cut the downspout extension to the desired length. Attach the extension to the elbow by slipping the extension over the end of the elbow.



*Step 5*

**Step 5:** Use screws to attach the extension to the elbow; it might help to pre-drill holes. For additional stability consider resting the extension on a support like a cinder block.

**Step 6:** To prevent erosion, a splash guard followed by a vegetated or rock-lined channel or swale or a perforated pipe can be used to direct water from the end of a down-spout extension to the rain garden or permeable area (see photo of rock swale on page 13). If the downspout outlet is close to (within 5 feet) a building, move the water safely away from the building by lining the swale with an impermeable material, such as a non-woven geotextile, and landscape with rocks to create a dry creek bed look by adding different sized river rocks to the swale.

**Step 7:** Make sure the rain garden or permeable area is appropriately sized for the volume of runoff it will be receiving. Use the Sizing your Rain Garden section (page 10) to determine the size of permeable area you will need.

**Step 8:** If you don’t have enough space or are directing runoff to an existing garden area that is smaller than optimal, make sure you provide a pathway for excess water flows when the rain garden or permeable area fills with water and begins to overflow. Direct these excess flows away from buildings and neighboring properties. If needed, create a rock-lined swale to direct the overflow. Remember to check with your local Building and Safety office if your project will significantly alter drainage on your property.



*A rain garden in bloom.*

The construction of a rain garden may require excavation and redistribution of soil on a property. Any time there is digging, underground utilities are a concern. Before digging, call 811 or go to digalert.org to acquire the location of potential underground utilities—this is a free service.

If you are considering tree removal, contact your city's Community Development Department as a special permit may be required.

# HOW TO DESIGN A RAIN GARDEN

## What is a Rain Garden?

A rain garden is a landscaped shallow depression that captures rainwater and allows it to soak into the ground. A properly functioning rain garden holds water for only 24–48 hours, it is not a pond feature since most of the time the bed of the rain garden is dry. Plants and soil ecology help to naturally filter and break down pollutants in the rainwater as it moves through the soil and root layers. A rain garden is most often planted with locally adapted plant species creating a natural ecosystem where birds, butterflies, and beneficial insects can thrive. Homeowners can maximize both environmental and economic benefits by installing a rain garden in place of turf—the captured rain and native plants reduce the need for irrigation and simplify maintenance since there is no need for mowing or fertilizer.

## Before You Begin

Constructing a rain garden may be inappropriate if you live in a designated landslide area or near steep slopes. Check with your City's Building & Safety office if you are uncertain. Permits are not required for typical residential landscaping projects, however if you plan on making major landscaping modifications such as moving more than 50 cubic yards of soil or altering 1 acre or more, contact your city's Building and Safety office for further assistance and City-specific code requirements.

## Assess Potential Rain Garden Sites

Observe your landscape during a rainstorm and identify how the water is flowing—the goal is to let gravity move the water from high points on your property into your rain garden. Potential rain garden sites are down slope of a downspout, or adjacent to a paved surface such as a roof or patio that will generate runoff for your garden.

**Consider the following when siting a rain garden:**

- Choose a relatively flat area or a naturally low-lying area with good drainage.
- It is possible to construct a rain garden on a gentle slope (see page 6, How to Measure Slope section) by creating a berm on the downslope side with soil excavated from the uphill area of the rain garden.
- Choose an area with soils that have good drainage or amend the soil to improve drainage. Do not site a rain garden in an area that already tends to be soggy.
- Consider removing turf or paving to create space for a rain garden.
- Do not place rain gardens underneath the canopy of existing trees to avoid disturbing or waterlogging the tree roots.



- Do not site rain gardens above septic systems.
- Do not site a rain garden where potential overflow will run onto neighboring properties.

**As a guideline, site the edge of a rain garden:**

- at least 3 feet away from public sidewalks,
- at least 5 feet away from property lines, and
- at least 5 feet away from building foundations, assuring at least a 2% slope away from the home.

## Sizing Your Rain Garden

It is easy to size a rain garden to capture a typical 1 inch rain event. Begin by identifying each impermeable area on your property that will be directed to the rain garden. Note: Multiple roof downspouts can be directed to one rain garden.

**Step 1:** Calculate the total impermeable area (in square feet) from which you plan to capture and direct rainwater runoff into your rain garden. Use the method on page 5 for calculating roof area. A similar method can be used to determine the total area of paved walkways or patio areas, just multiply the length by the width of each section of paved surface area (measured in feet) that will drain to your rain garden. Sum the square footage of all the impermeable areas to arrive at the total square footage that will drain to your rain garden.

**Step 2:** Determine the appropriate depth of pooled water in the rain garden. The first factor to consider when determining the depth of pooled water in a rain garden is the safety of small children. The second factor to consider is how readily your soils percolate water to ensure that the pooled water in your rain garden will drain within 24–48 hours. For the safety of small children, a maximum allowable depth of 6 inches should be utilized. If you have fast-draining sandy soils, you can design your rain garden to pool water up to the maximum allowable depth of 6 inches. Rain gardens with loamy soil can be designed to a depth of 4–5 inches and still readily drain within 24–48 hours. Rain gardens with soils having a significant clay content should be designed to pool only 2–3 inches of water and the soil should also be amended to encourage better drainage (see page 13).

**Step 3:** Once you have established the total runoff area (Step 1) and the appropriate pooling depth (Step 2), the size of your rain garden is easy to calculate. The chart below shows how the size of a rain garden varies with impermeable runoff area and pooling depth. Using the equation at the bottom of the chart, you can calculate a customized rain garden area. If you have insufficient space for a rain garden of the calculated size, a smaller rain garden can be installed as long as an overflow is provided for the water as per Step 5 on page 13.

**RAIN GARDEN SIZE IN SQUARE FEET (SF) FOR 1 INCH RAINFALL BASED ON POOLING DEPTH AND IMPERMEABLE RUNOFF AREA**

| Predominant Soil Type | Pooling Depth | 500 SF Runoff area | 750 SF Runoff area | 1,000 SF Runoff area |
|---|---|---|---|---|
| Sandy soils | 6 inches (max) | 80 SF | 120 SF | 160 SF |
| Loam | 5 inches | 96 SF | 144 SF | 192 SF |
| | 4 inches | 120 SF | 180 SF | 240 SF |
| Clay soils | 3 inches | 160 SF | 240 SF | 320 SF |
| | 2 inches | 240 SF | 360 SF | 480 SF |

Rain garden size (SF) = 0.96 x impermeable runoff area (SF)/pooling depth (inches)

## Choose Your Plant Palette

A variety of plants can be used in a rain garden to create a design that fits with the site and your taste. Consider California native and drought tolerant species that adjust well to seasonal rainfall patterns and require minimal supplemental irrigation. Plants located on the base and sloped sides of the rain garden will need to be selected from species that can withstand inundation, such as rushes and sedges. Plants on berms and along the perimeter will receive less water and should be selected accordingly.

There are several good resources available for the selection of rain garden plants native to Southern California in the Where to Go For More Information section (page 19) at the end of this guide. Native plant nursery professionals or garden clubs can also provide assistance.

Avoid using invasive plant species in your rain garden. Lists of invasive species can be found at the California Invasive Plant Council, Southern California region website: cal-ipc.org.

To help protect property from wildfires, owners of property in wildland areas should follow recommendations for landscaping and regular maintenance, including brush clearance guidelines. (See Additional Resources at the end of this guide.) All plants will burn, although when managed appropriately some have lower fuel value than others.

## Plants for Southern California

A few of the many California native plants available to you are described below.



California Lilac / *Ceanothus thyrsiflorus*. Shrub. Fragrant with bright blue flowers. Likes semi-dry soil, grows to be 6–8′ tall. Attracts hummingbirds.



California Poppy / *Eschscholzia californica*. Annual wildflower. Likes full sun and dry to semi-dry soils. Thrives everywhere with brilliant orange flowers. Attracts butterflies and birds.



Miniature Lupine / *Lupinus bicolor*. Shrub. Likes full sun and can tolerate a variety of soils. Produces purple flowers and attracts butterflies and birds. Dormant in summer.



Climbing Penstemon / *Keckiella cordifolia*. Shrub. Likes full or partial shade and many soil types. Produces red flowers and attracts butterflies.



Narrowleaf Milkweed or Mexican Whorled Milkweed / *asclepias fascicularis*. Winter deciduous perennial herb. Likes sun and tolerates a variety of soils and moisture. Lavender flowers followed by milkweed pods. This species of milkweed is among the most important host plant for Monarch butterflies in California.



Bristly Matilija Poppy / *Romneya trichocalyx*. Perennial Herb. Likes full sun and prefers sandy or gravelly soil with drainage. Large white flower that attracts moths. Summer deciduous. Needs to be planted in winter.



Pigeon Point Dwarf Coyote Bush / *Baccharis pilularis.* "Pigeon Point" Shrub. Likes full sun and dry soils. Hardy and fast growing. Attracts birds and butterflies.



Elegant Clarkia / *clarkia unguiculata*. Wildflower. Likes sun and dry to semi-dry soils. Easy to grow and long-lasting showy flowers in pink, red or purple. Attracts hummingbirds and butterflies.



Purple Needle Grass / *Stipa pulchra*. Grass. Likes sun to partial sun and semi-dry soils. Hardy and showy with purple seed heads. Attracts songbirds.



Rose or Blue Sage / *Salvia pachyphylla*. Shrub. Likes sun to partial sun and dry soil. Compact and scented with rose and blue colored flowers. Attracts hummingbirds, songbirds, butterflies, bees and lizards.



Sticky Monkey Flower or Bush Monkey Flower / *Mimulus aurantiacus*. Shrub. Likes partial shade to full sun and tolerant of difficult soils. Has orange flowers that attract butterflies and birds.



White Sage / *Salvia apiana*. Shrub. Likes sun to partial sun and dry soils. Flower stalks are long and arching with white flowers. Attracts butterflies, bees, birds, lizards and nectar-loving insects.



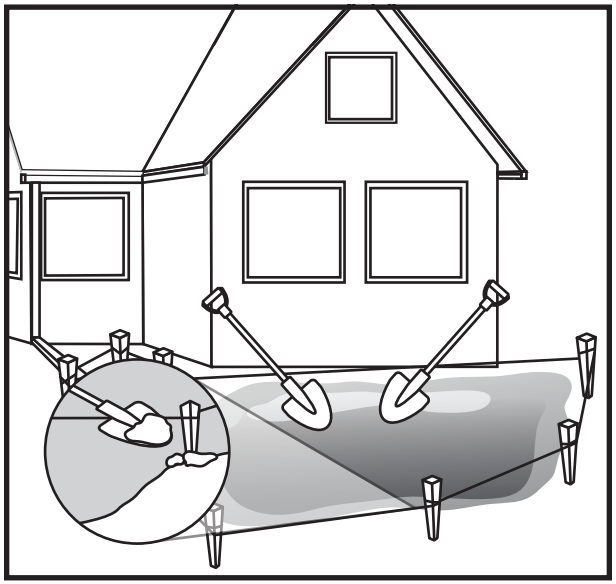
Yerba Mansa / *Anemopsis californica*/ Perennial herb. Likes partial shade to full sun and will tolerate any soil as long as it is moist, so appropriate for the base of a rain garden that is consistently damp. Forms a carpet/ groundcover with beautiful white flowers in spring. Goes dormant from late summer to early winter.

# HOW TO BUILD A RAIN GARDEN

The following outlines the steps in building a rain garden:

**Step 1:** Outline the rain garden area with string and stakes. Choose a shape complementary to the design of your yard.

**Step 2:** If the soil is too hard to dig, moisten it with a garden hose. Allow the water to seep in overnight. Dig up existing grass and plants. Set aside any native plants that can be used in the garden.



*Steps 1–3*

**Step 3:** Soil should be tilled to a depth of 18 inches and amended if necessary, as described in Step 4. The rain garden should have sloped sides of about 20% and a pooling depth no more than 6 inches deep. To minimize the risk of erosion, consider lining the side slopes with stones or plant vegetation. If the rain garden is on a slight slope, add a berm on the downhill slope to hold in rainwater. The berm helps trap water giving it time to percolate into the soil.

**Step 4:** Determine whether to use existing soil or to amend the soil. Amended soil can help your garden absorb runoff at a faster rate, which means a rain garden with amended soil can be smaller than one with clay soil and still receive the same amount of water. Amend the soil, if necessary, by removing approximately 18 inches of existing soil and filling the excavation area with approximately 12 inches of amended soil mix which can either be purchased pre-mixed or you can mix it yourself. The soil composition should be 50% sand, 25% topsoil, and 25% compost (2:1:1 ratio of sand, topsoil, and compost respectively).

**Step 5:** Construct an overflow or bypass so rain from large storms that exceeds the capacity of the rain garden is directed away from the home's foundation or neighboring property to the street or storm drain system. This can be done using a swale or dry creek bed designed into the landscape. Be sure to reinforce any overflow spillway with rocks on the downslope to prevent erosion.



*A swale directs water from the downspout to the rain garden. Many swales use rocks for a dry creek bed look.*



*Step 6*

**Step 6:** Plant the rain garden. Use a variety of species. Mulch well immediately after planting with several inches of mulch to prevent weeds and hold in moisture making sure not to bury small plants. Use heavy organic mulch that won't float away easily, such as shredded wood or coarse wood chips 1 to 2 inches across.

**Step 7:** Irrigate deeply once a week during dry months for the first year following planting to encourage root growth and keep plants strong. After the first year, decrease frequency of irrigation over time. Native and drought tolerant plants should need little to no water after the first couple of years, but a little extra water will keep them looking good during the dry season.

**Step 8:** Make sure your rain garden is functioning properly. After a rain, the garden bed should fully drain within 72 hours to avoid breeding mosquitoes. If the rain garden has problems with standing water, consider further amending the soil or increasing the rain garden size so it can better accommodate the rain water.

The University of California, Division of Agriculture and Natural Resources ANR Publication 8531 Coastal California Rain Gardens provides more detailed guidance on rain garden construction. Please see the Where to Go For More Information section (page 19) for a link to the website where you can download this publication.



*Southern California Rain Garden*

# HOW TO REDIRECT A DOWNSPOUT TO A RAIN BARREL



### What is a Rain Barrel?

Rain barrels capture rainwater from roofs and store it for use in watering potted plants, gardens, trees and landscaped areas. Rainwater is "soft" water low in minerals and salts and can be used to flush accumulated salts from potted plants. Rain barrels are typically made of heavy-duty plastic and range in size from the standard 55 gallons to more than 80 gallons. Eco-friendly rain barrels assembled from recycled food barrels or manufactured from recycled plastics are also available to consumers.

**Consider the following when choosing a rain barrel:**

- Fine mesh screens should be included at all openings to keep debris and mosquitoes out.
- A hose bib or spigot should be located at the bottom of the rain barrel.
- An overflow hose bib or spigot should be provided at the top of the rain barrel for directing excess flows.
- Rain barrel should not allow UV light penetration in order to prevent algae growth.
- Rain barrel should be made of heavy-duty molded plastic with sidewalls a minimum of 3/16 inch thick.
- Rain barrel should be no more than 5 feet in height, with height not more than 1.5 x width.
- All connections and openings, including hose bib or spigots, must be sealed, plugged, or screened using a double layer of fine mesh screen (1/16th inch) to prevent mosquitoes from entering.
- Top should be smooth without depressions to collect water or depressions should be filled in with sand after installation.
- Rain barrels must be clearly labeled "Not for Drinking or Storage."

Information on where to purchase a rain barrel and rain barrel pricing can be found by visiting the South Bay Rainwater Harvesting Program website. A webpage link is provided in the Where to Go For More Information section (page 19) at the end of this guide.

The rain barrel can be used to fill a watering can or connect to a garden hose or soaker hose. Water pressure at the rain barrel spigot will depend on the level of the water in the rain barrel. The higher the water level, the greater the amount of pressure. You can also improve flow through a hose attached at the rain barrel spigot by elevating the barrel. Collected water should be used promptly, and the barrel should be drained between rain events.

## Before You Begin

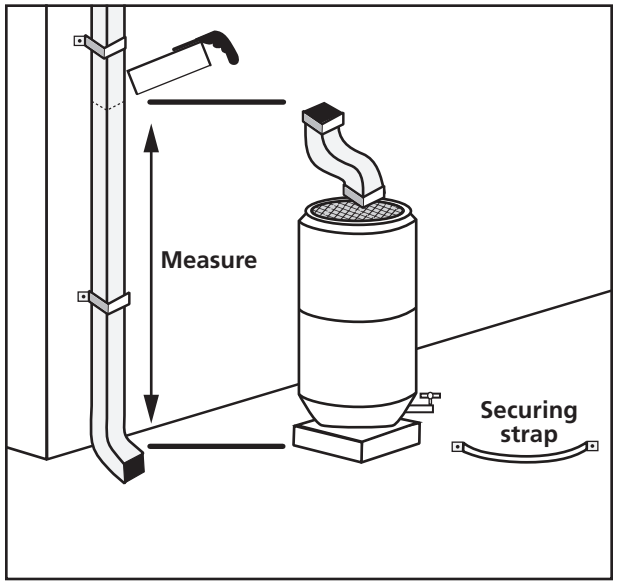
Make a list and assemble the tools and materials needed. The installation of a rain barrel requires materials for the downspout disconnection, and materials to build a platform to elevate the barrel and keep it stable, such as wood or cinder blocks. Homeowners may also need an additional strap to secure the barrel to the building. Be sure to wear safety glasses.

## Redirection Procedure

Redirecting a downspout to a rain barrel is a relatively simple procedure.

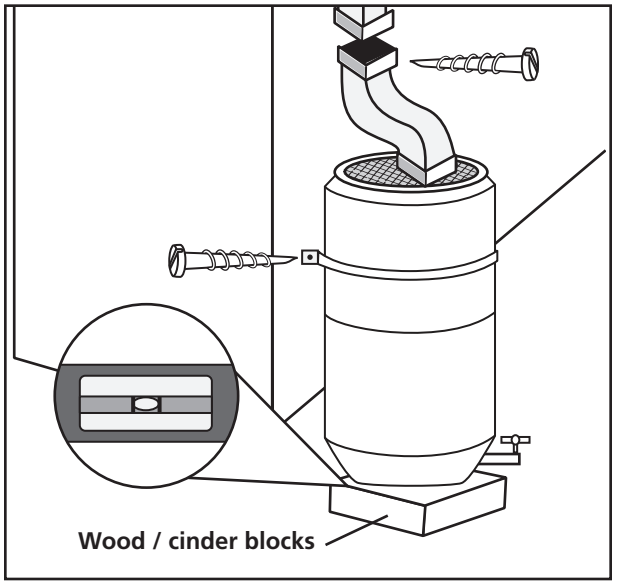
**Step 1:** Use the method in Estimate Roof Area to be Disconnected and Runoff Volume to be Managed section (page 5) to estimate capture volume. Consider whether to install one or multiple rain barrels. Note: During a 1 inch rain event, it only takes an approximate roof area of 90 square feet to fill a 55 gallon rain barrel. There are various methods for connecting two or more rain barrels either in parallel or in series to capture additional runoff from a single downspout. Check with the manufacturer or distributer of your rain barrel on how to do this.

**Step 2:** Decide where to locate your rain barrel, either directly under or a few feet from the downspout. During a heavy rain, overflow from the rain barrel should be directed away from the house, either to an area where it can percolate into the ground or enter the storm drain system. The rain barrel should be accessible for cleaning and should not block entrances and exits to and from the building or property. By attaching a hose to the spigot, you can easily convey water from the barrel to another area of the yard.




*Steps 2–4*

**Step 3:** Estimate how high the barrel will rest under the downspout, including the height of the cinder blocks or platform. The downspout should not connect directly to the rain barrel container but must allow for a minimum 3 inch air gap above the screened intake opening. Mark where the downspout will be cut to accommodate the air gap, and attach an elbow as shown in the figures.




*Steps 5–7*

**Step 4:** Cut the downspout with a hacksaw. You may need tin snips to smooth the material.

**Step 5:** Assemble the rain barrel platform. Make sure it is level.

**Step 6:** Attach the elbow over the downspout with a screw. Secure the downspout to the house with the bracket.

**Step 7:** Place the barrel beneath the elbow and secure the barrel to the house with a strap.

# OTHER RAINWATER HARVESTING OPTIONS







*Pavers with sand (top), grass (center), and gravel (bottom).*

In addition to rain barrels and rain gardens, other types of rainwater harvesting features can be installed at a residential property. Advanced rainwater harvesting applications and drainage management technologies include: installation of dry wells, French drains, subsurface infiltration trenches, cisterns and replacement of paved surfaces with permeable paving.

Regardless of which feature you choose, the goal of any rainwater harvesting strategy is to capture rainwater before it reaches the storm drains and percolate it into the ground or store it in a holding tank for beneficial use in your garden.

Rain gardens are one type of percolation basin. There are several additional percolation basin designs that can accommodate existing contours and vegetation on your property. For instance, depressions extending beyond the canopy of a tree can be created to catch and percolate runoff increasing the amount of water the tree receives over the course of a year. Terraced infiltration basins can be formed on sloped properties. Contouring a slope with berms or terraces slows the flow of water down the slope allowing it to percolate into the soil where plant roots can access it.

Impermeable walkways and driveways can be modified with gravel breaks or replaced with permeable pavings such as pavers. Installation of permeable paving in areas that will receive vehicle loads requires professional installation following the specification in the County of Los Angeles Department of Public Works Low Impact Development Standards Manual (February 2014). You should also consult your local Building & Safety office to determine whether a building permit is required for installing permeable paving.

Pavers are brick-like materials that are manufactured in a variety of shapes that fit together like tiles and are set in sand with small gaps between them creating grooves for water to percolate into the soil below. Pavers can be placed in a variety of attractive patterns and can even allow grass to grow up through the gaps between them. Paved walkways can also be removed and replaced with gravel or mulch. Other materials such as broken pieces of recycled concrete with gravel or mulch in between can also be used for paving.

Visit local demonstration gardens, take a workshop, and explore the references provided in the Where to Go For More Information section (page 19) of this guide to gather other ideas for rainwater harvesting projects.



# RAINWATER HARVESTING SYSTEM MAINTENANCE

### Rain Gutters

- Clean gutters at least twice a year, and more often if you have overhanging trees.
- Make sure gutters are pitched to direct water to downspouts.
- Repair leaks and holes.
- Look for low spots or sagging areas along the gutter line, and repair with spikes or place new hangers as needed.

### Downspouts

- Check and clear elbows or bends in downspouts to prevent clogging.
- Each elbow or section of the downspout should funnel water into the one below it. All parts should be securely fastened together with sheet metal screws.

### Rain Barrels

- Make sure all parts are securely fastened together and the rain barrel is securely fastened to the building.
- Remove any accumulated sediment or debris from the rain barrel and check for leaks at least once per year.
- Check and clear rain barrel screen and overflow mechanism to prevent clogging.
- Repair any leaks or holes.
- Make sure the rain barrel screens remain secure to prevent mosquito entry; replace damaged or worn screens.
- If necessary, scrub out the inside of the barrel with a scrub pad and warm, soapy water to remove mosquito eggs that may have attached to the inside walls.
- Inspect overflow area to ensure water will continue to drain away from structures.

### Rain Gardens (or other landscaping)

- Periodically remove weeds and add mulch over bare spaces as it naturally breaks down and is incorporated into the soil.
- Inspect your garden after a heavy rain. Remove excessive accumulated sediment and debris, watch for erosion and reinforce with rocks if necessary.
- If ponding occurs for more than 72 hours, use mosquito dunks to kill mosquito larvae. These are safe and non-toxic to humans and pets and readily available at garden centers.
- Replace plants as needed. If a plant doesn't survive, try a different type of plant in that location.
- Dense shrub growth is desirable; generally pruning isn't necessary except for aesthetics.

If pests become a problem, before resorting to the use of pesticides to control pests, use less toxic alternative integrated pest management (IPM) techniques. For details, visit the South Bay Environmentally Friendly Landscaping, Gardening, and Pest Control at: southbaycities.org/programs/environmentally-friendly-landscaping-gardening-and-pest-control.



# WHERE TO GO FOR MORE INFORMATION

Help can be acquired from a variety of sources.

To get started, visit the **South Bay Rainwater Harvesting** webpage by visiting the link southbaycities.org/programs/environmentally-friendly-landscaping-gardening-and-pest-control/rainwater-harvesting.

## Additional Resources

1. California Botanic Garden has a Grow Native Nursery offering native plant workshops and seasonal events as well as retail sale of California native plants; visit their website at calbg.org.
2. California Native Plant Society at cnps.org and their web tool at calscape.org for determining locally adapted plants for your garden
3. Metropolitan Water District's portal for water-wise garden inspiration at bewaterwise.com
4. Surfrider Foundation Ocean Friendly Gardens Program at surfrider.org/programs/ocean-friendly-gardens.
5. Southern California Chapter of the Native Plant Society: sccnps.org
6. TreePeople DIY: Your Climate Ready Home: treepeople.org/diy
7. Theodore Payne Foundation for Wildflowers & Native Plants: TheodorePayne.org
8. SAFE Landscapes: Southern California Guidebook—Sustainable and Fire-Safe Landscapes in the Wildland Urban Interface: ucanr.edu/sites/safelandscapes/
9. University of California, Division of Agriculture and Natural Resources ucanr.edu/sites/RainGardens/ also see their publication anrcatalog.ucanr.edu/pdf/8531.pdf, which is available free to download
10. California Invasive Plant Council Responsible Landscaping Website: cal-ipc.org/solutions/prevention/landscaping/
11. The Bay Foundation Rainwater Harvesting and Rain Gardens Page: santamonicabay.org/explore/our-communities/rainwater-harvesting-rain-gardens/
12. University of California Cooperative Extension's Water Use Classification of Landscape Species Guide IV (2014), which is available for free download at ucanr.edu/sites/WUCOLS/

## Local Botanic Gardens

1. Manhattan Beach Botanical Garden
   1237 N Peck Avenue
   Manhattan Beach, CA 90266
   ManhattanBeachBotanicalGarden.org
2. South Coast Botanic Garden
   26300 Crenshaw Blvd.
   Palos Verdes Peninsula, CA 90274
   SouthCoastBotanicGarden.org



# GLOSSARY OF TERMS

- **Berm** – A mound of earth constructed perpendicular to a slope used to temporarily retain water allowing time for it to percolate into the ground.
- **Cistern** – A reservoir or tank for holding water; as used in this document, a tank for storing rainwater that is substantially larger than a rain barrel.
- **Dry Well** – A gravity-fed, excavated pit lined with perforated casing and backfilled with gravel or stone. Dry wells not only aid in stormwater runoff reduction, but can increase groundwater recharge and have minimal space requirements.
- **Downspout** – Pipe that directs stormwater runoff from the roof of a house to the ground.
- **French Drain** – A type of drain consisting of an excavated trench refilled with pervious material, such as coarse sand, gravel or crushed stone, through which water percolates and flows to an outlet.
- **Geotextile** – Fabric-like products made of natural or synthetic materials, or a combination of the two, used to cover the soil surface to reduce erosion from rainfall impact, hold soil in place, and absorb and hold moisture near the soil surface. Depending on application, the geotextile selected may be impermeable or permeable to water.
- **Impermeable** – Not allowing water to penetrate. Examples of impermeable surfaces include paved driveways, walkways, or roofs.
- **Integrated Pest Management (IPM)** – An ecosystem-based strategy for controlling pests that focuses on prevention and control of pests through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant plant varieties, while minimizing risks to people and the environment.
- **Percolate** – Filter gradually through a porous surface or substance, e.g., soil.
- **Permeable** – Allowing water to penetrate. Examples of permeable surfaces include flower beds and rain gardens.
- **Rain Barrel** – A container for capturing rainwater from roofs and storing it for use in watering gardens, trees and landscaped areas. Rain barrels are typically made of heavy-duty plastic and range in size from the standard 55 gallons to more than 80 gallons.
- **Rain Garden** – A planted depression that allows rainwater runoff from impermeable urban areas like roofs, driveways, walkways and compacted lawn areas to be absorbed into the earth.
- **Rain Gutter** – Intercepts and redirects stormwater runoff from the roof to a downspout.
- **Runoff** – Water that does not soak into the ground and flows over impermeable areas or areas already saturated with water.
- **Swale** – A shallow ditch, usually lined with river cobble or vegetation to prevent erosion, which conveys runoff to a certain location, such as a rain garden.

# PHOTO CREDITS

**Pages 1 & 22 (Covers), Rain on poppies**
MaYcaL/iStock via Getty Images

**Page 3, California Golden Poppies**
Nicholas Motto/iStock via Getty Images

**Page 4, Storm drain with rainwater**
ziggy1/iStock via Getty Images Plus

**Page 9, Rain garden in bloom**
© 2009 Central Ohio Rain Garden Initiative

**Page 11, Plants for Southern California**

- California Lilac / *Ceanothus thyrsiflorus.*
  Rott70/iStock via Getty Images
- California Poppy / *Eschscholzia californica.*
  joel-t/iStock via Getty Images
- Miniature Lupine / *Lupinus bicolor.*
  Marinamis/iStock via Getty Images
- Climbing Penstemon / *Keckiella cordifolia.*
  LagunaticPhoto/iStock via Getty Images
- Narrowleaf Milkweed or Mexican Whorled Milkweed / *asclepias fascicularis.*
  LagunaticPhoto/iStock via Getty Images
- Bristly Matilija Poppy / *Romneya trichocalyx.*
  Andrei Stanescu/iStock via Getty Images
- Pigeon Point Dwarf Coyote Bush / *Baccharis pilularis*.
  Andrei Stanescu/iStock via Getty Images
- Elegant Clarkia / *clarkia unguiculate.*
  Andrei Stanescu/iStock via Getty Images

**Page 12, Plants for Southern California**

- Purple Needle Grass / *Stipa pulchra.*
  tlindsayg/Shutterstock
- Rose or Blue Sage / *Salvia pachyphylla.*
  © 2009 Ken Gillard
- Sticky Monkey Flower or Bush Monkey Flower / *Mimulus aurantiacus.*
  Hlsnow/iStock via Getty Images
- White Sage / *Salvia apiana.*
  Photographer unknown.
  Use licensed under CC BY-NC.
- Yerba Mansa / *Anemopsis californica*.
  Andrei Stanescu/iStock via Getty Images
- Garden featuring the California Lilac
  Krzysztof Dac/iStock via Getty Images Plus

**Page 13, Swale**
wuttichok/iStock via Getty Images

**Page 14, Garden After a Rain**
ANGHI/iStock via Getty Images Plus

**Page 15, Install Rain Barrel**
The Bay Foundation

**Page 17, Pavers**

- Pavers in sand.
  JPLDesigns/iStock via Getty Images
- Pavers in grass.
  Martina Sliger/iStock via Getty Images
- Pavers in gravel.
  worawut17/iStock via Getty Images

**Page 18, Rainwater with leaves**
The Bay Foundation

# South BAY

## A Homeowner's Guide to Rainwater Harvesting

