

LANDSCAPE DESIGNS FOR STORMWATER MANAGEMENT

Stormwater Control for Small Projects



Bay Area Stormwater
Management Agencies
Association



Dry creek infiltrates and conveys runoff.

Designing landscaped areas to soak up rainfall runoff from building roofs and paved areas helps protect water quality in local creeks and waterways. These landscape designs reduce polluted runoff and help prevent creek erosion.

As the runoff flows over vegetation and soil in the landscaped area, the water percolates into the ground and pollutants are filtered out or broken down by the soil and plants.

This fact sheet shows how you can design your landscape to absorb runoff from impervious surfaces, such as roofs, patios, driveways, and sidewalks, with landscape designs that can be very attractive.

If you are interested in capturing and storing water for irrigation use, see the Rain Barrel fact sheet in this series.

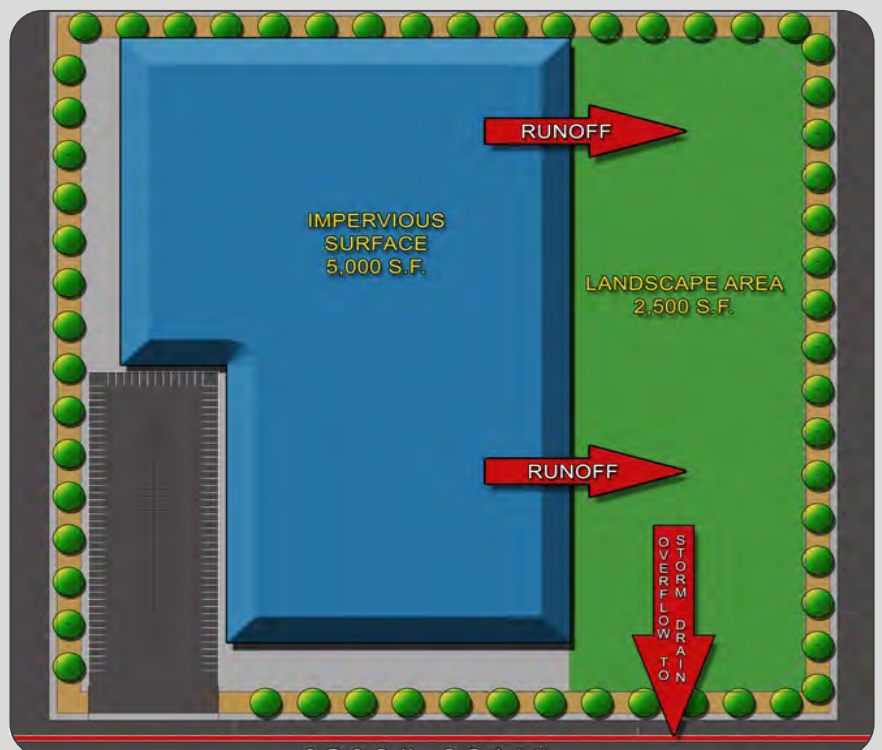
Can My Project Manage Stormwater in the Landscape?

Directing stormwater runoff to the landscape is suitable for sites with the following conditions:

- Roofs, driveways, parking areas, patios, and walkways that can drain to an existing landscape, or an area that may be converted to landscape.
- Areas of landscape with a slope of 5% or less are preferred; check with the municipality regarding requirements for steeper sites.
- Works best in well-drained soil; soil amendments may be used in areas with poor drainage.
- Landscaped areas that total at least 1/2 the size of the impervious area draining to it.
- Direct runoff away from building foundations.
- Runoff should not create ponding around trees and plants that won't tolerate wet conditions.

How Do I Size My Landscape?

The landscaped area should be 50% of the size of the contributing impervious surface. For example (see below), to manage runoff from a 5,000 square foot roof or paved surface, you should have 2,500 square feet of landscaping.



Techniques to Manage Stormwater in Landscaping

Direct Roof Runoff to Landscape

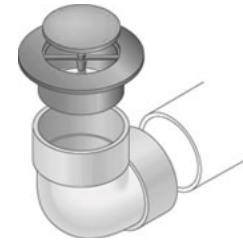
- Use additional piping to connect the downspout to the landscape if needed.
- Direct runoff away from building foundation.
- Prevent erosion by installing:
 - Splash blocks,
 - Rain chains,
 - Gravel area under a gutterless roof,
 - Pop-up drainage emitter connected to a pipe that carries runoff away from the foundation, or
 - Other energy dissipation technique.



Splash block



Gravel area under a gutterless roof

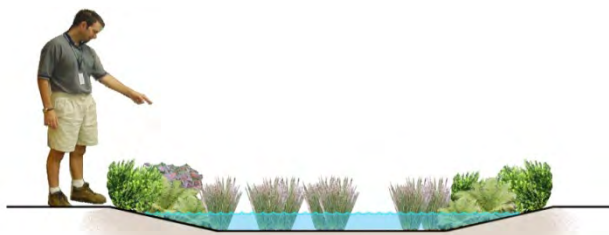


Pop-up emitter



Rain chain

Swales or Dry Creeks



Cross section

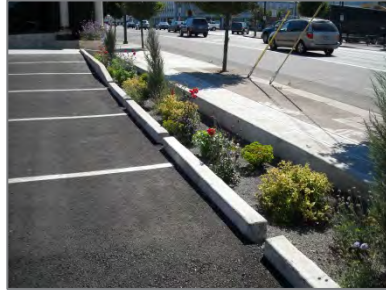
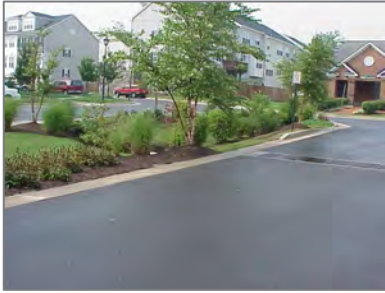


Swales and dry creeks are narrow, linear depressions designed to capture and convey water. Swales imitate a natural creek's ability to slow, infiltrate, and filter stormwater. To install a swale follow these steps:

- Excavate a narrow linear depression that slopes down to provide a flow path for runoff. The path length (10 to 15 feet or more) should meander to slow water and prevent erosion.
- Use plants from creek and river ecosystems to help reduce erosion and increase evaporation of runoff.
- The end of the swale requires an outlet for high flows (another landscaped area or a yard drain). Talk to municipal staff to identify an appropriate discharge location.
- Contact municipal staff for a local list of plants suitable for swales.

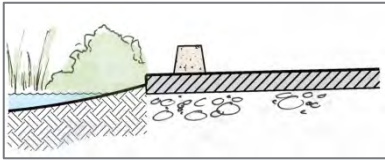
Techniques to Manage Stormwater in Landscaping

Direct Parking Lot Runoff to Landscape

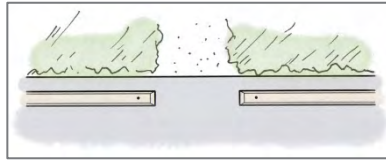


During storms, parking lots generate large amounts of runoff, which picks up oils, grease, and metals from vehicles. Landscaped areas can be designed to absorb and filter this runoff.

- Landscaped areas must be below the paved elevation. Allow an elevation change of 4 to 6 inches between the pavement and the soil, so that vegetation or mulch build-up does not block the flow.
- Grade the paved area to direct runoff towards the landscaping.
- If possible, provide a long path for runoff to infiltrate (while meeting the landscaped area sizing on page 1).
- Provide multiple access points for runoff to enter the landscape. Install curb cuts or separate wheel stops for the water to flow through. Provide cobbles or other permanent erosion control at points of concentrated flow.



Cross section

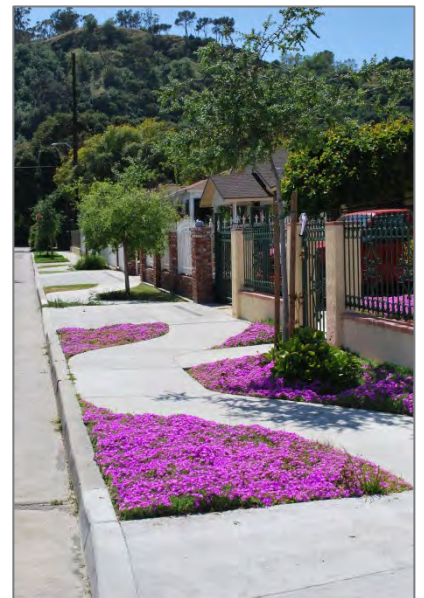


View from above

Manage Runoff from Driveways/Small Paved Areas

Driveways, sidewalks, patios, walkways, and other small paved areas can offer creative opportunities to drain runoff to landscaping.

- Install landscape adjacent to the paved surface, and grade the paved area so runoff flows toward the landscaping.
- Landscaped areas must be below the paved elevation. Allow an elevation change of 4 to 6 inches between the pavement and the soil, so that vegetation or mulch build-up does not block the flow.
- Install cobbles or rocks where runoff enters the landscape to avoid erosion.
- Use sizing ratio described on page 1.
- Use drought-tolerant native or climate-adapted plants to reduce irrigation.



Design Checklist

- ❑ Maximize the use of landscaping and natural areas that already exist. Try to design new landscapes immediately adjacent to impervious surfaces.
- ❑ Water should flow evenly (without concentrating runoff into small streams) from the impervious surface to the landscape; this will maximize the filtration and settling of sediment and pollutants and prevent erosion. The design should avoid allowing straight channels and streams to form.
- ❑ Amend soils to improve drainage, when necessary.
- ❑ If the project is located next to standard asphalt or concrete pavement, and there is concern about water undermining the pavement, include a water barrier in the design.
- ❑ Use curb cuts to create places where water can flow through to the landscape.
- ❑ Disconnect roof downspouts and redirect flow to adjacent landscapes. Disconnected downspout systems should incorporate a splash block to slow the runoff flow rate; a landscape flow path length of 10 to 15 feet is recommended.
- ❑ Use drought-tolerant native or climate-adapted plant species whenever possible. Avoid invasive or pest species. A list of invasive species may be found at the California Invasive Plant Council website (www.cal-ipc.org). Contact municipal staff for a list of plants suitable for stormwater management areas.
- ❑ Design the landscape area so that overflow from large storms discharges to another landscaped area or the storm drain system to prevent flooding.

Maintain Your Landscape

The following practices will help maintain your landscape to keep it attractive and managing stormwater runoff effectively.

- ❑ During dry months, irrigate during the first year to encourage root growth and establish the plants. In subsequent years, irrigate as needed by the plant species to maintain plant health.
- ❑ Repair signs of erosion immediately and prevent further erosion by reinforcing the surrounding area with ground cover or using rocks for energy dissipation.
- ❑ If standing water remains in the landscaped area for more than 4 days, use soil amendments to improve infiltration.
- ❑ Inspect the locations where water flows into a landscaped area from adjacent pavement to ensure that there is positive flow into the landscape, and vegetation or debris does not block the entrance point.



The City of Los Angeles and Geosyntec Consultants are acknowledged for providing text, formatting and various images used in this fact sheet. The Sonoma Valley Groundwater Management Program, San Mateo Countywide Water Pollution Prevention Program, City of San Jose, Sacramento Stormwater Quality Partnership, and the Purissima Hills Water District are acknowledged for images used in the fact sheet.

PERVIOUS PAVEMENT

Stormwater Control for Small Projects



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Permeable Interlocking Concrete
Pavers

Pervious pavement, also referred to as permeable pavement, contains pores or separation joints that allow water to flow through and seep into a base material (typically gravel or drain rock). Types of pervious pavement include porous asphalt and concrete, open joint pavers, interlocking concrete or permeable pavers, and plastic or concrete grid systems with gravel-filled voids.

Pervious pavement systems allow infiltration of stormwater into soils, thereby reducing runoff and the amount of pollutants that enter creeks, San Francisco Bay, the Pacific Ocean, and other water bodies. This improves water quality, helps reduce creek erosion, and can facilitate groundwater recharge. Pervious pavement is available in many different types that offer environmentally-friendly and aesthetically pleasing options for driveways, walkways, parking areas, and patios.

Is Pervious Pavement Feasible for My Project?

Pervious pavement is appropriate in locations with the following characteristics:

- The location is flat or nearly flat (a maximum 2% slope).
- The location is not in a seasonally wet area.
- The location is not close to a building foundation, unless measures are taken to prevent infiltration under the structure. (See Design Checklist.)



Typical Materials and Example Applications

Pervious Concrete

Optional geotextile on bottom and sides of open-graded base

Pervious Concrete
Typ. 5 to 8 in. (125 to 200 mm) thick

No. 57 stone subbase – thickness varies with design

Soil subgrade

Turf Block

Topsoil

Grass

Concrete grid

1/2 in. to 1 in. (13 to 25 mm) bedding sand

Edge restraint

Existing compacted soil sub-grade

Geotextile (as required)

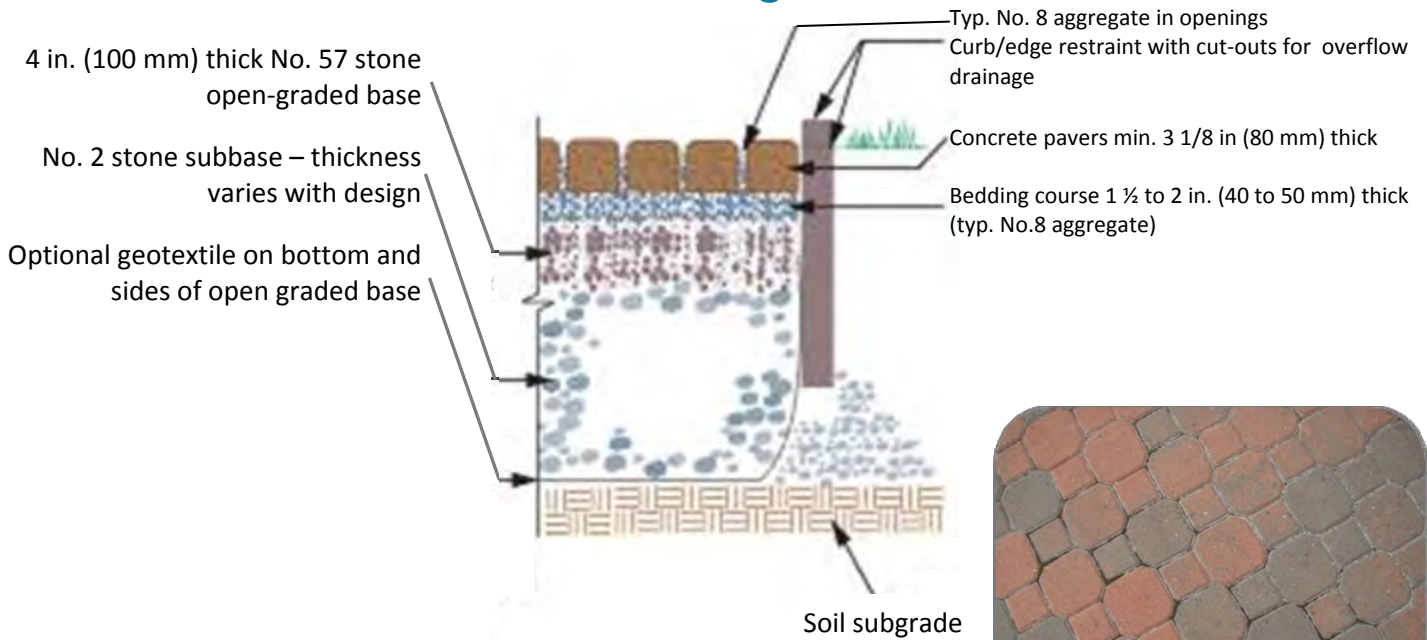
Compacted aggregate base

Base extends 12 in. (300 mm) beyond grid perimeter

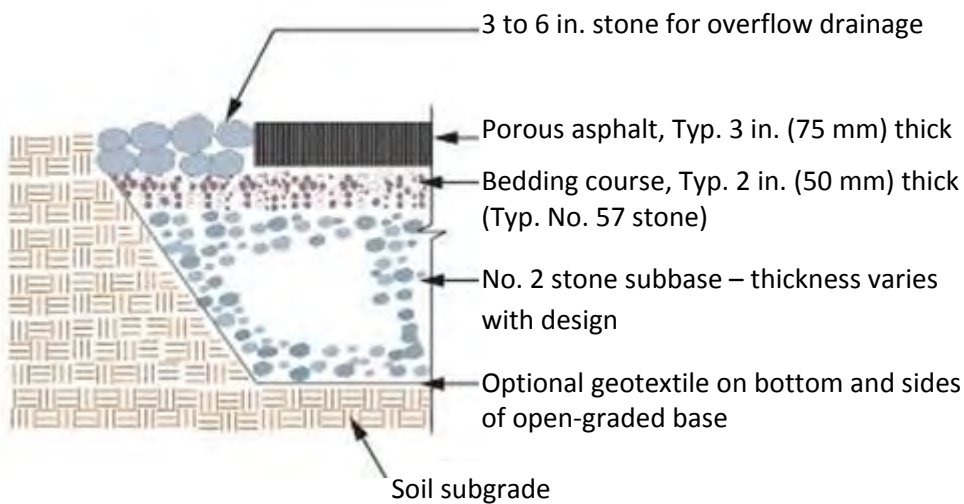


Typical Materials and Example Applications

Permeable Interlocking Concrete Pavers



Porous Asphalt



Design Checklist

When installing pervious pavement, the following design criteria should be considered.

- ❑ An open-graded base of crushed stone, which has 35 to 45 percent pore space, is installed below the surface pavement. The recommended base thickness is 6 inches for pedestrian use and 10 inches for driveways to provide adequate structural strength.
- ❑ Slope is flat or nearly flat (not greater than 2 percent).
- ❑ Flow directed to pervious pavement is dispersed so as not to be concentrated at a small area of pavement.
- ❑ No erodible areas drain onto the pavement.
- ❑ The subgrade is uniform and compaction is the minimum required for structural stability.
- ❑ If a subdrain is provided, its outlet elevation is a minimum of 3 inches above the bottom of the base course.
- ❑ A rigid edge is provided to retain granular pavements and unit pavers.
- ❑ If paving is close to a building, a barrier or impermeable liner may be required to keep water away from the building foundation.
- ❑ Pavers have a minimum thickness of 80 mm (3 1/8 inches) and are set in sand or gravel with minimum 3/8-inch gaps between pavers.
- ❑ Proprietary products must be installed per the manufacturer's specifications.
- ❑ The project complies with applicable sections of the current municipal code, including disabled access requirements and site drainage requirements, if applicable.

Maintenance Considerations

Once pervious pavement is installed, the following maintenance criteria should be followed:

- ❑ The use of leaf blowers on permeable pavement can force dirt and debris into pavement void spaces. Avoid blowing leaves, grass trimmings and other debris across permeable pavement.
- ❑ Remove weeds from pavement and replace missing sand or gravel between pavers as needed.
- ❑ Inspect subdrain outlets (if applicable) yearly to verify they are not blocked.
- ❑ Inspect pavement after rains for ponding or other visible problems. If there are problems with standing water, vacuum sweeping with specialized equipment may be required. Concrete grid pavers do not require sweeping.



Open Joint Pavers

The City of Los Angeles and Geosyntec Consultants are acknowledged for providing text, formatting and various images used in this fact sheet. The Interlocking Concrete Pavement Institute is acknowledged for contributing pavement sections, design details and specifications. The San Mateo Countywide Water Pollution Prevention Program, Santa Clara Valley Urban Runoff Pollution Prevention Program, and City of San Jose are acknowledged for images used in the fact sheet.

RAIN BARRELS AND CISTERNS

Stormwater Control for Small Projects



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Daisy chained system of 205-gallon rain barrels
Courtesy of The City of Oakland

Rain barrels and cisterns can be installed to capture stormwater runoff from rooftops and store it for later use. They are low-cost systems that will allow you to supplement your water supply with a sustainable source and help preserve local watersheds by detaining rainfall.

Collected rainwater may be used for landscape irrigation. Subject to permitting requirements, harvested rainwater may be allowed for toilet flushing; contact municipal staff for more information. Capturing even a small amount of your roof runoff will have environmental benefits because it will reduce the quantity and speed of stormwater runoff flowing to local creeks.

Rain barrels typically store between 50 and 200 gallons. They require very little space and can be connected or "daisy chained" to increase total storage capacity.

Cisterns are larger storage containers that can store 200 to over 10,000 gallons. These come in many shapes, sizes, and materials, and can be installed underground to save space.

How Much Storage is Recommended?

The number of rain barrels recommended to capture runoff from a given roof (or other impervious area) is shown in the following table.

Are Rain Barrels or Cisterns Feasible for My Project?

Rain barrels and cisterns are appropriate for sites with the following characteristics:

- Roof areas that drain to downspouts.
- A level, firm surface is needed to support a rain barrel(s) or cistern to prevent shifting or falling over. A full 55-gallon rain barrel will weigh over 400 lbs.
- A landscaped area where the captured water can be used (and where it can be drained by gravity flow) should be located within a reasonable distance from the rain barrel(s).
- A landscaped area or safe path to the storm drain system that can handle overflow.

Roof or Impervious Area (sq. ft.)

Suggested Minimum Number of 55 Gallon Rain Barrels*

Up to 750	1-2
750 – 1,250	2-3
1,250 – 1,750	3-4
1,750 – 2,250**	4-5

* Or equivalent capture using larger rain barrels or a cistern.

** To harvest rainwater from an area greater than 2,250 sq. ft. install 1 additional rain barrel per each additional 500 sq. ft.

Components of a Rainwater Harvesting System

Roofing Materials



Wood shingle roof
Courtesy of Gutter Glove

Technically, any impervious surface can be used for harvesting rainwater; however, the surface materials will affect the quality of captured rainwater, which has implications for the recommended uses.

Although it is technically possible to harvest runoff from parking lots, patios, and walkways, it is more difficult since a subterranean cistern or a pump is usually needed to move the water into an above-ground rain barrel or cistern. Also, there are typically greater levels of debris and contaminants that must be filtered out of the runoff before it enters the storage system. Due to these complexities, it is more common to harvest rainwater from rooftops, which is the focus of this fact sheet.

When designing your system, consider the roofing material on the building.

- If you have asphalt or wooden shingles, use the harvested rainwater only for non-edible landscapes, unless the water is treated first. Petroleum or other chemicals from these roofing materials can leach into the rain water.
- Roofs with cement, clay, or metal surfaces are ideal for harvesting water for a wide variety of uses.

Gutters and Downspouts

Properly sized and maintained gutters and downspouts are essential to a rainwater harvesting system.

- Strategically locate any new downspouts in an area where the rain barrel or cistern will be most useful.
- Consider the height of the rain barrel and the first flush device. Existing downspouts may have to be shortened to make room for the rain barrel and first flush device.
- Install a fine mesh gutter guard on gutters to keep leaves and other debris from entering and clogging the gutters. This will reduce the need for cleaning gutters and the rain barrel or cistern.
- As needed, consult a professional roofer to aid in gutter and downspout installation.



This gutter is covered by a fine mesh gutter guard to keep debris out.
Courtesy of Gutter Glove

Components of a Rainwater Harvesting System

Rain Barrel and Cistern Accessories to Keep Water Clean



First flush and downspout diverter installation
Courtesy of The City of Oakland

Various accessories to rain barrels and cisterns help protect the quality of harvested water and reduce maintenance. These accessories include “first flush” diverters, filters, and screens.

Leaves, twigs, sediment, and animal waste are common in runoff, especially at the beginning of a storm (“first flush”). This debris can result in clogging and encourage bacterial growth. A first flush diverter helps remove debris and contaminants by directing the first few gallons of runoff from the roof to landscaping, away from the rain barrel or cistern.

The following tips will help you keep the water in your system clean.

- Install a first flush diverter directly under your downspout. You may have to cut the downspout to connect the first flush diverter above the rain barrel.
- Use the same diameter pipe for the first flush diverter, the downspout, and the connector to the rain barrel. Avoid changing diameters of pipes in order to keep the system from backing up.
- Design the first flush diverter to discharge the first flush to non-edible landscaping.
- Install mosquito-proof screens under the lid of the rain barrel and inside the overflow outlet.

Foundation and Overflow

Before installing a rain barrel or cistern, prepare the site so that the system will function safely.

- Find or create a level location near the downspout on which to place the rain barrel or cistern.
- A concrete or stone paver foundation may be appropriate for smaller rain barrels. A more substantial foundation will likely be required for large cisterns.
- Secure rain barrels and cisterns to your structure with metal strapping, or anchor to the foundation, to prevent tipping in an earthquake.
- Maintain clear access to the rain barrel outlets and cleaning access points.
- Design an overflow path, so that overflow from the rain barrel(s) will discharge safely to a landscaped area, or storm drain system.
- Where possible, direct overflow to a rain garden, swale, or other landscaped area to maximize retention of rainwater onsite.
- Direct the overflow away from the rain barrel, building foundation, and neighboring properties.
- Consult with the municipality to identify overflow locations.



Large unit installed at a single family residence.

Courtesy of Stephanie Morris

Design Checklist

When installing rain barrels and cisterns, consider the following criteria unless otherwise instructed by the municipality.

- ❑ Do not use flexible piping, to prevent mosquito breeding in water that may pool in flexible pipes. If irrigating edible landscapes, consider pipes that meet FDA food grade standards.
- ❑ When designing the overflow path, remember that in heavy storms rain barrels and cisterns *will* overflow. A 1,000-sq.-ft. roof will produce about 600 gallons of runoff during a storm that has produces a depth of 1 inch of rain.
- ❑ There shall be no direct connection of any rain barrel or cistern and/or rainwater collection piping to any potable water pipe system. Rainwater systems shall be completely separate from potable water piping systems.
- ❑ Place the bottom of the barrel at a higher elevation than the landscape, to use gravity flow.
- ❑ All rain barrels and cisterns should have a screen to ensure mosquitoes cannot enter.
- ❑ Allow overflow to drain to your landscape or a rain garden. Ensure that areas receiving overflow do not have standing water for more than 48-hours.
- ❑ The low water pressure from a small rain barrel will not operate in-ground sprinkler or low-volume devices. Consider using a soaker hose.
- ❑ If using a soaker hose, remove the pressure-reducing washer to increase the water flow.
- ❑ If the water is not needed for irrigation during the rainy season, consider releasing the water to a vegetated area between storms, so the barrels will be empty to catch rain from the next storm. This will help protect your watershed by reducing the quantity and speed of water entering local creeks during storms. Install a spigot and drip tape to allow the rain barrel or cistern to slowly drain between storms. You can store the water captured towards the end of the rainy season to irrigate your garden in the dry season.
- ❑ For more information, ask municipal staff to refer you to countywide stormwater guidance.

Operation and Maintenance

After installing your rain barrel or cistern, follow these tips for long-term safety and functionality.

- ❑ Regularly check the gutters and gutter guards to make sure debris is not entering the rainwater harvesting system.
- ❑ Inspect the screens on the rain barrel or cistern prior to the wet season to make sure debris is not collecting on the surface and that there are not holes allowing mosquitoes to enter the rain barrel. Inspect screens more frequently if there are trees that drop debris on the roof.
- ❑ Clean the inside of the rain barrel once a year (preferably at the end of the dry season when the rain barrel has been fully drained) to prevent buildup of debris. If debris cannot be removed by rinsing, use vinegar or another non-toxic cleaner. Use a large scrub brush on a long stick, and avoid actually entering the rain barrel. Drain washwater to landscaping.
- ❑ Clean out debris from cisterns once a year, preferably at the end of the dry season.



Daisy-chained system
Courtesy of Acterra

The City of Los Angeles and Geosyntec Consultants are acknowledged for providing text and formatting used in this fact sheet. The City of Oakland, Acterra, Gutter Glove, and Stephanie Morris are acknowledged for images used in the fact sheet.

RAIN GARDENS

Stormwater Control for Small Projects



Bay Area Stormwater
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Large Residential Rain Garden

Rain gardens are landscaped areas designed to capture and treat rainwater that runs off roof and paved surfaces. Runoff is directed toward a depression in the ground, which is planted with flood and drought-resistant plants. As the water nourishes the plants, the garden stores, evaporates, and infiltrates rainwater into the soil. The soil absorbs runoff pollutants, which are broken down over time by microorganisms and plant roots.

Rain gardens are a relatively low-cost, effective, and aesthetically pleasing way to reduce the amount of stormwater that runs off your property and washes pollutants into storm drains, local streams, and the San Francisco Bay. While protecting water quality, rain gardens also provide attractive landscaping and habitat for birds, butterflies, and other animals, especially when planted with native plants.

Is a Rain Garden Feasible for My Project?

Rain gardens are appropriate where the following site characteristics are present:

- Rain gardens should be installed at least 10 feet from building foundations. The ground adjacent to the building should slope away at a 2% minimum slope. A downspout extension or "swale" (landscaped channel) can be used to convey rain from a roof directly into a rain garden. Rain gardens can also be located downstream from a rain barrel overflow path.
- Rain gardens should be at least 3 feet from public sidewalks (or have an appropriate impermeable barrier installed), 5 feet from property lines, and in an area where potential overflow will not run onto neighboring properties.
- The site should have well-drained soil and be relatively flat. Soil amendments can improve infiltration in areas with poor drainage. Add about 3 inches of compost to any soil type and till it in to a depth of about 12 inches.
- A front or backyard can work well for a rain garden, especially in areas where the slope naturally takes the stormwater.

How Large Does My Rain Garden Need to Be?

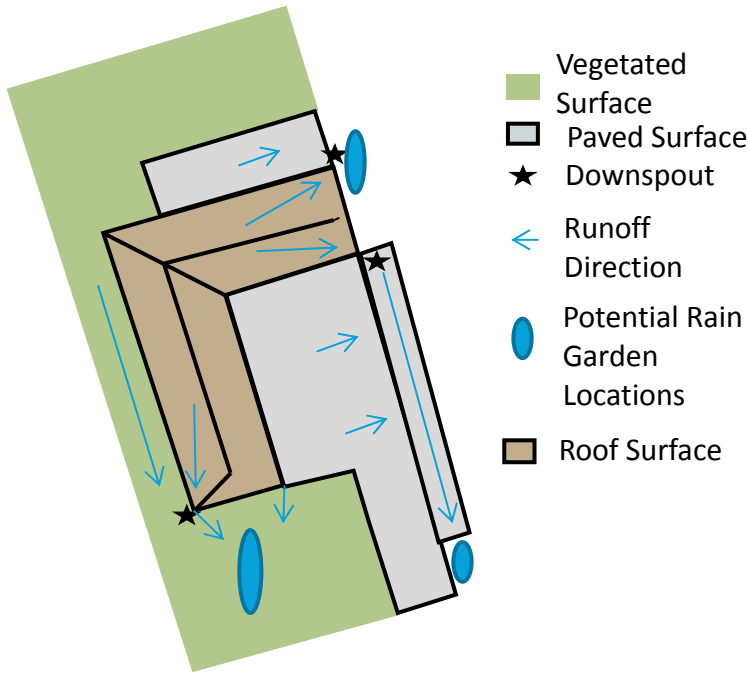
A general recommendation for a garden with a 6-inch ponding depth is to size the rain garden to approximately 4% of the contributing impervious area. Your soil type will affect how the rain garden should be sized because the water infiltration rate depends on the soil type; rain gardens should be larger in areas with slower infiltration. The following table can be used as general guidance.

Contributing Area (sq. ft.)	Rain Garden Area (sq. ft.)
500 – 700	24
701 – 900	32
901 – 1,100	40
1,101 – 1,300	48
1,301 – 1,500	56
1,501 – 2000*	70

*Projects adding roof or other impervious areas in excess of 2,000 sq. ft. should add 20 sq. ft. of rain garden surface area per every 500 sq. ft. of additional area.

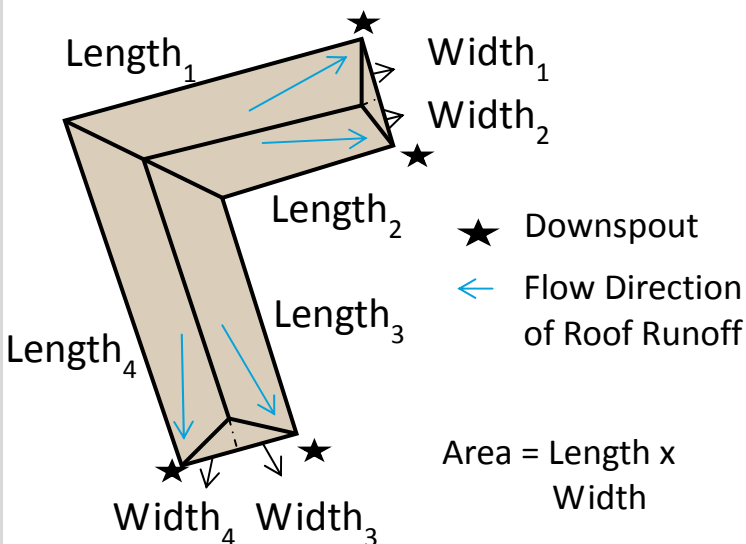
How to Plan and Install a Rain Garden

Select a Location and Plan for Overflow



- Before choosing the location of your rain garden, observe how rainwater is distributed across your home and yard. The ideal rain garden location is a flat or gently sloped area and is down slope from a runoff source.
- Site your garden at least 10 feet away from any structures (unless an impermeable barrier is used) and 5 feet from property lines.
- Avoid siting your garden over underground utilities and septic systems, near large trees, or next to a creek, stream or other water body.
- Your rain garden will overflow in large storms. Therefore, all garden designs should include an overflow system. One option is to build the perimeter of the garden so that it is perfectly level and to allow water to gently spill over the top during large storms. Another option is to build in a spillway that connects to another landscaped area, or the storm drain system.

Plan the Size of Your Rain Garden

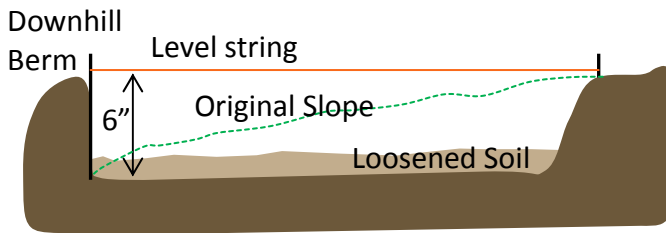


- Once you have determined where your garden will be sited, look at the surrounding area and identify which surfaces will contribute runoff to the garden. Is it all or just a part of the roof, patio, or driveway?
- Estimate the roof area by measuring the length and width of the building foundation and adding a few inches for the overhang. Multiply the length times the width to determine the contributing area. Once you have calculated the area of each contributing surface, add them up to obtain the total contributing area.
- Refer to the chart on page 1 to identify the size of the rain garden you will need to manage runoff from the contributing area.

If you do not have the space, budget, or interest in building a garden of this size, you may consider capturing some of your roof runoff in rain barrels to reduce the amount of runoff, or discharge the overflow to another landscaped area.

How to Plan and Install a Rain Garden

Install your Rain Garden



- Once you have selected a site and planned the size of your rain garden, lay out the shape using a string or tape to define the outline of where you will dig.
- If the yard is level, dig to a depth of 6-inches and slope the sides. If the site is sloped, you may need to dig out soil on the uphill side of the area and use the soil to construct a small berm (a compacted wall of soil) along the down slope side of the garden.
- Use a string level to help level the top of the garden and maintain an even 6-inch depth.
- Once the garden is excavated, loosen the soil on the bottom of the area so you have about 12 inches of soft soil for plants to root in. Mix in about 3 inches of compost to help the plants get established and improve the water-holding capacity of the soil.
- If water enters the garden quickly, include a layer of gravel or river rock at the entry points to prevent erosion.

Select Appropriate Plants



California Fuchsia



Common Rush



White Sage



Douglas Iris

You can design your rain garden to be as beautiful as any other type of garden. Select plants that are appropriate for your location and the extremes of living in a rain garden

Site Considerations:

- How much light will your garden receive?
- Is your property near the coast or located in an inland area (this affects sun and temperature)?
- Are there high winds near your home?

Recommended plant characteristics:

- Native plants adapted to local soil and climate,
- Drought tolerant,
- Flood tolerant,
- Not invasive weedy plants,
- Non-aggressive root systems to avoid damaging water pipes,
- Attracts birds and beneficial insects.

*Contact municipal staff to obtain a full list of recommended plants, provided in the countywide stormwater guidance.

Design Checklist

When installing a rain garden, the following design considerations are recommended.

- ❑ Locate the rain garden at least 10 feet from home foundation, 3 feet from public sidewalks, and 5 feet from private property lines. If rain gardens need to be located closer to buildings and infrastructure, use an impermeable barrier.
- ❑ Locate the rain garden to intercept and collect runoff from a roof downspout or adjacent impervious area.
- ❑ Size the rain garden appropriately based on the soil type and drainage area (see Page 1).
- ❑ Do not locate the rain garden over septic systems or shallow utilities. Locate utilities before digging by calling Underground Service Alert at 811 or (800) 227-2600.
- ❑ Locate the rain garden on a relatively flat area, away from steep slopes. If you plan on moving a large quantity of soil, you may need a grading permit. Contact your local municipality for further assistance.
- ❑ Consider installing an underdrain to enhance infiltration in very clayey soils. Contact municipal staff for guidance on how to properly install an underdrain.
- ❑ An overflow should be incorporated in the rain garden to move water that does not infiltrate to another pervious area and away from the home's foundation or neighboring property.
- ❑ Drought and flood resistant native plants are highly recommended and a variety of species should be planted. Avoid invasive plants. Contact municipal staff for a list of plants appropriate for rain gardens from the applicable countywide stormwater guidance. A list of invasive species may be found at the California Invasive Plant Council website (www.cal-ipc.org).

Maintenance Considerations

Once a rain garden is installed, the following steps will help the garden function effectively.

- ❑ Rain gardens should be irrigated periodically (as needed) during dry months, especially while plants are being established. Plants should be inspected for health and weeds should be removed as often as necessary.
- ❑ Apply about 2 inches of mulch and replace as needed. Mulch with a material that will not float away such as compost or a larger sized hardwood mulch (avoid microbark, for example).
- ❑ Areas of erosion should be repaired. Further erosion can be prevented by stabilizing the eroding soil with ground cover or using energy dispersion techniques (e.g., splashblock or cobbles) below downspouts.
- ❑ Avoid using synthetic fertilizers or herbicides in your rain garden because these chemicals are water pollutants.
- ❑ Standing water should not remain in a rain garden for more than 3 days. Extended periods of flooding will not only kill vegetation, but may result in the breeding of mosquitos or other vectors.



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