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Coastal California Rain Gardens

Capture Rain and Let the Benefits Flow

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Rain gardens collect rainwater and beautify a yard. They provide an effective form of rainwater harvesting, allowing property owners to save valuable water from going down storm drains. Rain water has been collected by numerous cultures since ancient times, but the concept of a residential rain garden is recent. They were pioneered in Prince George's County, Maryland, in 1990. Although more commonly found in wetter climates, rain gardens can be beneficial in California's Mediterranean climate, with our dry and wet seasons. Local rainfall does not meet water demand in the summer months and water is diverted from rivers or pumped from wells to support local needs. Rain gardens offer an attractive and practical way to conserve water.

Rain gardens collect rain that falls on a roof or other surfaces (fig. 1). The water is channeled via rain gutters, pipes, swales (vegetated depressions between two ridges), or curb openings into a depression in the yard, where it soaks into the ground and waters vegetation. A properly functioning rain garden holds water for only a short period of time; it is not a pond feature (fig. 2). Most of the time, the bed of the rain garden is dry. The purpose is to

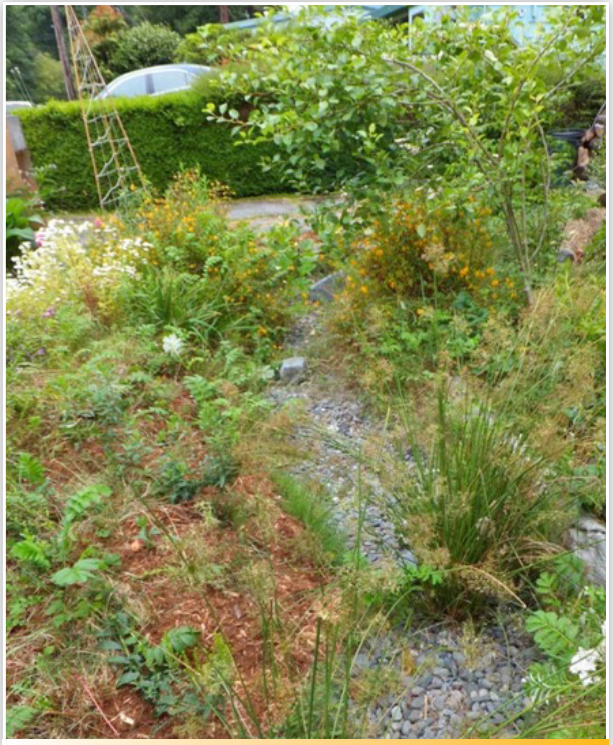


Figure 1. The gravel bed and meandering path of the dry streambed will hold water for a day. *Source:* High Tide Permaculture

Figure 2. This rain garden demonstrates rainwater retention while making an attractive addition to the yard. *Source:* M. Myers

Figure 3. Removing a lawn and creating a channel for water flow. *Source:* High Tide Permaculture

Benefits of Rain Gardens

Less imported water used for yard irrigation.

Lower water bills.

Reduces flooding and erosion.

Less polluted storm water runoff.

Attractive yard feature.

retain water just long enough for it to percolate into the soil. Rain gardens keep water on site and, on a larger scale, may provide the environmental benefit of groundwater recharge.

Rain gardens allow water to permeate the ground, acting as a natural water filter. They are essentially small scale bioretention basins. They slow the flow of water, allowing it to percolate into the ground, where plants and soil microorganisms can break down organic compounds and remove pollutants such as phosphorus, nitrogen, and hydrocarbons. By keeping water on site and preventing overflow, less contaminated water enters storm drains and local water bodies (rivers, streams, lakes, and/or the ocean). Damage to local aquatic ecosystems from erosion and pollution may be reduced. Furthermore, rain gardens provide other attractive benefits to homeowners: potable water used for irrigation is reduced, less money is spent on irrigating plants near the rain garden, and if designed correctly, the likelihood of property flooding is diminished.

This publication provides information to get you started constructing a small-scale or home rain garden. For more details and related information, see the resources section below.

Planning a Rain Garden

Location, Location, Location

To select a good location, observe your landscape during a rainstorm and identify existing drainage patterns. The goal is to direct water from high points and let gravity move it into your rain garden. A downslope area that naturally receives water from a roof or overland flow is ideal.

Situate the rain garden in a natural depression or on a flat surface. The rain garden can be constructed on a slope, but more digging will be necessary to produce a level bottom (fig. 3). Areas where the water table is high or the land is often saturated are not good options. Additionally, rain gardens should not be located over a septic system. Water should not pond in a rain garden for an extended period; rather, it should soak into the ground within 1 to 3 days. Be aware that any existing trees or large plants may not adapt well to even temporarily saturated soil in their root zone. For this reason, large tree roots should be avoided; also, they may be damaged during rain garden installation and can hinder the process. Furthermore, avoid any underground pipes or utilities. Lastly, if possible, locate the garden in full or partial sunlight where plants will thrive.

Site Selection Guidelines

Downslope rainwater collection surface.

Minimum 5 feet from structures without a basement; minimum 10 feet from structures with a basement (check your local jurisdiction for specific code requirements).

Not over a septic system.

Not in a place that is already soggy.

Ideally in full or partial sunlight.

Avoid large tree roots.

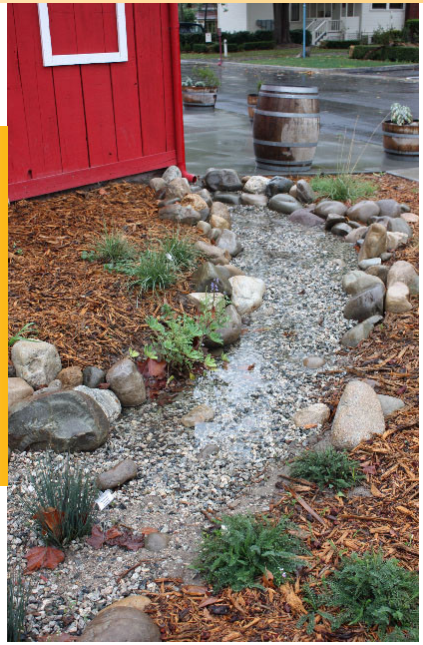


Figure 4. This newly planted garden makes it easy to see the downspout from the roof directing water to the garden. Stones are used to stabilize the area where water enters the garden and to prevent erosion. *Source:* M. Myers

Figure 5. Gravel has been added to the bottom of the streambed during this constructon in this home yard. *Source:* High Tide Permaculture

A Rain Garden in Clay Soil

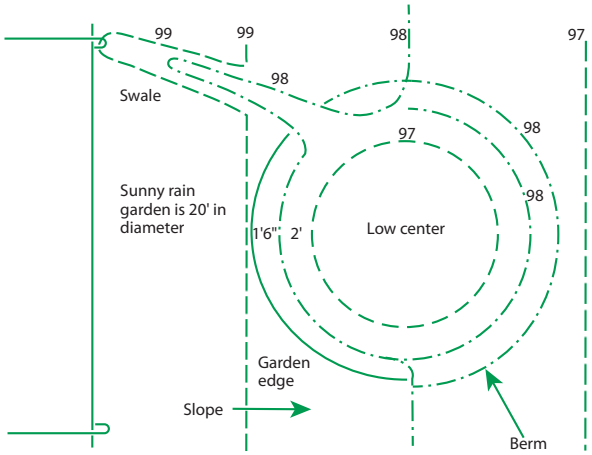
If your soil is mostly clay or another low-permeability soil type, increase the area of the rain garden. Add soil amendments such as compost or pumice to 6 to 24 inches below the ponding area. Do not use mason or ballfield sand. Mix in 3 inches of compost on the surface.

Size and Shape

Be creative when designing the rain garden: oval, round, long and narrow, or kidney bean–shaped are all possibilities. Choose a shape complementary to the design of your yard. For rain gardens with sandy soils, the garden area should be a minimum of 20 percent of the drainage area. For loamy soils, the area should be 30 percent of the drainage area, and gardens with clay soils should be up to 60 percent. For example, a 1,000-square-foot rooftop requires at least a 200-square-foot garden with sandy soil. As a rule of thumb the rain garden should be large enough to hold at least 1 inch of rain. If the catchment area is a vegetated surface, such as a slope where some percolation will occur, the rain garden can be much smaller relative to the catchment area. Refer to the references and resources section, below, for more details.

Catching and Channeling the Rain

Water is most easily harvested from a roof, driveway, or other impervious surface. Typically, a gutter system and downspout are employed to direct water off the roof; rain chains are another decorative option. If the runoff from a roof directly hits the soil, cover the area with a bed of rocks to prevent soil erosion (fig. 4). For both roof and ground-level catchments, channel water toward the garden using downspout extensions (gutter pieces attached to the end of downspouts), pipes (often underground), or vegetated swales. If heavy water flow is expected, a ditch lined with rock is a good option (fig. 5). Also, swales can be fortified with landscape fabric and stones. Additionally, rock or stones can be used to stabilize the area where water enters the garden and to prevent erosion. For good water flow, channels should have a minimum 2 percent slope (1/4 inch per foot) (fig. 6). The sides of the channel should have a slope with a depth-to-width ratio of no more than 2:1 (for example, if the swale channel is 1 foot in depth, its width should be no greater than 2 feet across). To hold rainwater, the center of the garden should be from 6 to 12 inches at its deepest point. The edges of the garden should gently slope to the center with approximately a 1-inch drop per foot to prevent erosion. Rain gardens on a slope will need a berm on the lower end



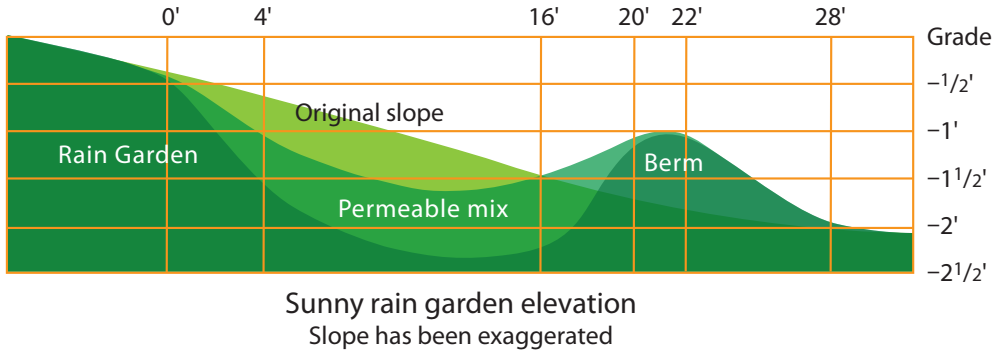


Figure 6. Sunny rain garden elevation; slope has been exaggerated.
Source: After Wilson and Gilbertson 2006.

Mosquitoes?

Rain gardens are not ponds. Appropriately designed, they allow water to soak into the ground within 24 hours. Since mosquito larvae need over 7 days to develop from an egg into an adult, a well-designed rain garden won't harbor them. If for some reason ponding occurs for more than 72 hours, mosquito dunks should be employed. These hockey-puck-shaped disks contain bacteria that kill mosquito larvae yet are nontoxic to people and pets. They are available at local hardware and garden stores.

to create a depression. On the downslope side of the rain garden, use the soil removed from the center of the garden to make a berm 3 to 6 inches high and 8 to 12 inches wide with gently sloping sides. The berm may be planted with drought-tolerant plants.

Overflow

Since most rain gardens are built to hold water from a 1-inch rain event, they can handle water volume from the majority of California rainstorms; it is, however, necessary to build an overflow route so that when large storms hit, flooding does not occur (fig. 7). Often, an overflow route can be directed off-site to a conventional storm water drainage route (e.g., a driveway that drains to a storm drain in the street. The downhill side can have a cutaway to direct water in the direction you want it to go.

Plant Selection

In most parts of California's Mediterranean climate there is little significant rainfall during 6 months of the year; in the absence of irrigation, all plants in a coastal California rain garden need to tolerate dry summers. Many native plants are a good option since they are well adapted to seasonal, short-duration water supply and long periods of drought. Different types of plants may be necessary for the rain garden. Plants located on the base and the sloped sides of the garden will need to be selected from species that can withstand complete inundation as well as extended drought conditions. Plants on berms will not need to tolerate extended wet conditions, so this area can be planted with a variety of drought-tolerant or native

Figure 7. Runoff from surrounding areas flows into the rain garden basin, inundating the plants in this public landscape and parking area.
Source: M. Myers

Figure 8. This rain garden consists of drought-tolerant annuals, perennials, and grasses. *Source:* Bimini Slough, Los Angeles

plants including colorful annuals, grasses, and herbaceous plants (fig. 8).

Plant List

Plants for the base of the rain garden should be able to withstand flooding in the winter and also drier conditions in summer. The plants on mid-slope should be small and also able to tolerate wet conditions. On top of the berms you can use small trees and shrubs that tolerate dry condition in the summers. For southern California the use of succulents and other xeriscape plants is an option. If available, summer irrigation is an option which allows more choices, especially on the top of the berms. Table 1 lists a small sampling of plants for use in rain gardens. For more suggestions for plants to use in coastal California rain gardens, see http://ucanr.edu/sites/RainGardens/.

Planting

Plant the rain garden when the soil is dry, preferably in the fall when the air temperatures are cooler but the soil is still warm. Wet soil is more easily compacted, reducing permeability. Soil permeability should be determined prior to planting the rain garden. To test for soil permeability, dig a hole 6 inches deep and fill it with water. If the hole still contains water after 24 hours, the soil infiltration is slow and needs to be remedied. To increase slow soil infiltration, amend the soil with 2 to 3 inches of compost worked into the first few inches of topsoil. Loosen the soil to a depth of approximately 2 feet to allow roots to grow and to permit easier water infiltration. Immediately after planting, but before mulching, water the garden thoroughly. Mulching is very important: apply 2 to 4 inches without covering small plants. Mulch should be reapplied each year until the plants have matured. Use dense, organic mulch that won't float away easily, such as shredded wood or coarse wood chips 1 to 2 inches across. Although plants in the rain garden are drought tolerant, you will need to water them during the first year while they are becoming established. After this, minimal or no watering is necessary.

Table 1. Plants for coastal California rain gardens, by location in the garden

Plants for the bottom		**Plants for mid-slope**		**Plants for the berm**	
Common name	**Scientific name**	**Common name**	**Scientific name**	**Common name**	**Scientific name**
creeping wildrye	*Elymus triticoides*	clustered field sedge **S**	*Carex praegracilis*	pitcher sage	*Salvia spathecea*
wild ginger **S**	*Asarum caudatum*	salt grass	*Distichlis spicata*	California polypody fern **S**	*Polypodium californicum*
torrent sedge	*Carex nudata*	common or spreading rush	*Juncus patens*	common yarrow	*Achillea millefolium*
scouring rush	*Equisetum hyemale*	Mexican rush	*Juncus mexicanus*	California fuschia	*Epilobium canum*
douglas Iris	*Iris douglasiana*	yerba buena **S**	*Clinopodium douglasii*	Ceanothus	*Ceanothus* spp.
yerba mansa	*Anemopsis californica*	wood rose	*Rosa gymnocarpa*	Siskiyou lewisia, cliff maids	*Lewisia cotyledon* 'Sunset Strain' and other succulents
New Zealand bush sedge **S**	*Carex solandri*	southwestern spiny rush	*Juncus acutus*	Cleveland sage, blue sage	*Salvia clevelandii*
basket rush	*Juncus textilis*				

Note: **S** = can be used in the shade.

Figure 9. The thick mulch layer and diligent weeding will help avoid weed problems while plants mature. Plants include snowberry, douglas iris, luma berry, juncus (rush), sticky monkey flower, and yarrow. *Source:* High Tide Permaculture

Rain Garden Maintenance

Rain gardening is a dynamic process. It is important to test your system during a rain event. Observe whether water is flowing where you want it to go and make necessary adjustments.

- Keep lowest areas free of debris.
- Prevent erosion; block erosion trails.
- Clean and repair channels, berms, and moats.
- Keep gutters and downspouts free of debris.
- Dense shrub growth is desirable; generally, pruning is not necessary.
- At the end of the rainy season, remove accumulated sediment.
- Collect seeds and cuttings from successful plants; use them next season.
- Continually reassess functionality.

Despite a gardener's best efforts, creating a new garden disturbs soil, which may allow weeds to grow. While weeds may not initially seem like a problem, they can cause difficulties later, such as growing profusely enough to block drainage channels, reducing the aesthetics of your garden, competing with more desirable plants for water, and producing flammable debris during the dry season (fig. 9). Weed often during the first year or so while your plantings mature. As your plants establish themselves and grow larger, they will shade the ground beneath them, which, along with mulch, should reduce weed issues over time.

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