

# Building a Rain Garden in Colorado



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# What is a Rain Garden?

A rain garden is a landscaped area designed to capture runoff and reduce polluted runoff using natural filtration processes. Established with a variety of native and perennial plants, grasses and flowers; rain gardens can add color to the landscape and provide habitat for birds, butterflies and insects.



<http://www.prairiefirenewspaper.com/>

# Why are they Important?

When it rains; the water that comes off rooftops, lawns, and driveways drain into the stormsewer system and eventually end up in a nearby river, lake or stream. Along the way, runoff can pick up pesticides, fertilizers, pet waste and other pollutants which end up harming local water bodies. Rain gardens help prevent this pollution from reaching water bodies by temporarily storing runoff and allowing the water to infiltrate into the ground (usually within 24 hours). During this time, pollutants are filtered out naturally by the compost, soil and plant roots.

# Choosing a Location

Consider the following when selecting the location for a rain garden on your property.

- The rain garden should not be directly over any utilities or irrigation systems. Call 811 to mark out any utilities on your property. Note that 811 will not identify underground irrigation systems. You will have to do this yourself, or contact your landscape contractor to mark out the irrigation system.
- Stay at least 10 feet away from buildings to prevent water from entering basements.
- The rain garden should be planted where full or partial sun will be present year-round.
- Runoff from rooftop downspouts or driveways should be able to be redirected towards the garden.
- A relatively flat slope to make construction easier.
- Do not place a rain garden directly over a septic system or leach field.



**Know what's below.  
Call before you dig.**



<http://water.epa.gov/>

# Sizing Your Rain Garden

When determining the design of your rain garden two numbers need to be calculated. The first sizing number is the rain garden's depth. Depth should be maximized to capture substantial runoff but shallow enough to prevent standing water from being present after 24 hours. Secondly, the required surface area or footprint of the rain garden needs to be determined. Proper surface area will ensure runoff will be captured from most storms.

## Determining Rain Garden Depth

A simple infiltration test can be performed to determine the rain garden depth. The procedure for performing the infiltration test is as follows.

1. Dig a hole the size and shape of a coffee can in the location of the rain garden.
2. Fill the hole with water and measure the initial water height with a ruler.
3. After 4 hours, measure the new water depth and determine the change in water height.
4. Divide the change in water level by 4 to account for lateral water movement.  
E.g. – Change in water level of 4 inches  $\div$  4 = 1 inch
5. Use the table below to determine the rain garden depth based on the change in water level value.

Note: If the change in water level is less than 0.5 inches, then the area is not suitable for a rain garden.

Change in Water Level $\div$ 4 (inches)	Rain Garden Depth (inches)
$\frac{1}{2}$ - 1	3
1 - $1\frac{1}{2}$	6
$1\frac{1}{2}$ - 2	9
More than 2	12

# Sizing Your Rain Garden

## Determining Rain Garden Surface Area

The size of your roof, garden depth, available space and how much runoff you want to control will determine the rain garden surface area. Within Colorado a rain garden should be able to capture 0.5 inches of runoff from the contributing area. A step-by-step guide of how to do calculate the required surface area can be followed below. Please note that these steps assume that each downspout has the same contributing area.

Step	Directions	Value
1	Enter the building foundation length (feet)	
2	Enter the building foundation width (feet)	
3	Calculate the total roof area (square feet) (Step 1 * Step 2)	
4	Enter total number of downspouts from building	
5	Enter number of downspouts that will drain to the rain garden	
6	Calculate rooftop area collected (square feet) (Step 3 ÷ Step 4 * Step 5)	
7	Enter rain garden depth (inches)	
8	Calculate rain garden surface area (square feet) (Step 6 * 0.5 ÷ Step 7)	

*If the calculated rain garden surface area is too large for the allotted space, a smaller garden can still be built. Some runoff capture and treatment is better than nothing!*

# Layout

Your rain garden can be constructed into any desirable shape as long as it has the required surface area. Just remember that you want the garden bed to be as level as possible. Two examples of varying layouts can be seen below.



<http://www.cpe.rutgers.edu>



Colorado Stormwater Center

# Materials

- Compost—1/2 cubic yard per 100 square feet of rain garden surface area.
- 2-4 inch cobbles (1-2 wheelbarrows)
- 4 inch drainage pipe or downspout extensions (optional)
- Mulch—1/3 cubic yard (8 cubic feet) per 100 square feet of rain garden surface area. Use a shredded mulch will prevent it from floating away.
- ~~Weed Barrier~~: Do NOT use weed barriers in your rain garden. These barriers can interfere with the natural filtration processes and create standing water problems.

# Tools

## Household

Depending on the project and personal preferences, the tools required for each project may vary. The following list is comprised of the most common tools

- Gloves
- Tape measure (25 feet)
- Spray paint
- Garden rake
- Wheelbarrow
- Mattock (for removing large rocks/ roots)

## Optional

Two common power tools may ease construction and save time; a garden tiller and a trencher. A garden tiller can be used to loosen the existing soil and for mixing compost into the rain garden bottom and the trencher can be used for burying draining pipe. Both pieces of equipment can be rented from local home improvement stores for around \$100/day each.



<http://smalltownstock.photoshelter.com>



<http://www.groundhoginc.com/>

# Construction

## Step 1

Mark the outline of the rain garden with spray paint and make sure it is not above any utilities or underground irrigation systems. Remember, call 811 before digging!



<http://www.trexservices.com/>

Tip: If the rain garden will be located on an area where there is currently grass, you may want to kill the grass first by placing black garbage bags over the area 2-3 weeks before construction.

## Step 2

Dig out the rain garden to the depth calculated from the infiltration test.

- The bottom should be as flat as possible.
- You may use some of the soil to create a berm around the rain garden to help capture runoff

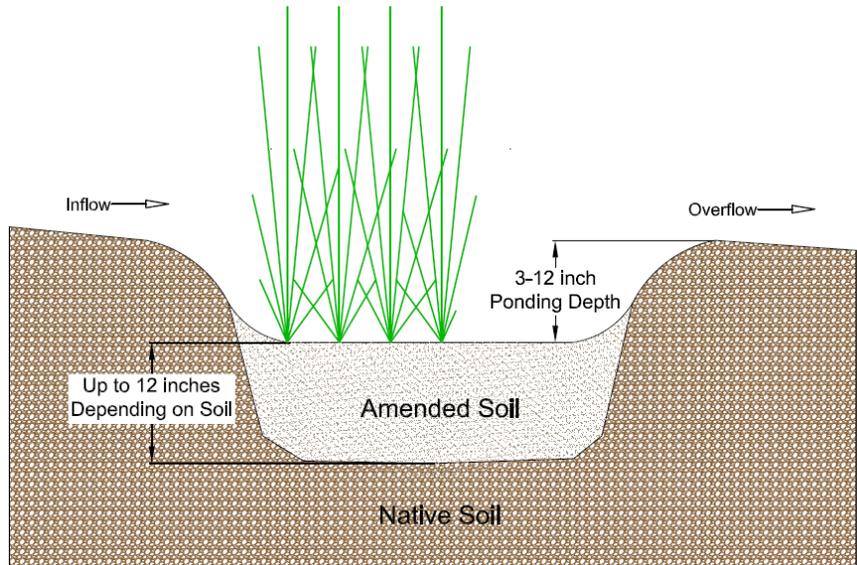


<http://www.wholehome.com/>

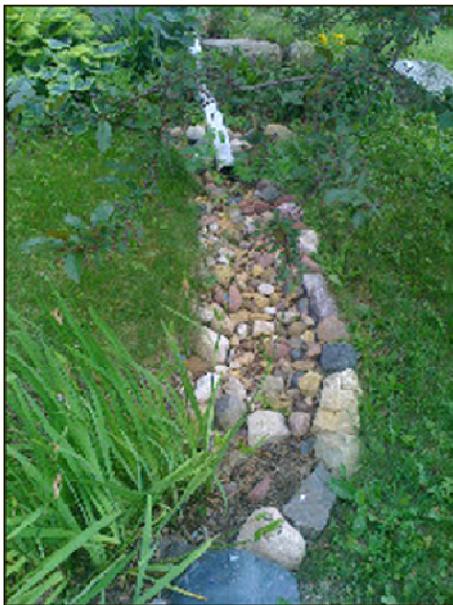
# Construction

## Step 3

Apply compost and mix it 8-12 inches into the soil. If you do not have a garden tiller, mix the compost into the soil using a shovel and garden rake.



## Step 4



<http://www.shootingstarnativeseed.com/>

Direct runoff to rain garden. This can be accomplished in a number of ways.

- 1) Extend rain gutter downspout to the rain garden
- 2) Bury drainage pipe from rain gutter downspout to rain garden. Buried pipe should be 4-6 inches below ground.
- 3) Build a drainage swale with rock cobbles. The drainage swale should be about 2-3 inches deep and 1 foot wide.

# Construction

## Step 5

Protect your rain garden from erosion by placing rock cobbles below the inlet pipe and in areas where runoff will spill over during large storm events.



Colorado Stormwater Center

## Step 6



<http://hococonnect.blogspot.com/>

Finish your rain garden by:

- Planting potted plants or spreading seed mix.
- Applying shredded mulch throughout the rain garden
- Watering new plants and/or seeds frequently until well established

# Plant Selection

Selecting the right plants will minimize maintenance and reduce additional water needs. Try to use native plants as they will be best adapted to Colorado weather and soil conditions. Plants should be drought tolerant while also being able to withstand occasional standing water. Potted plants will establish quicker, however, they will be more expensive to purchase. Alternatively, you can use a native grass and wildflower seed mix (use about 1 ounce per 100 square feet of rain garden surface area) which are available at most local nurseries and can greatly reduce the cost of the project. Local nurseries can also provide valuable information about particular species and will likely have recommendations for your specific area.



Sulphur flower

<http://sierrafoothillgarden.com/>



Purple prairie clover

<http://www.fireflyforest.com/>



White yarrow

<http://granadanativegarden.org/>



Golden columbine

<http://cactusphotographics.blogspot.com/>

# Plant Selection

Native Colorado plants to consider planting include (but are not limited to):

Common Name	Scientific Name	Color	Height (feet)	Conditions
Prairie sandreed	<i>Calamovilfa longifolia</i>	Ornamental grass	1.5 – 6	Dry
Indian ricegrass	<i>Oryzopsis hymenoides</i>	Ornamental grass	1 – 2	Dry
Sand drop-seed	<i>Sporobolus cryptandrus</i>	Ornamental grass	1 – 3	Dry
Western wheatgrass	<i>Pascopyrum smithii</i>	Turf	1 – 2.5	Dry-moist
Blanket flower	<i>Gaillardia aristata</i>	Yellow-Orange	1 – 2	Sun, Dry
Prairie cone-flower	<i>Ratibida columnifera</i>	Yellow	1 – 2.5	Sun, Dry
Purple prairie clover	<i>Dalea purpurea</i>	Purple	0.5 – 1.5	Sun, Dry
White yarrow	<i>Achillea lanulosa</i>	White	0.5 – 2	Part-sun, Dry-moist
Golden columbine	<i>Aquilegia caerulea</i>	Yellow	2 – 3	Sun to part shade, Dry-moist
Sulphur flower	<i>Eriogonum umbellatum</i>	Yellow to rust brown	0.5 – 1	Sun, Dry

# Maintenance

Rain gardens generally need very little maintenance. Irrigation may be required during the first growing season to ensure plants establish themselves, especially if started from seed. However, after the first season, supplemental watering will only be needed occasionally during hot, dry spells.

Weeding may be required as needed. Using a shredded hardwood mulch will reduce weeds. Adding fresh mulch each spring will maintain an aesthetic appearance.

Fertilizing the garden should not be necessary. Compost and runoff should contain the needed nutrients to sustain vegetation for several years.

If large amounts of sediment are deposited within your garden it should be removed periodically to maintain the rain garden's capture volume. Try to find and stabilize the sediment source upstream if necessary. On the other hand if areas of your garden begin to erode, backfilling and further stabilization may be necessary.

# Contact Information

If you have any questions feel free to contact Chris Olson at the Colorado Storm Water Center.

- ◇ Web: <http://stormwatercenter.colostate.edu>
- ◇ Email: [Chris.Olson@colostate.edu](mailto:Chris.Olson@colostate.edu)
- ◇ Phone: (970) 491-1339

