



CREATING YOUR RAIN GARDEN

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wikiHow
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WHY RAIN GARDENS?

The rain falling on buildings and pavement in suburban and urban areas turns into “run off” that rapidly reaches rivers and streams. There it can flood roads and buildings, erode stream banks, and carry pollutants damaging to human health and aquatic life.

Homeowners and businesses can help reduce these negative impacts by slowing down and soaking up the runoff flowing off of their roof tops and paved surfaces. One effective and attractive way to do this is to create a rain garden.

This **Creating Your Rain Garden** booklet tells you how to proceed with the planning, installation, and care of a rain garden. The 14 *Create-A-Rain-Garden* steps and following two sections on *Tips* and *Warnings* come directly from wikiHow to do anything at [Wikihow.com/Create-A-Rain-Garden](https://www.wikihow.com/Create-A-Rain-Garden) (Edited by Waited, Sondra C, Eric, Travis Derouin and 18 others).

We added the Plant Guide to provide more direction on what to plant in a rain garden in SE Pennsylvania. We also included lists of additional guidance documents and local contacts for more information on rain gardens.

We invite you to help keep our water clean and our streams healthy by creating a rain garden!

The Pennsylvania Environmental Council



HOW TO CREATE A RAIN GARDEN

There are lots of ways you can reduce water pollution, but rain gardens may be the most beautiful of them. A rain garden is like a bowl or basin in your yard that captures rainwater from your roof, sidewalks, and driveways, and allows it to soak into the soil instead of polluting local watersheds as stormwater runoff. As an added bonus, since rain gardens are planted with an assortment of native plants, they make an attractive, low-maintenance addition to your yard.

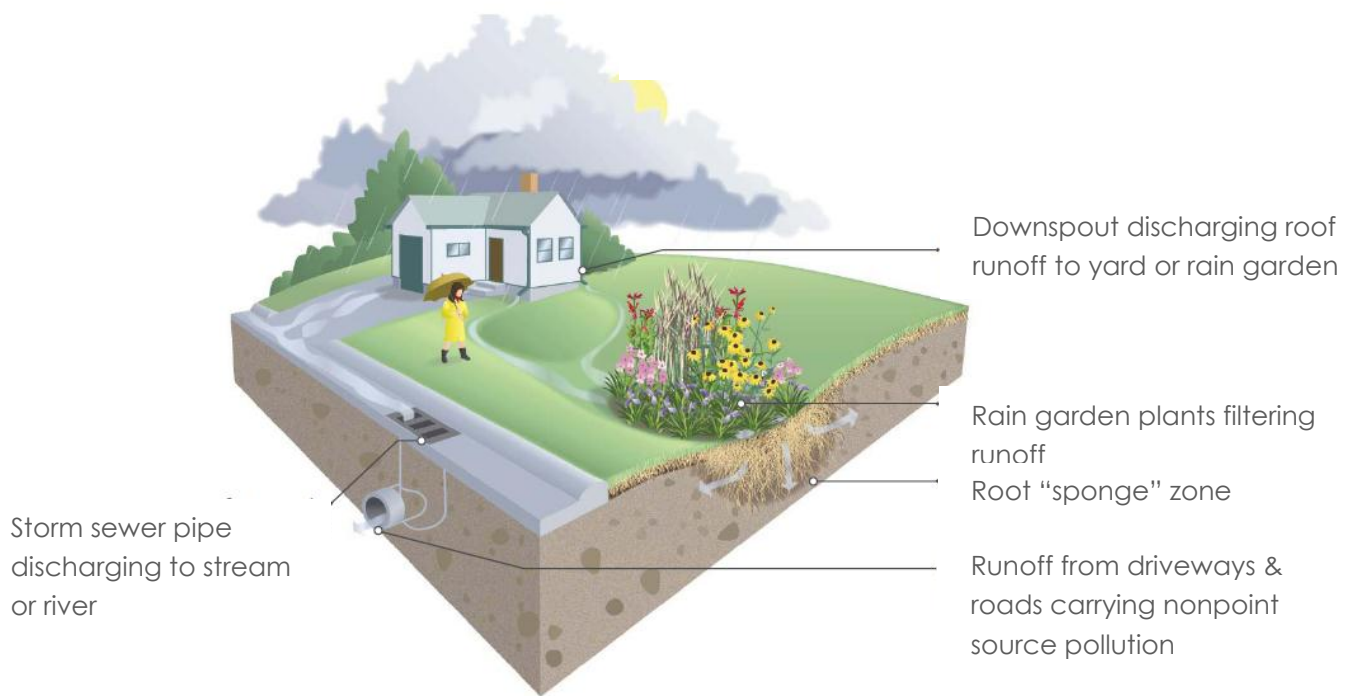


Image Courtesy of the City of Maplewood, MN

(1) FIND A SUITABLE LOCATION FOR YOUR GARDEN

It's easiest to install a rain garden in an area of your yard that water already flows to, usually a depression in the ground or a spot at the bottom of a slope. you can usually identify a suitable area by examining your yard during a rain storm to see how water flows off it.

- Rain gardens should be located at least **10 feet away from foundations** to prevent basement flooding and structural problems.
 - They should **never be located directly over a septic system**, over underground utility lines--always call before you dig--or in a right-of-way.
 - In addition, rain gardens are **not suitable** for areas where the seasonal high water table level is less than **24"** from the surface, as the water table will prevent infiltration of runoff water into the soil.
 - Finally, **large rain gardens**, or any rain garden that requires extensive excavation, **should generally not be placed under large trees**, as excavation may damage tree roots and excessive water can be harmful to some species of trees.

- The **more level** the spot, the easier it will be to install your rain garden. The rain garden site doesn't have to be perfectly level, but steeper slopes will require more excavation to make your garden deep enough to hold water, and slopes over **12%** generally require too much excavation to be worthwhile. A spot at the base of a steep slope is best.
- The most obvious spot for a rain garden is an area **where water already tends to pool after rains**. Pooling or ponding, however, may indicate that the water table is too high or, more commonly, that the soil has a low infiltration rate, which will make the area unsuitable for a rain garden.
 - To test for adequate drainage, dig a hole **6-8"** deep and fill it with water. The water should drain completely within **12 hours**; if it doesn't, the spot is not suitable for a rain garden unless you do some extra work to prepare the soil (see Tips section).

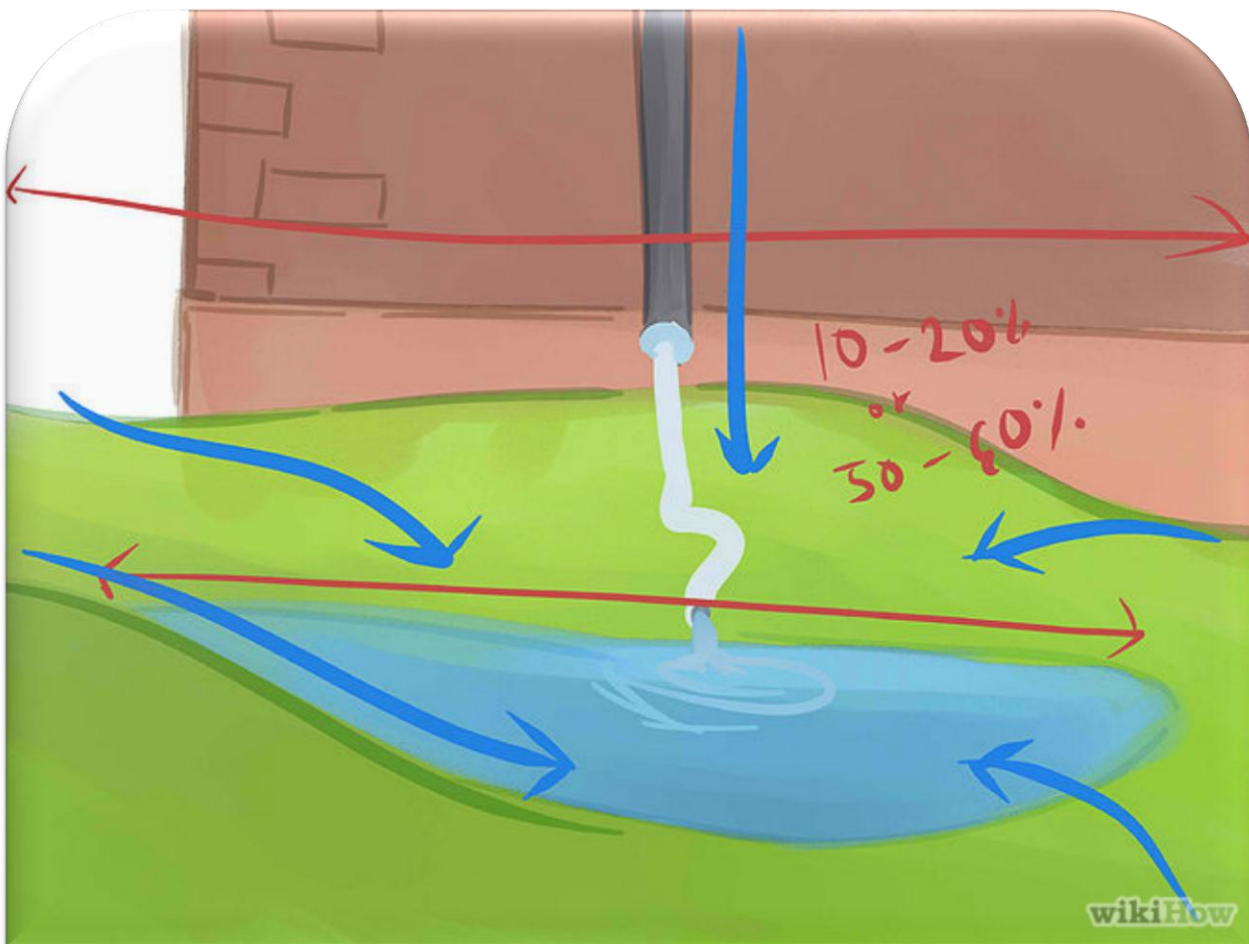


(2) FIGURE OUT HOW BIG YOUR RAIN GARDEN SHOULD BE

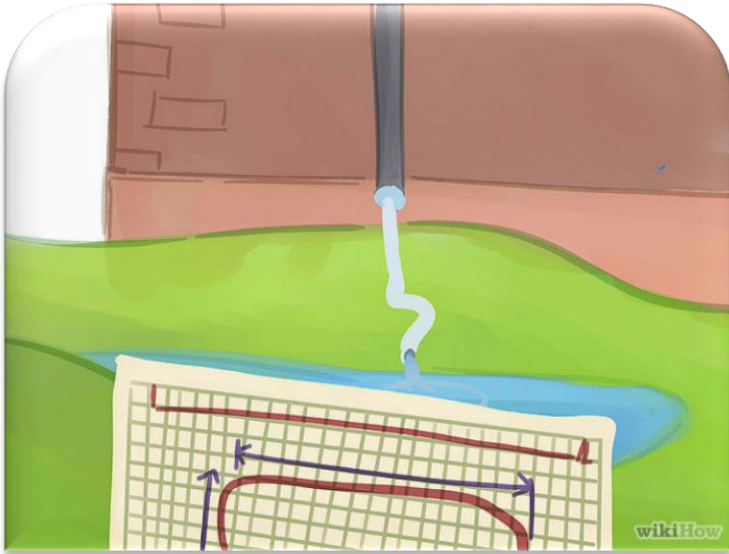
The ideal size of your rain garden depends on the size of the area that drains into it and the soil in the rain garden.

- Determine the area (in square feet or square meters) of the surface that will drain into your rain garden.
 - Watch the drainage pattern during a storm or carefully examine the contours of your yard to determine where the water will come from.
 - Then measure this, including, if applicable, the area of your roof and any paved surfaces that will drain into the garden.
- The area of your rain garden should be proportional to the area it drains.
 - For **sandy soils**, the rain garden size should equal about **10-20% of the total drainage area**, while for very clayey soils, aim to make your rain garden equal to 50-60% of the total drainage area.

- **Loamy soils** require a rain garden area somewhere in between these two extremes, depending on their clay content.
 - These proportions can be reduced for deeper rain gardens (those which are more than **5" deep** over most of their area) or those that are more than **30 feet** from the primary sources of drainage.
- All these numbers, however, are only guidelines. A rain garden can't be "too big," and even if it's smaller than the guidelines recommend, it will still help reduce runoff.

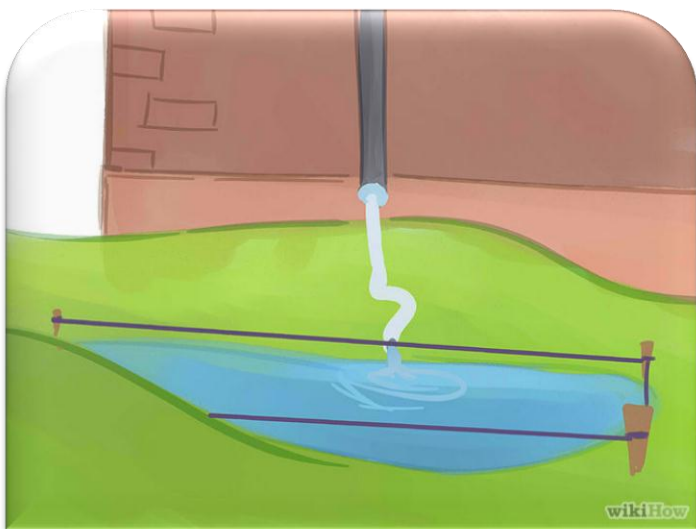


(3) PLOT OUT THE GARDEN PLAN



It's a good idea to plan your rain garden on a sheet of graph paper or a computer design program before you start digging. Keep in mind that rain gardens typically work best if they are curved and slightly irregularly shaped. The longest side should be perpendicular to the slope.

(4) STAKE OUT THE GARDEN AREA



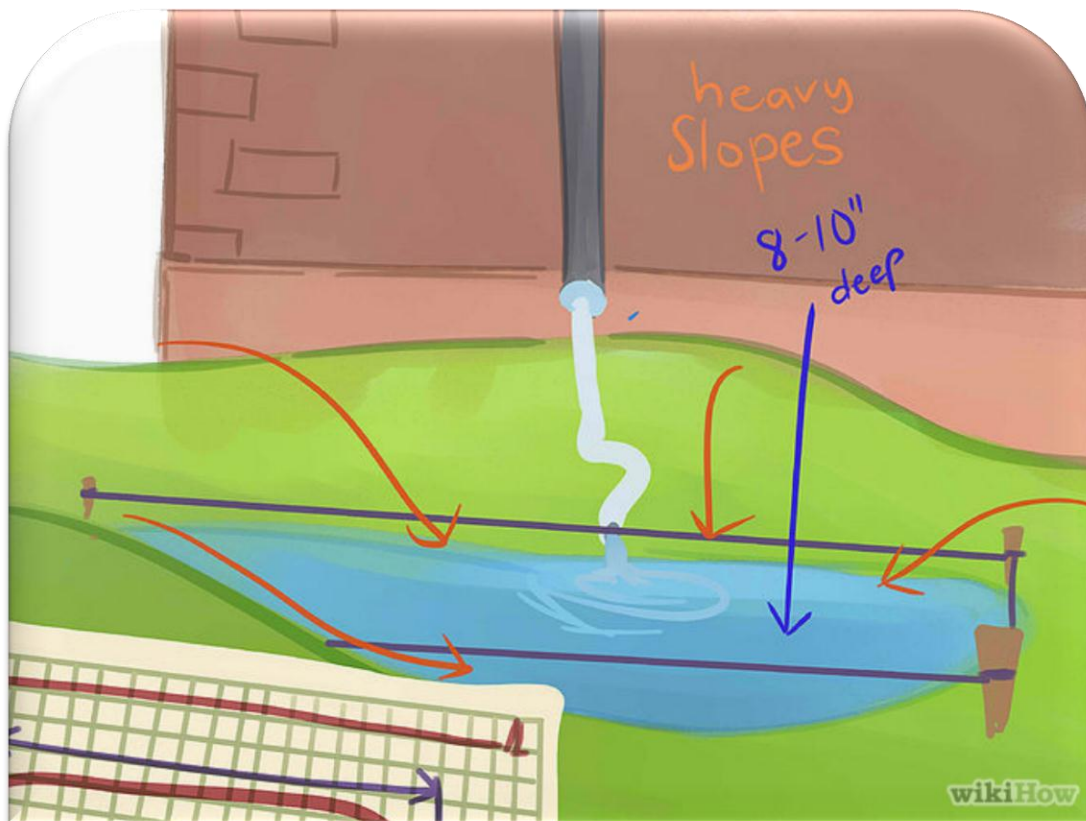
With plan in hand, use stakes and string (or hose) to mark the perimeter of the rain garden.

(5) DETERMINE HOW DEEP YOUR GARDEN SHOULD BE

The ideal depth for a rain garden depends on the slope of the garden area:

- A flat area or one with a very **gentle slope** can be as little as **3-5"** deep, while **6-7"** works best for a **5-7% slope**, and **8-10"** works best for an **8-12%** slope.

Add another **inch or two** if you plan to incorporate **compost** into the rain garden soil.

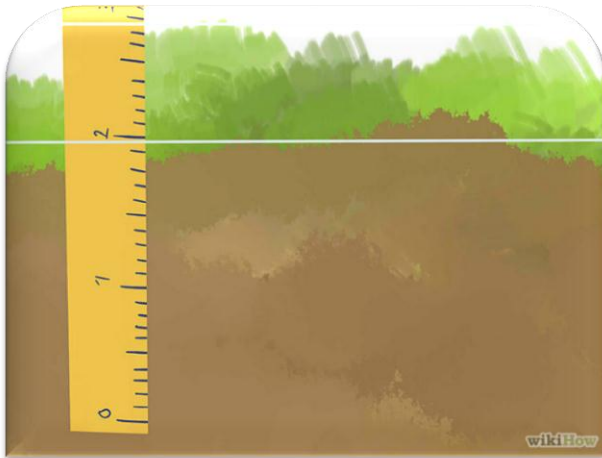


(6) DIG OUT THE GARDEN TO THE DESIRED DEPTH



It's important to get the bottom of the rain garden as level as possible so that runoff water will spread evenly in the garden rather than pooling in one area.

To ensure that it's level, use the following methods, working in **one 5-foot wide section at a time**.



If the garden is in a level area, drive a stake at each end of the garden and run a string from one stake to the other, tying the string at the bottom of each stake so that the string is taut and touching (or almost touching) the ground over its entire length. Dig the entire area to the same depth, frequently measuring the depth from the string to the base of what will be the rain garden.

If the rain garden is situated on a slope, you will need to dig the uphill end out deeper than the downhill end to ensure the base is level.

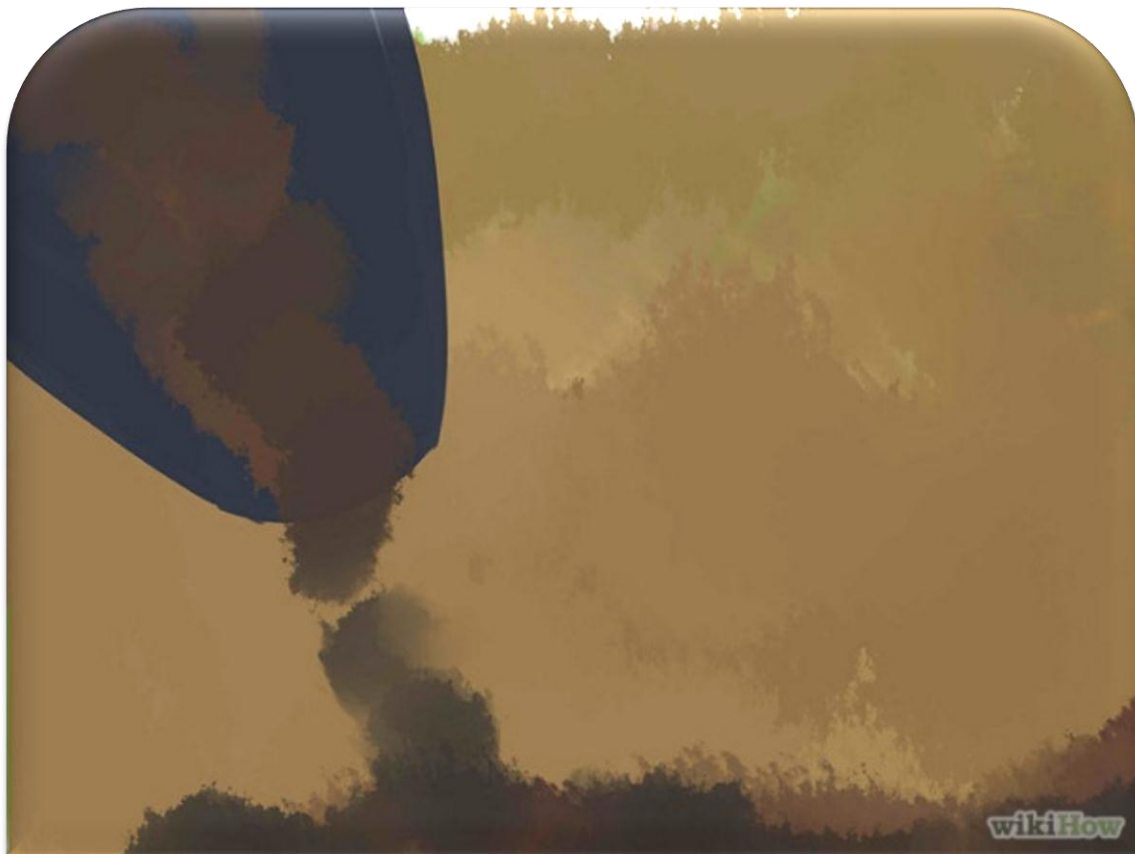
- Drive a stake at the uphill end and another at the downhill end.
- Tie a string around the base of the uphill stake, and then run the other end of the string to the downhill stake.
- Tie the string to the downhill stake so that the string is level over its entire length. You can attach a line level to the string to check that it's level, or you can use a standard carpenter's level.
- Start at the uphill end and dig down from the string to the desired depth.
 - The amount of soil you actually need to remove will be less and less as you move farther downhill, and you may even need to fill in the bottom (downhill portion) of the garden with some of the soil you removed from the top (uphill portion).
 - As an example, suppose you had a 10' long section of your rain garden with a 10% slope (meaning that the elevation drops 1' for every 10 linear feet). If you wanted your rain garden to be 10" deep, you would dig 10" down into the ground at the top of the section, but by the time you reached the bottom you would actually be adding 2" of soil to make the base level.
- Place the excess removed soil along the downhill edge of the rain garden so you can use it to build the berm (dam).

(7) ADD SOME COMPOST

Depending on your soil, you may not need to add organic matter, but it can loosen the soil, enhancing its permeability and making it easier for new plants to develop strong roots.

It also makes for a better growing medium by providing nutrients that might be lacking in the soil.

- If you choose to add organic matter, spread a **2-3" layer of compost** in the bed of the rain garden and gently mix it into the soil.



(8) LEVEL THE BOTTOM OF YOUR BASIN

Once you've dug the entire area out to the correct depth, "fine tune" your leveling either by eyeballing it or by taking a long 2x4 board and placing it on the ground with a carpenter's level atop it. Fill in or dig out areas as necessary.

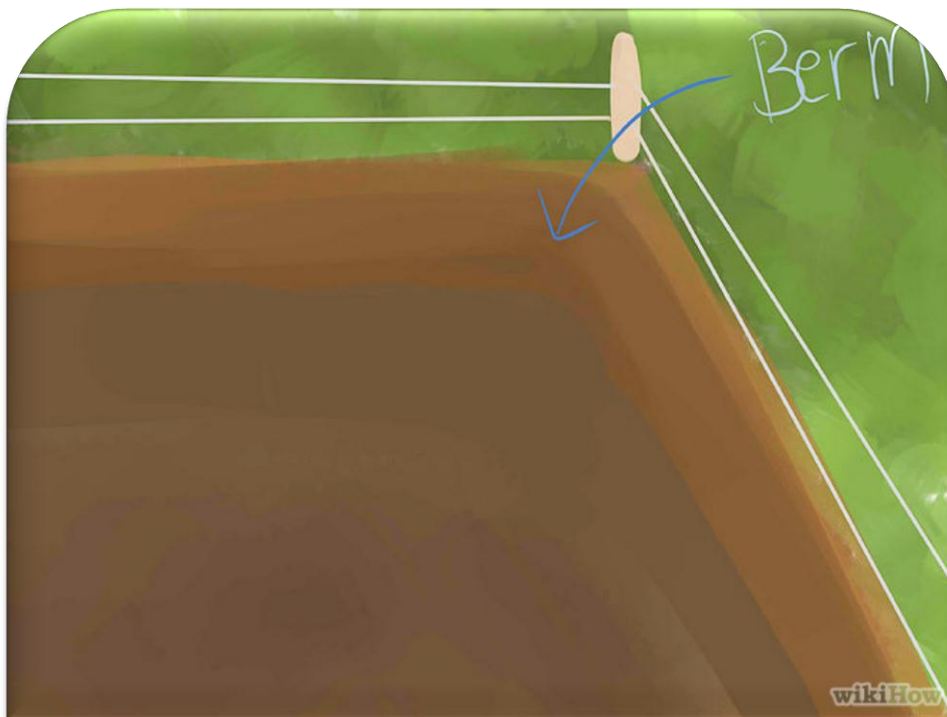
You just want to make sure you got rid of the slope and get out any major bumps or dips.

- It doesn't have to be perfectly level, and you should try to avoid compacting the soil by walking around on it too much.



[9] BUILD A BERM TO HOLD THE WATER IN

A rain garden can't do its job if water just flows out of it, so if there's any slope at all, you'll need to build a berm (an earthen dam) around the downhill edge and up the sides. If you have leftover soil from digging, you can use this to make the berm, but for steeper slopes you'll most likely need to bring in additional soil. An effective berm should be high enough so that it is level around the entire perimeter of the rain garden. In other words, the top of the berm along the downhill edge of the rain garden should be at the same elevation as the uphill edge. The berm should not be higher than the uphill edge, however, as this can cause the garden to retain too much water.



- At the downhill edge of the slope, you'll probably need to add quite a bit of soil to make the berm high enough.
 - As you proceed uphill along the sides, the amount of soil required will become less and less until you reach the uphill edge of the rain garden, where the edge is high enough without any berm at all.
- Shape the berm so that both the inside and outside edges have a gentle slope.
 - The berm should be rounded--you don't want to make a sharp vertical wall.
- Compact the berm by stomping on it with your feet. The berm must be well compacted to prevent erosion.

(10) PLANT AN ASSORTMENT OF PERENNIAL PLANTS IN THE GARDEN

- It's best to choose native plants when possible, as they generally require the least care to thrive and also tend to develop strong root systems.
- The plants in the rain garden itself should thrive in moist soil and be tolerant of influxes of large quantities of water.

- It's a good idea to get plants that are at least 1-2 years old because they will already have established root systems.
- A diverse blend of plants will require less maintenance, and you should try to incorporate native grasses or sedges (not turfgrass) into your garden.
- Shrubs generally have excellent root systems that will soak up water and prevent erosion, and in larger rain gardens, you can even plant some varieties of water-loving trees.
- Do some research to determine the best plants for your climate, but have fun and be creative.



(11) ADD A LAYER OF MULCH

- A **2" layer of mulch** will help keep weeds down and help your plants get off to a good start.
- **Be careful not to submerge** the crowns of the new plants. Heavier mulches, such as pine straw, wood chips, or shredded wood, are preferable to lighter mulches because the lighter materials tend to float and get displaced or carried away if overflow occurs.
- It's generally a good idea to add **another layer** of mulch in the **second year**, but **thereafter it should be unnecessary**.



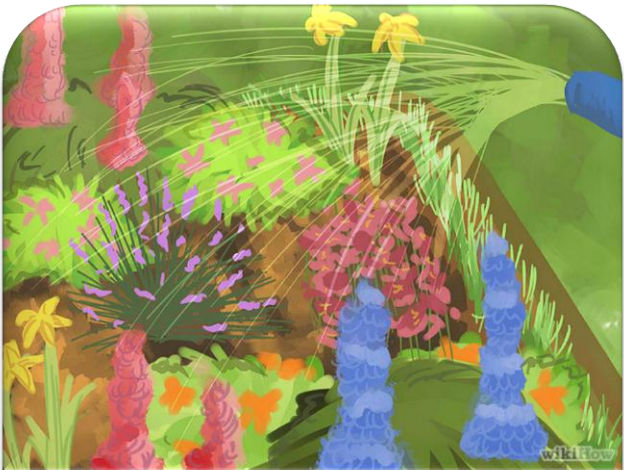
(12) PLANT A GROUND COVER OR GRASS ON THE BERM.



A ground cover or grass is essential to help reinforce the berm and prevent erosion.

It's also important at the top of the rain garden, where water flows in, because it slows down the water to prevent siltation and disturbance of the garden.

(13) WATER THE PLANTS



Care for the plants as you would care for other new transplants. Make sure they get plenty of water, even when it doesn't rain.

After a couple years the plants will have deep, well-established root systems, and you probably won't need to water them except in the severest droughts.

(14) CONTROL WEEDS

As with any newly planted garden, weeds will likely be a problem. Pull them regularly, and as your garden matures, your plants will eventually choke out the competition from weeds.



(Tips)

- According to some estimates, storm-water runoff is responsible for up to 70% of water pollution. Rain gardens can significantly reduce your contribution to pollution, especially when combined with other runoff abatement methods.
- Properly designed rain gardens do not enable mosquito breeding, as the water should drain from the garden within 24 hours!
- You can install multiple rain gardens if no one area is large enough for your drainage needs. It's often recommended that each rain garden be no more than 300 square feet in area, though this is not a "rule."
- Soils with a low infiltration rate can sometimes be amended to make a spot suitable for a rain garden. In order to do so, you need to identify the problem.
 - If the water table is too high, a rain garden simply isn't feasible. If soil compaction is the issue--and it commonly is--you'll need to dig the soil up to a depth of at least 2 feet and break it up to loosen it.
 - Another common problem is soil with a high clay content, as clay easily becomes waterlogged. If this is the case, you'll need to dig out the clay soil and replace it with a mixture of 50-60% sand, 20-30%

compost, and 20-30% topsoil, with the topsoil having little or no clay.

- If water from a roof or other impervious surface doesn't naturally drain into your rain garden, you can install a swale or pipe to direct the runoff to the garden.
- It's very important to slow the flow of water into your rain garden.
 - If you've designed it to drain a large area, a heavy rain could create a rushing torrent of water that will flood your garden with silt and wash plants away.
 - The larger your "upstream" area of grass or ground cover, the better. If you need to slow the flow further, consider installing vegetated swales and/or small berms.
 - It's also a good idea to try to reduce your runoff in other ways, as an integrated approach is usually the best approach.
- Using rain barrels or a cistern to collect runoff from your roof enables you to store water that you can use to irrigate your lawn or garden. You can then direct the overflow from these containment systems to a rain garden.

(Warnings)

- Always check with your local utility providers to determine the location of buried utility cables before digging. Electrocution and loss of services can result from severing these cables.
- Native plants are the best choice for your garden, but in most cases it's harmful or illegal to dig them in the wild, so buy them from a nursery. If, as is often the case, native plants are not available, many suitable plants can be vegetatively propagated.
- Areas without sufficient precipitation will not be able to sustain a rain garden.
- Water boards in some states have specific laws prohibiting the collection and storage of rain water for any use. Check first to avoid legal action and/or large fines.
- Always check for underground electrical cables

(Examples)

AMBLER PENNSYLVANIA RAIN GARDEN CONSTRUCTION (PHOTOS COURTESY OF AMBLER EAC):



OTHER REGIONAL EXAMPLES (PHOTOS COURTESY OF RAIN GARDENS FOR THE BAY):



WILMINGTON, DE



AMBLER, PA



LIMA, PA



MIDDLETOWN, DE



RED LION, PA



BERWYN, PA

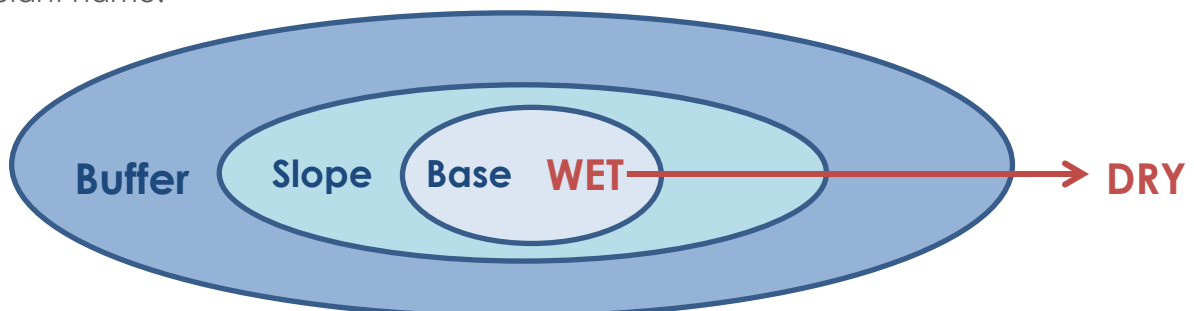
(Plant Guide)

Native plants are an essential element of rain gardens. Native Plants are plants that occur in the region in which they have evolved. Over a long period of time they become uniquely adapted to the climate, soils, rainfall, and seasons of their home region. They are integrated into the local “web of life”, often serving as shelter and food sources for native birds, butterflies, and other wildlife species. They are also often more resistant to predatory insects and diseases than non-native species.

Because of their adaptability and benefits, native plants are an essential element of any landscaping project including rain gardens. Though not a definitive guide to all the plants that can be used in a rain garden, we offer below some recommendation based on plant lists developed by local experts (see Resources). The recommendations are sorted by plants best used on the bottom wetter part of the rain garden, the wet-to-dry side slopes, and the often dryer rain garden buffer.

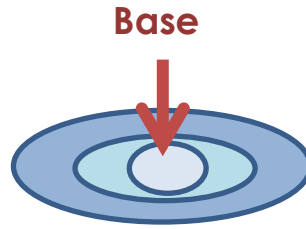
There are many plant guides online, and any plant can also be searched on the internet to see if it is native to the region. The online USDA Plants Database (<http://plants.usda.gov/>) is a helpful resource if there is uncertainty about a certain plant's native status.

In this guide, certain plants are meant for ground cover and are marked by “GC” after the plant name.



The different moisture “zones” associated with a rain garden based on New Jersey’s Rain Garden Manual created by the Rutgers Cooperative Extension’s Water Resource program

(Base)



WILDFLOWER AND FERNS

- a) Great blue lobelia (*Lobelia siphilitica*)
- b) Blueflag Iris (*Iris Versicolor*)
- c) Boneset (*Eupatorium perfoliatum*)
- d) Cardinal Flower (*Lobelia cardinalis*)
- e) Monkey Flower (*Mimilus ringens*)
- f) Royal Fern (*Osmunda regalis*) GC
- g) Swamp Milkweed (*Asclepias incarnata*)
- h) Turtlehead (*Chelone glabra*)

TREES AND SHRUBS

- i) Buttonbush (*Cephalanthus occidentalis*)
- j) River Birch (*Betula nigra*)
- k) Swamp white oak (*Quercus bicolor*)
- l) Green ash (*Fraxinus pennsylvanica*)
- m) Silky dogwood (*Cornus amomum*)
- n) Sheep laurel (*Kalmia angustifolia*)

Base Plants



a



b



c



d



e



f



g



h



i



j



k



l

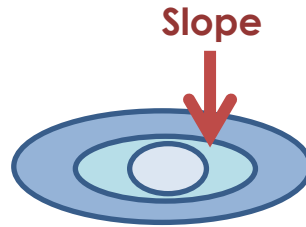


m



n

(Slope)



WILDFLOWER AND FERNS

- | | |
|--|---|
| a) Cinnamon Fern (<i>Osmunda cinnamomea</i>) GC | b) White wood aster (<i>Aster divaricata</i>) |
| c) Sensitive Fern (<i>Onoclea sensibilis</i>) GC | d) New England aster (<i>Aster novae-angliae</i>) |
| e) Columbine (<i>Aquilegia</i>) GC | f) Mayapple (<i>Podophyllum peltatum</i>) GC |
| g) Joe pye-weed (<i>Eupatorium purpureum</i>) | |

TREES AND SHRUBS

- | | |
|---|---|
| h) Red maple (<i>Acer rubrum</i>) | i) Whiteberry holly (<i>Ilex verticillata</i>) |
| j) Serviceberry (<i>Amelanchier Canadensis</i>) | k) Red chokeberry (<i>Photinia pyrifolia</i>) |
| l) Ninebark (<i>Physocarpus opulifolius</i>) | m) Highbush blueberry (<i>Vaccinium corymbosum</i>) |

Slope Plants



a



b



c



d



e



f



g



h



i



j



k



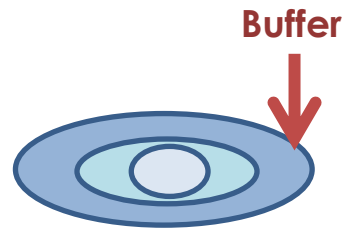
l



m

Additional photo credits: e. Gary A. Monroe , b. Elaine Haug

(Buffer)



WILDFLOWER AND FERNS

- a) Black-eyed susan (*Rudbeckia hirta*)
- b) Butterfly milkweed (*Asclepias tuberosa*)
- c) Horsefly weed (*Baptisa tinctoria*)
- d) Beardtongue (*Penstemon digitalis*)

TREE AND SHRUBS

- e) Arrowwood (*Viburnum dentatum*)
- f) Lowbush blueberry (*Vaccinum angustifolium*)
- g) Redbud (*Cercis Canadensis*)
- h) White oak (*Quercus alba*)
- i) Witchhazel (*Hamamelis virginiana*)
- j) Hackberry (*Celtis occidentalis*)

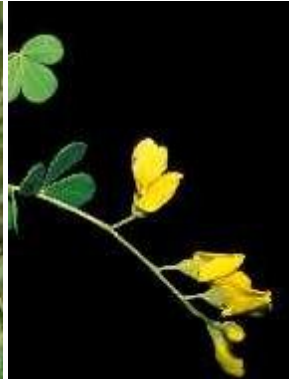
Buffer Plants



a



b



c



d



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g



h



i



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Additional photo credits A. Martin van der Grinten, B. Larry Allain, c. Thomas J. Barne, e. Smithsonian institution, f. Larry Allain

(Other Plants)

WILDFLOWERS:

- a) Wild ginger (*Asarum canadense*) GC
- b) New York ironweed (*Veronia noveboracensis*)
- c) Virginia bluebells (*Mertensia virginica*)
- d) Blue vervain (*Verbena hastata*)

TREES AND SHRUBS:

- e) New Jersey tea (*Ceanothus Americana*)
- f) Sweetfern (*Comptonia peregrina*)
- g) Spicebush (*Lindera benzoin*)
- h) Hornbeam (*Ostrya virginiana*)
- i) Tulip poplar (*Liriodendron tulipifera*)

GRASSES:

- j. Switchgrass (*Panicum virgatum*)
- k. Little bluestem (*Schizachyrium scoparium*)
- l. Big bluestem (*Andropogon gerardii*)

OTHER PLANTS



a



b



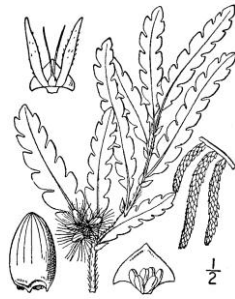
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Additional photo credits : e, h Larry Allain, g,i Jeff McMillian

(Resources)

- [WIKIHOW CREATE A RAIN GARDEN](http://www.wikihow.com/Create-a-Rain-Garden) [HTTP://WWW.WIKIHOW.COM/ CREATE-A-RAIN-GARDEN](http://www.wikihow.com/Create-a-Rain-Garden)
- [Rutgers Cooperative Extension](http://water.rutgers.edu/Rain_Gardens/RGWebsite/rginfo.html)
http://water.rutgers.edu/Rain_Gardens/RGWebsite/rginfo.html
- [Buy Plants for Rain Garden:](http://realpalmtrees.com/knowledge-base/world-plant-cold-hardiness-zones/comparison-charts-usda-zones-and-palm-trees/) <http://realpalmtrees.com/knowledge-base/world-plant-cold-hardiness-zones/comparison-charts-usda-zones-and-palm-trees/>
- [Rain Garden Design and Construction, Northern Va Soil & Water Conservation District:](http://www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf)
<http://www.fairfaxcounty.gov/nvswcd/raingardenbk.pdf>
- [U.S. Environmental Protection Agency \(EPA\):](http://cfpub.epa.gov/npstbx/files/cwc_raingardenbrochure.pdf)
http://cfpub.epa.gov/npstbx/files/cwc_raingardenbrochure.pdf
- [U.S. Geological Survey \(USGS\):](http://wi.water.usgs.gov/non-point/bqy21/index.html) <http://wi.water.usgs.gov/non-point/bqy21/index.html>

For More Information Contact

Krista Schierer- Montgomery County Conservation District
kscheirer@montgomeryconservation.org
610-489-4506

Mary Ellen Noonan-Bucks County Conservation District
Maryellennoonan@bucksccd.org
215-345-7577

Penn State Extension: College of Agricultural Sciences
610-489-4315

Susan Curry- Ambler EAC
suscurry@comcast.net
215-591-1551

Christopher C. Obropta, Ph.D., P.E- Rutgers Cooperative Extension, New Jersey Agricultural Experiment Station
obropta@envsci.rutgers.edu
848-932-5711

Paul Racette or Susan Myerov- Pennsylvania Environmental Council
pracette@pecpa.org,
smyerov@pecpa.org
215-545-4570

