

Landscapes for Maine

Adding a Rain Garden to Your Landscape

PHOTO: EDWIN REMSBERG, USDA-CSREES

Bulletin #2702

What Is a Rain Garden and Why Would You Want One?

A rain garden is a depression in the ground that is planted with water-loving native perennials and shrubs. Water from a downspout or other source flows into the rain garden, where it soaks into the ground and is used by the plants.

Rain gardens make sense

Rain gardens help protect the water quality in our lakes, streams, and rivers by reducing the amount of polluted runoff reaching these resources. If designed and installed correctly, rain gardens reduce the amount of runoff from hard, impervious surfaces by up to 98 percent. As this water is no

longer running over the surface of the land, it cannot transport pollutants to nearby streams via surface runoff or storm drains.

Rain gardens are easy and inexpensive to install and maintain. Since they are flexible in size, shape, and appearance, they can fit into almost any landscape and lifestyle.

Rain gardens are beautiful

In addition to adding beauty to lawn areas with height and color, rain gardens can replace lawn areas, which would otherwise need mowing, with an interesting combination of native plants. Rain gardens can also eliminate unsightly erosion problems on your property by reducing excess water from rooftops or driveways. They can

complement any home style, as there are many choices of shapes and plants that can be incorporated into your garden. Rain gardens can even attract birds and butterflies!

Do rain gardens harbor mosquitoes?

A properly constructed rain garden will *drain* water, not hold it. In a well-designed rain garden, water will soak into the ground in a day. Mosquitoes will not survive in areas that dry out in seven days or less after a summer rain, because the development of a mosquito from egg to adult takes longer than seven days.

Planning for Your Rain Garden

Choose a location

Follow these placement guidelines to help make the rain garden more enjoyable for you and your neighbors:

- Remember that the purpose of the rain garden is to put water into the ground! Place your garden at least ten feet

How rain gardens remove pollutants

Pollutant Removal Mechanism	Pollutants Removed
Absorption to soil particles	Dissolved metals and soluble phosphorus Small amounts of nutrients including phosphorus and nitrogen
Microbial processes	Organics, pathogens
Exposure to sunlight and dryness	Pathogens
Infiltration of runoff	Minor abatement of localized flooding, minor increase in localized base flow of groundwater, allowing some nutrients to be removed when groundwater flows through buffer
Sedimentation and filtration	Total suspended solids, floating debris, trash, soil-bound phosphorus, some soil-bound pathogens

Brix, H. "Wastewater treatment in constructed wetlands system design, removal processes, and treatment performance." In *Constructed Wetlands for Water Quality Improvement*, ed. G.A. Moshiri, 9–22. Boca Raton, FL: CRC Press, 1993. Adapted in W. Hunt and N. White, *Designing Rain Gardens*. NC State University Cooperative Extension, 2001. <http://www.engr.uga.edu/service/outreach/Stormwater%20BMP/BioretenionOverview.pdf>

away from your foundation in order to avoid water seepage in your basement.

- Do not place a rain garden over a septic tank or leach field.
- Do not place a rain garden near your drinking water well.
- Be aware of and avoid underground pipes and utilities. If you don't know where they are, call Dig Safe® at 1-888-DIG-SAFE (344-7233) at least three days before digging. Outline the proposed area with white paint. Dig Safe® will automatically notify all of its member utilities (gas/oil/steam, electric, communications, water, and sewer) that own underground facilities in the area of the excavation so that they can mark their facilities.
- Check for any private wiring or underground utilities. Look around for lights in the yard, such as spotlights on flagpoles or signs, lights at the end of the driveway, and sheds with electricity.
- Place the rain garden in a flat area if possible to make installation easier.
- Do not place the rain garden in a naturally wet area. Wet spots may seem ideal, but they will drain too slowly.
- Avoid trees and tree roots, as they may be injured by nearby digging and may not tolerate additional moisture in the soil.
- Maine has mandatory protective Shoreland Zoning regulations. If you are working

on lakefront, stream front, or coastal property, contact your local code enforcement officer before you begin. If you live in Maine's unorganized territory, contact the Land Use Regulation Commission (LURC) at 207-287-2631.

Determine how big your rain garden should be

For best water quality treatment benefits, the rain garden should hold the water from a one-inch rainstorm. An easy way to ensure this is to make the rain garden 30 percent of the drainage area. To calculate that volume, figure out the size of the rooftop, driveway, or other impervious surface that will drain into your garden in square feet, and make the garden area 30 percent of that area. For example, a 1000-square-foot rooftop would require a 300-square-foot rain garden.

You can make the rain garden larger than 30 percent of the drainage area, or as small as 20 percent. Simply use 30 percent as a guideline.

Decide how to channel the water

How you direct water from the downspout, driveway, or other hard surface to the rain garden is a matter of choice. Some common methods include gutter extensions, piping, and ditches.

Gutter extensions are simply metal gutter pipes attached to the ends of your downspouts. They must be angled downward slightly for the water to flow. The advantage of gutter extensions is that they are easy to install. However, some people find them

unsightly. You may prefer to carry your water underground via plastic or PVC pipe.

Grass-lined shallow ditches, or *swales*, can be used to direct water to the rain garden. These ditches should be gently sloped to avoid erosion. The side slopes of the ditch should be no steeper than a 2:1 ratio (a one-foot rise for every two feet across).

If you expect heavy flows of water (e.g. from a large driveway area), a rock-lined ditch is advisable. Line the ditch with landscape fabric in order to prevent it from eroding.

Stabilize the area where the water enters your rain garden with stone to prevent erosion of the rain garden. Watch this area carefully during the first few rainstorms following installation.

I have a lot of standing water on my property. Can I still have a rain garden?

Rain gardens are designed to infiltrate water. Standing water indicates poor infiltration, and we do not recommend directing additional water to these naturally wet areas.



Plan ahead for grass removal

If the rain garden is located in an existing lawn, you may want to kill the grass before digging. This takes some forethought, as you will need to lay black plastic or a tarp on the lawn until the grass dies (doing this over the winter works best).

Do NOT use a weed killer such as Roundup® to kill grass. You can always simply remove the sod as you excavate the garden, and use it elsewhere if possible.

Estimate your cost

The cost will depend on how much work you decide to do yourself. If you do all of the work—digging the garden, buying the plants, planting, and mulching—your costs will range from three to five dollars a square foot. If you hire a landscaper to do some or most of the work, such as design work, excavation, or planting, the total cost could approach ten to fifteen dollars a square foot.

Designing Your Rain Garden

Determine shape and placement

Once you have calculated the size of your rain garden, determine a general shape, and position the garden within your landscape. Have fun, and explore two or three options before making a final design decision.

Rain gardens can be circular, kidney-shaped, or long and narrow. The shape of the garden depends on your wants and needs. Just remember that a

central portion of the garden must be six inches below the grade of the surrounding land in order to temporarily hold water. Gently slope the garden to this lowest point to avoid erosion within the garden. A one-inch drop for every foot across is a good rule of thumb. For a 300-square-foot rain garden, choices include a circular garden with a 20 foot diameter, or a longer, narrower garden approximately 10 feet by 30 feet.

Remember that rain gardens on slopes will need to be dug more deeply into the high side of the slope to produce a level bottom. You will need to build a *berm*, or hump, on the lower end to keep the water in the garden.

The design stage provides an opportunity to get creative. While thinking about the shape of the garden as well as the color, shape, and height of the plants, consider adding elements such as stone or fencing, or set a bench nearby. Personalize your garden!

Select plants for your design

When selecting plants, consider

- zone hardiness,
- sunlight needs,
- moisture needs,
- soil type needs,
- height and width,
- color,
- texture, and
- whether they are native.

Is your site shady or sunny? Remember that it takes more than six hours of sunlight to be considered “full sun.” Choose plants that will perform well in the light you have available. Choose water-loving plants for

the lowest portion of the rain garden, and dry-tolerant plants for the edges.

Use native plants whenever possible. Native plants will survive better in our environment. For help selecting native plants that meet your light, moisture, and height requirements, consult our bulletin #2500, *Gardening to Conserve Maine’s Native Landscape*. This bulletin specifies the light and moisture needs and eventual height of native perennials and

Buying your plants

Buy plants with healthy root systems. The healthier the root system, the quicker your plants will become established. Use only nursery-propagated plants or those from your own garden. DO NOT collect plants from the wild. If you buy bare-root perennials, be sure to keep the roots moist until you plant them.

“Plugs” will get you more plants for less money. These small-sized seedlings grown in trays take longer to fill in the space in your garden, but plugs can help keep costs down.

Most reputable nurseries have selections of native plants. If you are unsure, ask nursery staff! They are very knowledgeable, and will often have other suggestions if a particular plant is not available. Also, asking for native plants may convince nurseries to offer more of them. For sources of native plants, consult our bulletin #2502, *Native Plants: A 2002 Maine Source List* (see *Resources* section).

Plan ahead. Nurseries will have a larger selection in the spring than at the end of the summer. You may have to visit multiple nurseries if you want a large number of a particular plant.

shrubs. Plants designated “H” (hydric) will do well in the lowest, wettest areas of the rain garden, while “M” (mesic) to “S” (sub-eric) will do well in the drier areas.

Another good resource is *The Buffer Handbook Plant List*, which indicates whether plants will do well in wet, moist, or dry conditions, and includes native as well as noninvasive, nonnative plants. (See *Resources* section for both publications.)

Installing Your Rain Garden

Avoid wet conditions

Be sure to install your rain garden when the soil is dry. If you disturb wet soils, you compact the soil to the point that water can no longer infiltrate – which will defeat the entire purpose of a rain garden!

Dig your garden

Soil mix matters

The rain garden should allow water to easily seep into the ground. If your soil is mostly clay, you may need to amend the soil to make it more permeable. A recommended soil mix is 50 to 60 percent sand, using native soil for the remainder. Adding up to 20 percent compost in place of native soil will enhance initial plant growth, and high-clay soils will need even higher amounts of compost, organic matter, or topsoil to increase soil permeability.



Once you know the size, shape, and location of the rain garden, it’s time to get your hands dirty! If you do all the work yourself, it may take the better part of a day. Consider inviting friends to make the work faster and more fun.

First, delineate the outline of the rain garden on the ground. You can use a garden hose, string, or spray paint. Be flexible. Even the most carefully sketched plan may need to be adjusted to fit the area.

If you have not already killed the grass in your garden area with a black plastic or other covering, you will need to remove the sod as you excavate the garden. Do NOT use a weed killer such as Roundup® to kill the grass.

Try not to compact the soil as you dig the rain garden. Work from one side to the other side, or from the center to the outside, so you don’t pack down the soil.

Loosen the soil at least two feet deep. Even though the garden will only be six inches deep in the center, loosening the soil will help your plants establish root systems in this new environment. Now is the time to add compost or other soil amendments if needed.

Use extra soil to create a berm on the downslope side of the garden. The berm will act as a wall to hold water in the garden during storms. Make the berm three to six inches high and eight to twelve inches wide, with gently sloping sides. Taper it off as it wraps around to the inlet of the rain garden. Now stomp on it! This soil needs to be compacted to hold the water in the garden before it soaks into the ground.

Cover the berm with grass or mulch to prevent erosion. If you seed the berm, use straw to prevent it from eroding until the grass takes hold.

Plant your rain garden

This is the fun part!

Set your plants out in the garden to match your design. Now you can adjust the position of the plants, if necessary, before you start planting. If possible, keep the plants in their pots to prevent them from drying out before they are planted. Wrap bare-root plants in wet newspaper until planting.

Remember that you don’t want to compact the soil. Work from one side of the garden to the other to reduce the amount of foot traffic in the garden. If you think that you have packed the soil down too much, use a rake to loosen it.

Dig each hole twice as wide as the pot and deep enough to keep the crown of the plant level with the ground. Make sure your plant is level, then fill the hole with soil and pack the soil around the plant to remove any air pockets.

Water immediately after planting. Giving the plants a good soaking will give your rain garden a good start. Use a watering can if possible: a high-pressure blast from a hose will push soil away from the plant and keep the water from soaking in, doing more harm than good. Water the new plants before adding mulch to ensure that the maximum amount of water reaches the roots.

Mulch your garden

The value of mulch is often overlooked. Mulch is important in any garden to keep plants moist and discourage weeds. Layering sheets of newspaper around the plants before adding mulch will provide an added weed barrier.

Apply a three- to four- inch layer of mulch to your rain garden. Be sure to keep the mulch away from the crown of each plant. Add some additional mulch each year for a few years, until the plants have matured, so the soil does not dry out too quickly. After a few years, mulch is not necessary, unless you prefer its more formal appearance.

How much mulch will you need? A cubic yard¹ of mulch will cover a 100-square-foot area with about three inches of mulch.

With the exception of bark chips and artificially colored mulches, you can generally use any type of mulch that will stay in place and retain moisture. Bark chips don't work because they tend to float away in rain gardens, and artificially colored mulch will leach color into the soil. We have used Superhumus and Erosion Control Mix—blended products from earthlife™—in our test rain gardens with success. If you are unsure, ask your nursery professional.

Nurseries sell mulch by the bag and by the cubic yard. If you don't have access to a truck, most nurseries will deliver for a nominal fee.

Maintaining Your Rain Garden

Watch your rain garden the first time it rains. Where does the water go? Does it pond where you intended it to? Or are the moisture-loving plants left high and dry? Does the force of the water erode the mulch and soil at the entrance to the rain garden? Use the first few storms to evaluate your garden. If the contours need to be adjusted, use a rake or shovel as needed. Strategically placed rocks can slow the force of the water.

If you have used shallow ditches or swales to direct water to the rain garden, inspect these ditches often to be sure that the bottoms are not eroding. Keeping the side slopes of the ditches no steeper than 2:1 (for every two feet across, a one-foot rise) will help prevent erosion.

Keep in mind that during the first year, especially during the dry summer months, you may need to water the rain garden so that the plants can get established. Use a rain gauge to keep track of the rainfall. Your rain garden will need one to two inches of water per week the first year.

Frequent weeding will be necessary in the first few years before plants become established. In order to distinguish between weeds and young plants, consider adding plant labels next to each plant.

Once the plants mature and become established, maintenance of a rain garden is nothing more than routine landscape

maintenance: weeding, pruning, plant replacement, mulching, and supplemental watering during dry spells.

While some people trim dead stems and leaves from their perennials before winter, you can leave them over the winter to provide food for birds and wildlife. Once new growth appears in the spring, remove the dead stems and leaves.

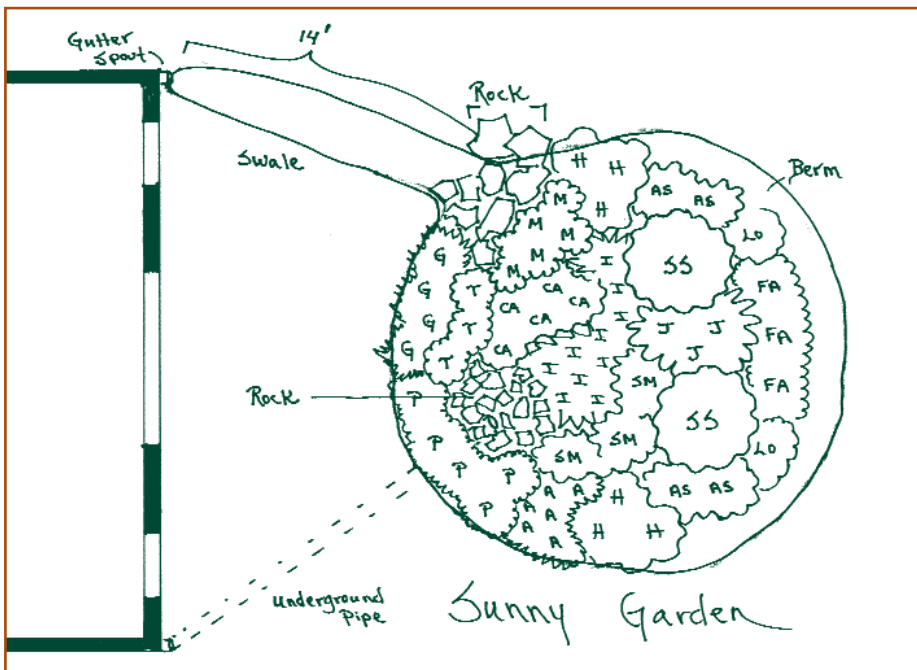
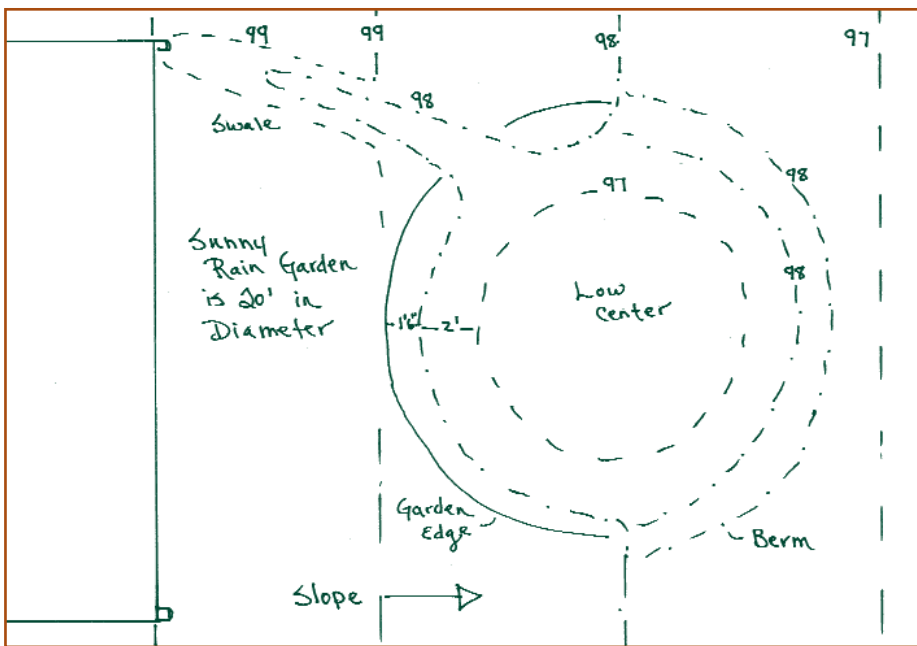
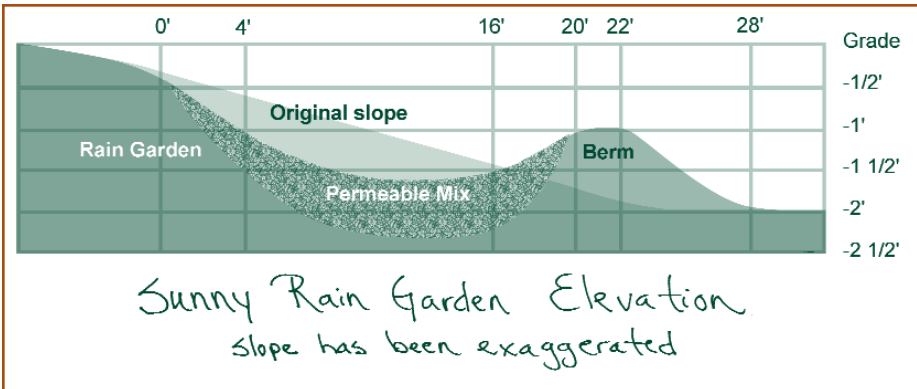
Solving plant problems

Here are some considerations if your rain garden plants fail to thrive:

- ◆ New plants need a consistent supply of water until their roots are established—even though your rain garden catches stormwater. Your rain garden will need one to two inches of water per week during the first year.
- ◆ Consider the location of each plant within the garden. Some plants will not tolerate having their roots dry out, while others do not like them to be moist all the time.
- ◆ Double-check the hardiness zone rating of your plants. If you end up replacing plants, choose plants rated for a colder zone than yours, to ensure that they can survive the very coldest temperatures they might experience.
- ◆ Make sure that you have used plants well suited to the light levels and light duration of your garden's location.

¹ 27 cubic feet, or about what will fit in the back of a pickup truck

Example of a Sunny Rain Garden Design



Plant List for a Sunny Rain Garden

Plants for the wetter center of the garden:

Woody shrubs:*

SS: *Clethra alnifolia*, summersweet. 5–6'H x 4–6'W. Late-to-emerge foliage. Fragrant, large, white flower stalks in summer.

Perennials:**

CA: *Lobelia cardinalis*, cardinal flower. 2–4'H x 1'W. Bright red flowers from July to September.

T: *Asclepias tuberosa*, orange butterfly weed. 2–3'H x 2–3'W. Can handle dry areas. Orange blooms from June to September.

I: *Iris versicolor*, blue flag iris. 2–4'H x 2–4'W. Blue flowers in spring.

M: *Caltha palustris*, marsh marigold. 8"H x 1'W. Glossy heart-shaped leaves with bright yellow flowers in the spring.

J: *Eupatorium maculatum*, joe-pye weed. 3–5'H x 1–2'W. Red stems, purple-red flowers from July to September.

SM: *Asclepias incarnate*, swamp milkweed. 2–3'H x 2–3'W. Will not tolerate drought. Showy, flat, reddish flowers from July to October.

Plants for the dryer outer edge of the garden:

Woody shrubs:*

P: *Potentilla arguta*, tall cinquefoil. 1–3'H x 1–3'W. Thick leaves and many white flowers all summer.

Perennials:**

G: *Geranium maculatum*, wild geranium. 1–2'H x 2'W or more. Purple flowers in the late spring and sometimes again in the fall. Pretty foliage.

A: *Anemone canadensis*, windflower. 2'H x 10"W. Pure white blossoms in June. Large, attractive leaves.

LO: *Lobelia spicata*, spiked lobelia. 3–5'H x 3–5'W. Blue flowers from June to August.

FA: *Symphyotrichum umbellatus*, flat-topped aster. 3–7'H x 3–7'W. White to yellowish-centered flowers in the fall.

AS: *Symphyotrichum novae-angliae*, New England aster. 3–7'H x 3–7'W. Purple flowers in the fall.

H: *Helenium autumnale*, perennial sunflower. 3–5'H x 2–3'W. Lots of yellow flowers in the fall.

***Woody shrubs:** Though they may shed their leaves, the woody structure of these plants will provide winter interest in the garden.

****Perennials:** These plants die over the winter and sprout new shoots in the spring. Sometimes some of last year's foliage will survive the winter, but generally you should trim off the dead foliage in late fall and wait for the green growth of spring.

Plant List for a Shady Rain Garden

Plants for the wetter, shadier center of the garden:

Woody shrubs:*

- HV:** *Hamamelis vernalis*, vernal witch hazel. 6–10'H x 6–10'W. Showy golden yellow fall color. Long-lasting, scented yellow flowers in the late winter.
- RH:** *Rhododendron canadense*, rhodora (native rhododendron). 1–3'H x 1–3'W. Showy purple flowers in the spring. Tolerates wet, acidic soil.
- LE:** *Ledum groenlandicum*, Labrador tea. 1–3'H x 1–3'W. Showy white flowers in late spring, tolerates wet feet.
- IV:** *Ilex verticillata*, winterberry. 6–8'H x 6–8'W. Plant a male and female to take advantage of showy orange berries that persist all winter long.

Perennials:**

- RF:** *Osmunda regalis*, royal fern. 2–5'H x 2–5'W. Large, showy fern. Needs moisture! You must keep this plant watered if you are experiencing low rainfall.
- C:** *Aquilegia canadensis*, native columbine. 1–2'H x 1–2'W. Showy red and yellow flowers in spring. Sometimes blooms again in autumn. Beautiful foliage.
- S:** *Onoclea sensibilis*, sensitive fern. 2'H x 18"W. Soft, green fern. Thrives in moist areas.
- CA:** *Lobelia cardinalis*, cardinal flower. 2–4'H x 1'W. Bright red flowers from July to September.

Plants for the dryer outer edge of the garden:

Woody shrubs:*

- W:** *Comptonia peregrina*, sweetfern. 2–4'H x 2–4'W. Rickrack-shaped leaves are heavily scented when crushed. *Comptonia* should be purchased in sod form as it is difficult to establish individual plants. Tolerates sandy, dry, rocky soil.
- AR:** *Arctostaphylos uva-ursi*, bearberry. 6–12"H x 1-2'W. Shiny evergreen leaves turn bronze in the fall. Small white to pink flowers in the early spring, bright red berries in late summer that persist through winter. Tolerates sandy, dry, rocky soil.

Perennials:**

- G:** *Geranium maculatum*, wild geranium. 1–2'H x 2'W or more. Purple flowers in the late spring and sometimes again in the fall. Pretty foliage.

***Woody shrubs:** Though they may shed their leaves, the woody structure of the plant will provide winter interest in the garden.

****Perennials:** These plants die over the winter and sprout new shoots in the spring. Sometimes some of last year's foliage will survive the winter, but generally you should trim off the dead foliage in late fall and wait for the green growth of spring.

Example of a Shady Rain Garden Design

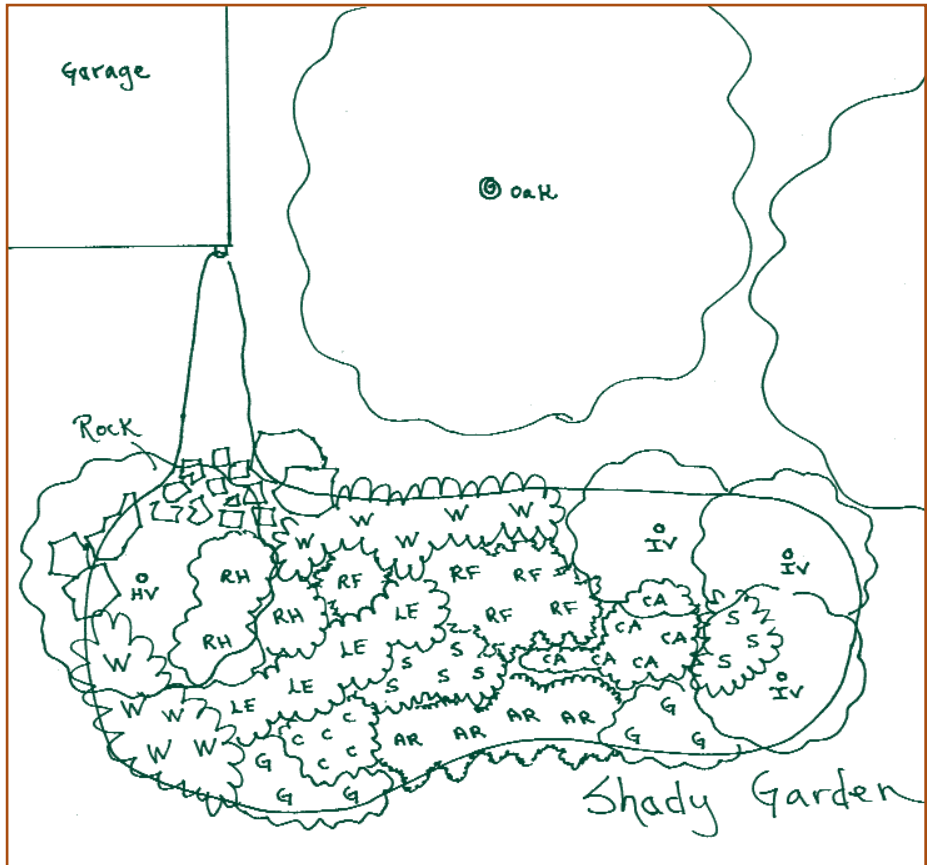


PHOTO: EDWIN REMSBERG, USDA-CSREES

Resources

Native plant lists from the Portland Water District and the Maine Department of Environmental Protection: part of the *Conservation Practices for Homeowners* fact sheet series. Available at <http://www.pwd.org/news/publications.php>.

Native Plant List; Part/Full Shade, Dry Soil, DEPLW0777, May 2006.

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Landscapes for Maine bulletins from UMaine Cooperative Extension. Available at www.umext.maine.edu or by calling 800-287-0274 (in Maine):

Designing Your Landscape for Maine, bulletin #2701 (Orono, ME: 2005).

Gardening to Conserve Maine's Native Landscape: Plants to Use and Plants to Avoid, bulletin #2500 (Orono, ME: 2003).

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