Rain Gardens to the Rescue

Absorbing stormwater runoff...and student interest!

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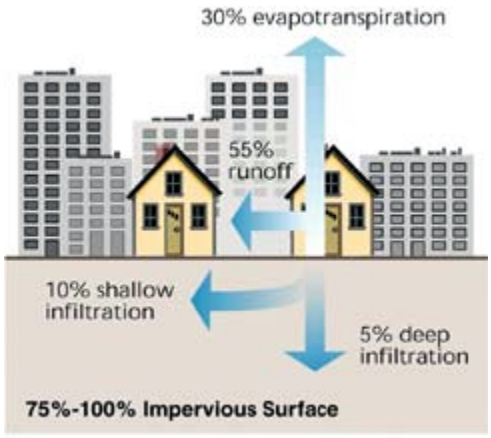
Also known as a bioretention system, a rain garden is a landscape feature planted in a shallow depression designed to capture stormwater runoff. Once collected, stormwater is slowly absorbed into and filtered by the soil. As a result, rain gardens decrease the amount of water and pollutants entering municipal drainage systems and natural waterways. More than a functional solution to a landscaping problem, a rain garden can be an attractive focal point in the landscape, serve as wildlife habitat, and provide an exciting outdoor laboratory. With tasks from soil drainage anaylsis and calculating stormwater volume to choosing plants and monitoring the performance of the rain garden, this project provides students with the opportunity to use their skills and knowledge to solve a real-world problem.

Just like any school garden, your rain garden will be unique. Each one varies greatly in size and shape depending on the needs of the site and the environmental conditions (annual rainfall, soil type, topography, plant life, and so on). You can use a wide variety of planting material, ranging from small herbaceous perennials to large shrubs and trees, but deep-rooted native species adapted to fluctuating water levels and local weather conditions are the best choice.

It's important to realize that a rain garden is not a water garden or pond. Whereas a pond holds water all the time and can support aquatic plant and animal species, a rain garden is more like a sponge. Although water pools as runoff collects, the soil in a rain garden will absorb it within two to four days – an important characteristic that prevents it from becoming mosquito-breeding site. Because of its excellent drainage, the soil in a rain garden may actually become quite dry.

Benefits of Rain Gardens

Your students are probably familiar with the water cycle, and that in natural environments, rain falls directly onto vegetation and is evenly distributed over the land's surface. Plants slow the velocity of raindrops and the pace at which they reach the soil, aiding absorption (approximately 50 percent of the rain will be absorbed by the soil) and decreases runoff (approximately 10 percent of rain will run off to local water ways). But in suburban and urban settings where rain is hitting impervious surfaces, water moves to areas where it can be absorbed, or it collects in low spots. As little as 15 percent of the water may be absorbed where it falls and up to 55 percent will run off. Not only does this result in lower groundwater reserves, which endangers drinking water supplies and can ultimately cause cities to sink (subsidence), it also creates a significant amount of water aboveground that has to go *somewhere*. To prevent flooding of houses and roads, cities install drainage systems to move stormwater to municipal water treatment facilities or to streams, lakes, and rivers. (The National Resources Conservation Service provides an excellent graphic of the urban water cycle to help illustrate these principles — click here to download.)



Although rain contributes greatly to recharging local waterways, runoff from urban environments "scrubs" impervious surfaces, picking up pollutants such as oil, fertilizers, insecticides, and bacteria. These substances can kill water life and interfere with the delicate balance of the aquatic ecosystem. Scientist estimate that 70 percent of the pollution in streams, rivers, and lakes is from stormwater runoff.

To decrease the amount of runoff flowing directly into local waterways, some is diverted into treatment facilities to remove the contaminants and then deposited into waterways or drinking supplies. But it's not feasible for treatment facilities to catch and process *all* stormwater. Thus we turn back to nature for a solution. Here's a list of benefits provided by rain gardens:

- decreased amounts of polluted storm water runoff reaching local streams, rivers and lakes
- increased absorption of water to recharge ground water supplies
- filtration of pollutants by soil and plants helps improve water quality in groundwater supplies
- installation is less expensive than other drainage techniques

- improvement of the landscape with attractive plantings and a low-maintenance alternative to lawns
- creation of a habitat for birds, butterflies, and other creatures

We've developed a couple of lessons and offer links to others to make the design, installation, and monitoring process a rich context wherein students can exercise their academic skills. You'll find references to these as you continue through the next section.

Creating a Rain Garden

1. Site it. Observe the landscape during a rainy period to determine the natural runoff patterns. In order to capture rainwater, the garden must be planted downslope from buildings and other surfaces that increase storm water runoff, but up slope from municipal storm drains and natural waterways. If you don't find a good spot along the current routes of runoff, you may need to install drains to help move the water to your site. Locate the garden at least 10 feet away from building foundations and away from septic systems. Also, avoid mature trees because digging the garden could cause serious damage to their root systems.

2. Check and correct drainage. Once you identify a possible site, test soil drainage. (The first lesson, The Right Spot for a Rain Garden walks you through the process.) If you find the soil in your prospective site is not very absorbent, you may want to look for a better location. Another alternative is to amend or replace the soil to increase its water filtering capacity. Ideal rain garden soil is comprised of 20 to 25 percent leaf mulch or compost, 50 percent sandy soil, and 25-30 percent topsoil.

3. Design time! As mentioned earlier, gardens can vary greatly in size, shape, and plant material. In the second lesson, The Right Size for a Rain Garden, students can determine one of these variables: the volume of runoff on your site, and the square footage required to handle it.

Below are some general guidelines provided by the Virginia Department of Forestry regarding design elements and considerations.

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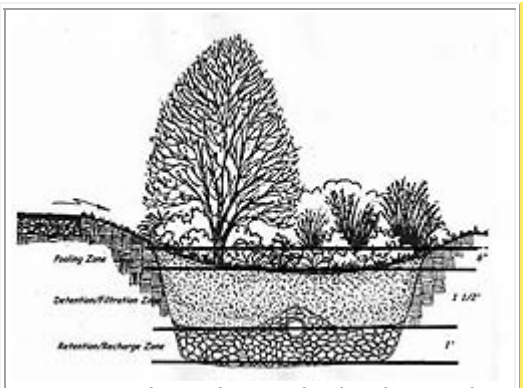
- A ponding area or depression helps capture runoff. It should be shaped like a saucer – with the middle deeper than the edges. The grading between the middle and edges (generally six inches) should be gradual so that water is spread as evenly as possible throughout the garden. Edges are usually drier than the middle, so choose and site plants accordingly.


Cross-section of a typical rain garden
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- Avoid compacting the soil during planting and maintenance because it will decrease its drainage capacity. Lay down planks, which spread your weight over a larger area, to provide a walking and work surface.
- Tough plants that can tolerate extreme wet and dry conditions are required. Although native plants are not a requirement, they are usually a good choice because they are adapted to local environmental conditions and are easy to care for. Choose plants with deep roots – they improve soil structure and aid in water absorption.
- Mulch protects the soil from erosion and moderates extreme wet and dry conditions. Shredded bark mulch is best because it does not wash away as easily as bark chips, which tend to be lightweight.
- A grass buffer strip around the garden slows the speed at which the runoff enters the garden, decreasing soil erosion.
- A berm of soil or rocks built at least six inches tall helps to keep the runoff in the garden long enough to allow absorption. Grade the site so that, in the off chance your garden does overflow, the runoff will head to storm drains rather than towards structures.

4. Dig in. Once you've chosen your location, call your local utilities hotline and ask them to mark any underground utility lines on the property. Avoiding these marked areas, cultivate the soil, with a tiller or by hand, to a depth of 1 to 2 feet to break up any existing soil compaction.

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