

Projects Manual

Environmentally-Friendly Landscapes for Healthy Watersheds



Rain Gardens • Conservation Landscapes • Pavement Removal • Dry Wells
Permeable Pavers • Rain Barrels & Cisterns • Green Roofs • Canopy Trees



RainScapes Projects Manual

Table of Contents

RainScapes Overview	3
Rain Barrels and Cisterns.....	10
Conservation Landscaping Techniques.....	16
Dry Wells.....	24
Green Roofs.....	29
Permeable Pavers	33
Pavement Removal.....	38
Rain Gardens.....	44
Tree Canopy.....	55



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Overview

The RainScapes Program



RainScapes are watershed-friendly ways to reduce rainfall runoff. The County's

RainScapes Program provides information and guidance to County property owners who are interested in protecting the environment. When it rains in Montgomery County, some of the water soaks in the ground. Unfortunately, most of that stormwater flows across hard surfaces like driveways, roofs and patios collecting pollution along the way, and reaching our streams. Runoff from hard

surfaces can account for 60 percent of the stormwater runoff in some areas. Runoff enters the County storm drain (a.k.a. storm sewer) system, and then enters our streams causing damage to the streams and ultimately the Bay by causing erosion, and mixing in other pollutants such as trash, nutrients and pet waste.

RainScapes projects are designed to slow the runoff, and reduce the amount of runoff and pollutants entering our streams. Stormwater that soaks into the ground is filtered by the soil and replenishes groundwater and stream levels, and keeps our streams healthy and able to support a wide

range of functions. Additional environmental benefits of these projects include reduced energy and water consumption and improved air quality in our suburban landscape.

The Montgomery County Department of Environmental Protection (DEP) is offering rebates to encourage property owners (residential, commercial, and private institutional) to reduce runoff from their properties by using RainScapes techniques for natural drainage projects. RainScapes techniques are onsite stormwater management tools that reduce stormwater runoff, improve the County's water quality, and may add value to your property.

The RainScapes Rewards Rebate Program

The Montgomery County DEP RainScapes Rewards Rebate Program offers financial incentives in the form of rebates to property owners who install RainScapes techniques.

Eligible drainage projects include:

- Planting **rain gardens**
- Replacing turf grass with **conservation landscaping**
- Planting new **tree canopy**
- Replacing existing hard surfaces with **permeable pavers**

- Installing **rain barrels, cisterns, dry wells** or a **green roof** to replace an existing roof
- Removing **pavement**

A property is eligible for a rebate whether it is residential property or commercial, multi-family, or institutional property. Annual funds for the programs are limited, so rebates will be awarded on a first-come-first-served basis.

This manual provides planning and installation guidance for homeowners about the voluntary stormwater management practices

highlighted in the County's RainScapes Program.

The RainScapes Program is funded by the County's Water Quality Protection Program.

You must submit your project to DEP for approval prior to the construction of your project. After completion of an approved project, you will submit your receipts to receive your rebate check in the mail.

For more information or to submit an application, please visit www.rainscapes.org

Who is eligible?

To be eligible for a County RainScapes rebate, your residential or commercial property must be located in Montgomery County, **outside** of the municipal limits of the City of Rockville, the City of Takoma Park, or the City of Gaithersburg. Projects are **not** eligible if they are associated with permit approval requirements for new building construction, additions, or renovations.

Which RainScapes techniques can I easily implement on my property?

A variety of RainScapes techniques can help capture and soak up rainfall instead of allowing all of it to flow over rooftops, driveways, sidewalks, and roads as stormwater runoff. The techniques promote infiltration, reduce the volume of runoff leaving your property, and reduce the pollutants entering our streams. Eligible RainScapes techniques are described on the following pages.

Why are the RainScapes techniques beneficial?



RainScapes techniques are effective tools that we can use to capture stormwater before it runs off our property. Too much stormwater runoff can cause flash flooding, erosion, and other problems for our streams and the habitat that surrounds them.

The RainScapes Program promotes the use of innovative techniques to soak up or store rainwater, reduce runoff, and keep pollutants from entering our streams. RainScapes techniques are typically small-scale measures that can be implemented on residential, institutional, and commercial properties to manage stormwater onsite.

These techniques offer many environmental and community benefits, which include:

- Reduced stormwater runoff
- Improved water quality
- Improved air quality
- Reduced water usage during droughts
- Enhanced aesthetics
- Enhanced wildlife habitat
- Reduced energy costs to heat and cool your home
- Increased property values



Rain garden in mid-summer

These 8 techniques are eligible for RainScapes rebates:

Rain Gardens



Rain gardens are shallow gardens designed to capture and soak up stormwater.

Rain gardens:

- Retain stormwater and filter it on the property
- Are a good option if your property has sufficient space for the rain garden and overflow area
- Enhance the visual appeal of your landscape
- Need adequate space in your yard
- Need soils that drain well
- Budget can vary depending on the size and type of plants used, and how much of the installation labor can be done by the owner
- Have maintenance requirements that vary depending on plant selection

Conservation Landscaping



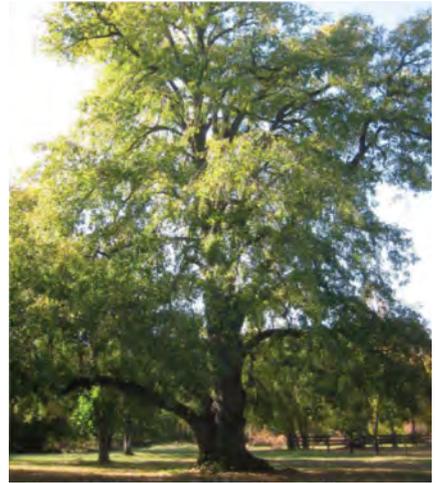
Conservation landscaping replaces part of your traditional lawn with native plants that

have adapted to Montgomery County's local rainfall and soil conditions.

Conservation landscaping:

- Improves water quality and provides wildlife habitat benefits
- Reduces the need for mowing, which results in energy and air quality benefits
- Reduces the need for fertilizing
- Reduces the need for watering
- Requires regular gardening/maintenance

Tree Canopy



Trees absorb rainfall through their roots and collect rainwater on their leaves and branches. A

tree canopy is created when trees planted near each other create an "umbrella" or canopy of leaf cover that shades the ground.

Tree canopies:

- Reduce stormwater runoff by absorbing and collecting rainfall on leaves and branches and through the tree's roots
- Provide shade
- Enhance visual appeal and increase property values
- Save energy once the tree becomes large enough to shade the house or air conditioning unit
- Are a long-term investment
- Are relatively low cost
- Require little maintenance (e.g., mulching)

Permeable Pavers and Pavement Removal



Replacing the hard surfaces on your property with alternative materials allows rainwater to

soak into the ground below, and reduces the amount of runoff that leaves the property.

Permeable pavers:

- Reduce stormwater runoff by allowing infiltration
- Are a good option if there are large amounts of hard surfaces (concrete, asphalt)
- Are more expensive than some other techniques
- Enhance curbside appeal
- Require proper installation by a certified contractor
- Require annual maintenance with sweeping and gravel replacement

Pavement removal:



- Does the first 4 items listed above
- Decompacts the soil

Green Roofs



Roofs covered with vegetation to absorb and collect rainfall are called green roofs.

Green roofs:

- Capture rainfall and reduce stormwater runoff from the roof
- Save on energy bills
- Are expensive (the cost can be recouped if you plan to be in the building a long time, as they can provide a longer roof life and decrease energy costs, etc.)
- Need to be properly designed and installed by a certified contractor
- Have weight load restrictions (modular systems reduce this problem)
- Need a maintenance plan, which includes seasonal roof drain inspection and weeding

Rain Barrels and Cisterns



Rain barrels and cisterns collect and store rainwater from your roofs.

Rain barrels and cisterns:

- Are a good option if you want to re-use rainfall for irrigation of grass, plants, or garden
- Are a good option if roof downspouts currently discharge to a driveway or sidewalk
- Are relatively easy to install
- Can be inexpensive
- Require active participation; the rain barrel or cistern must be emptied between rain events from April to November
- Reduce the use of potable treated water for landscaping purposes

Dry Wells



A dry well is an underground rock-filled pit that collects stormwater from roof downspouts

or hard surfaces, such as driveways and filters the water through the ground.

Dry wells:

- Reduce stormwater runoff by capturing rainfall from roofs or driveways and allowing it to infiltrate through underlying soils
- Are a good option if space is limited (built underground)
- Need soils that drain well
- Need to be properly designed and installed by a certified contractor (except for driveway dry wells, which can be a do-it-yourself projects)
- Require minimal maintenance

What are the community benefits of implementing a RainScapes technique on my property?



RainScapes techniques provide community benefits in addition to the many individual property owners' benefits. At the individual level, you may feel a sense of accomplishment for your personal contribution to improving the environment. At the community level, RainScapes techniques can beautify neighborhoods, reduce local flooding and increase desirable wildlife habitat, which can increase property values. Remember that you can implement multiple RainScapes techniques on your property to increase the benefits!

By implementing these techniques community-wide, cumulative benefits can be achieved.

This program is a voluntary partnership effort that promotes individual actions to achieve a greater reduction in stormwater runoff to the County's streams.

What can I expect from this manual?

Each section describes a RainScapes technique; including benefits and incentives

- How to assess your property
- How to design, plan, and implement the technique
- Cost and maintenance needs
- Different applications of the RainScapes technique
- Additional resources
- Each property is unique and must be evaluated individually. The site evaluation for each technique is outlined for each section.



Conservation landscaping in Wheaton, MD

Planning guidance

The pre-installation planning guidance below is intended to help you determine which RainScapes techniques will be most effective for your property. The lists below identify things to consider before implementing a RainScapes technique. A variety of constraints such as setbacks, lot size, underground utilities, and drainage area should be considered to determine which RainScapes techniques are appropriate for a particular property. The completed “checklist” should be submitted as part of your RainScapes Rewards Rebate application.

Questions to Consider:

- What problem(s) are you trying to solve?
 - » Do you have areas of ponding water or soggy soil in your backyard?
 - » Does your basement flood?

- » Does your property have a significant amount of hard surfaces?
- » Does a lot of stormwater flow off your property and create a problem for a downhill neighbor?
- » Does a lot of stormwater flow onto your property from adjoining properties?
- What is your budget?
- Do you want to capture water to re-use it? If so, where?
- How much time do you have for maintenance?
- What is the landscaping look you want to achieve?
- Do you have the equipment needed to install the RainScapes technique?
- Do you want a do-it-yourself project, or would you prefer to hire a contractor?

RainScapes Technique	Ability to Reduce Stormwater Leaving Your Property	Level of Active Participation	Cost
Rain Gardens	Medium	Medium	Medium
Conservation Landscaping	Medium	Medium	Low
Tree Canopy	Medium	Low	Low
Permeable Pavement	High	Low	High
Green Roofs	High	Low	High
Rain Barrels	Low	High	Low
Cisterns	High	Med	High
Dry Wells	High	Low	High



Residential lot showing a variety of runoff management techniques

Site constraints

- Underground utilities: You must call “Miss Utility” to identify your underground utilities before installing rain gardens, trees, permeable pavers, conservation landscaping, dry wells, or anything else that requires digging
- Setbacks and right of way locations
- Size of drainage area
- Lot size relative to impervious area
- Slopes
- Tree root zones
- Shade
- Soil characteristics (permeability is important for RainScapes techniques)
- Local ordinance, deeds, or homeowners’ associations may have landscaping restrictions

Applying for a rebate through the RainScapes Program:

- Evaluate your property
- Select RainScapes technique(s) to implement
- Fill out the online rebate application
- Take “before” photographs of the proposed project area to include in the application
- Wait for approval before beginning the project (allow 3 weeks for processing)

If your application is approved:

- Contact MISS UTILITY to mark utilities near the project area if you intend to install rain gardens, conservation landscaping, permeable paver retrofit projects, dry wells, or trees.

- DEP will perform a preliminary site inspection (optional for rain barrel).

If your project is verified for eligibility after the DEP application review:

- Install your project within 6 months of the County’s preliminary inspection date.
- Call or e-mail the RainScapes Rewards Coordinator to schedule a final inspection, which typically occur within 10 business days of your call.
- DEP will conduct a final inspection.
- Submit project documentation including:
 1. Itemized receipts or contractor invoices.
 2. Sign and return the RainScapes Rewards property owner agreement.

If you are interested, you can participate in activities to encourage your neighbors and local businesses to install RainScapes techniques. For more information, visit www.rainscapes.org

To determine which watershed you live in, visit: <http://www.montgomerycountymd.gov/dectmpl.asp?url=/Content/dep/maps/welcometowatershed.asp> to search by zip code.



Newly installed conservation landscape with rain garden on the right side



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Rain Barrels and Cisterns

Why should I install a rain barrel or cistern?



One inch of rain falling on a 10-square-foot roof can produce about 6 gallons of stormwater

runoff. Roof downspouts typically direct the roof runoff directly onto hard surfaces such as driveways, streets, and sidewalks that prevent the water from soaking into the ground. When water cannot soak into the ground, it flows over the surfaces and enters storm drains that flow to streams. As it flows over hard surfaces and lawns, the stormwater picks up pollutants, such as sediment, grease and oil from cars, and pesticides and fertilizers from lawns. The stormwater is collected in storm drain pipes that direct the flow into streams, which can lead to downstream erosion, flash flooding, and water quality and stream habitat problems.

By collecting your roof runoff in rain barrels or cisterns, you can reduce stormwater runoff from your property. Stormwater runoff is reduced, because you are collecting the stormwater and allowing it to soak into the ground when you use it for irrigation. When you use the

(continued on page 2)

What are they?

Rain barrels and cisterns collect and store a portion of the rainwater from your roof. The most common type of rainwater collection system used by homeowners is a rain barrel.

Rain barrels come in a variety of sizes but typically as a 55-gallon container that collects roof runoff. Rain barrels can be added to any building with gutters and downspouts, and they have an outlet that can be connected to a garden hose so the rainwater can be used to water landscaping plants, lawns, and gardens. All rain barrels require an overflow port.

Cisterns are sealed tanks that can be located above ground, partially buried, or below ground. Cisterns are larger than rain barrels and they can collect water from several downspouts from one building's roof or from multiple roofs if they are large enough. Large cisterns may require a permit, so please check with the County's Department of Permitting Services. When cisterns or rain barrels are full, the overflow should be directed to a safe location away from the building foundation. Overflow may also connect into a dry well, rain garden, or other area where the runoff can infiltrate

into the ground on your property. To be eligible for a RainScapes rebate, a cistern must be a stand-alone system for landscape applications and non-domestic use, and there must be sufficient space on your lot to accommodate overflow.



Rain barrel



Cistern (Brookside Gardens)

(continued from page 1)

rainwater to water your gardens and landscaping, you also use less potable (tap) water for this purpose, which can lower your water bills. Since rain barrels and cisterns collect rainwater for use on site, they can reduce the harmful effects to streams caused by large and rapid stormwater runoff flows.

Water collected in rain barrels or cisterns is for non-potable, exterior uses only; the County does not currently permit hooking these devices into your home's sewer system for actions such as toilet flushing. Cisterns may be connected to existing stormdrain systems, but it is expensive to do so and a direct connection will require a permit. Cisterns may require an electric pump to empty out the water, which may require a permit from the County's DPS. Contact the County DPS to obtain information about the necessary right-of-way and other applicable permits to connect to a public storm drain system.

What are the benefits and incentives?

The RainScapes Rewards Rebate Program offers a **rebate** for rain barrels and cisterns. See rainscapes.org for rebate information. As mentioned above, you can save money on your water bills by using water from your rain barrel instead of tap water to water your plants, lawns, and gardens. However, the most important reason may be that you are doing your part to help the environment and protect your local streams and the Chesapeake Bay.

How to...

Assess Your Property

Take some time to walk around your property to assess your roof gutter and downspout system. Do this when it is raining, so you can see where the rain lands on your property and where it flows. Follow these basic steps to identify your property's drainage conditions:

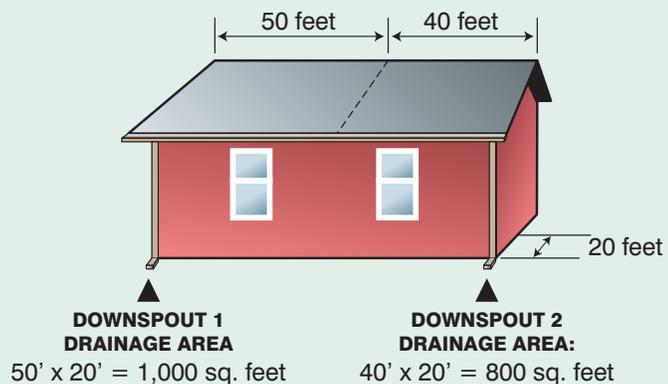
1. Locate each downspout.
2. See where rainwater from each downspout flows. You may find that your downspouts are directed to your grassy lawn, a landscaped area, a storm drain, or your driveway. If rainwater from a downspout currently flows to a grassy or landscaped area, you may not need a rain barrel because water is already soaking back into the ground. The best place for a rain barrel is where downspouts discharge onto or near a hard surface, such as a driveway, sidewalk, or patio, where the water cannot be absorbed.
3. Once you have identified downspouts for a rain barrel or cistern, you need to estimate the size of the roof area that contributes water to each downspout (see diagram). Based on your observations in Step 2 of where the rainwater flows, estimate the drainage area (square feet) to the particular downspout. Web maps such as Google® can be used to measure your roof areas (using the measuring tool) if you don't have a site plan of your lot. Then estimate what percentage of the building's total roof area this amount represents. The drainage area and percentage of the building's roof area are required for the RainScapes Rewards Rebate application. See the figure below for an example calculation.

Calculating Percentage of Building's Roof Area:

Total roof area for building: 20 ft x 90 ft x 2 sides = 3,600 sq. ft.

Downspout 1, total drainage area: 1,000 sq. ft.

Downspout 1, percentage of total roof area: $1,000 / 3,600 = 0.28$ (28%)



To submit the **RainScapes Rewards Rebate Application**, please visit www.rainscapes.org.

How to...

Design and Plan

Sizing the Rain Barrel



Determine the size of the runoff drainage area for a particular downspout, and calculate the size of the rain barrel(s) you will need.

The rain barrel volume can be calculated for any rainfall amount using this equation:

$\text{Volume (V)} = \text{Roof area for downspout} \times 0.083 \text{ ft (1 inch of rain)} \times 7.5 \text{ gals/cubic ft} \times 0.90 \text{ (to account for system losses)}$.

Using downspout 1 from the illustration on the previous page, the volume of the rain barrel for 1 inch of rainfall is:

$\text{Volume (V)} = 1,000 \text{ sq ft (roof area for downspout 1)} \times 0.083 \text{ ft (1 inch of rain)} \times 0.90 \times 7.5 \text{ gals/cubic ft} = 560 \text{ gal}$.

Based on this calculation, a 55-gallon rain barrel attached to downspout 1 would fill to capacity from 0.1 inch of rainfall.

Additional Guidance

The assessment of your property should guide your decision of where to place your rain barrel(s). Remember that the best place to connect a rain barrel is:

- At a downspout that would otherwise discharge rainwater on or near a hard surface that prevents the rainwater from being absorbed into the ground
- A surface such as a steep lawn area that causes the rainwater to run off before it can be absorbed

The sizing calculations should tell you how many rain barrels you need and how large the barrels should be.

Rain barrels should be placed on a secure flat surface adjacent to your house or garage and near the downspout that will be cut and connected to the rain barrel. Rain barrels rely on gravity flow, so it is important to find a location

where the rain barrel can be placed slightly higher than the area where you will use the stored water. In

some cases, you may need to create a stable elevated platform out of materials such as cinder blocks or pavers to provide enough gravity pressure at the outlet connection for adequate flow and for easier access to the hose bibb.

Rain barrels and cisterns must have an overflow outlet in case the tanks become full during a rain storm. The overflow should be directed to a safe discharge location away from the building foundation. If your downspouts currently discharge into underground pipes, extra care must be used to size the overflow port and direct overflow back into the drain pipe.

Do not drink the rainwater collected in rain barrels or cisterns, because it may contain roof debris with high levels of bacteria or other pollutants. As a precautionary measure, you may want to place a sign on your rain barrel or cistern that says “Do not drink!” Collected rainwater may be used to water vegetable gardens, but fruits and vegetables should be washed with tap water before being consumed.

In some cases, downspouts may **ALREADY** be designed to meet stormwater management requirements (i.e., they may connect to buried dry wells). Modification of a downspout that has been constructed to meet SWM plan requirements may be a violation of County SWM Code.



Rain barrel

Can I do this project myself?

Yes. For rain barrels, you can use this module as a guide.

You can construct the rain barrel yourself or you can order one that is already constructed and simply install it.

If I want to hire a contractor, what should I ask?

- What experience do you have installing rain barrels or cisterns?
- Are you accredited by any nationally recognized organizations such as the American Rainwater Catchment Systems Association?
- Can you supply references from previous clients?
- Are you insured/bonded?
- What is included in your services?
- What type of system would you recommend for my property?
- Do you have experience linking multiple rain barrels in series?
- Will you work with subcontractors such as electricians if needed for cistern installation?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?

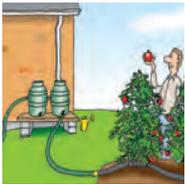


Step B



Overflow assembly

How to... Build and Install



While pre-assembled rain barrels can be purchased, rain barrels are also fairly

easy to construct from common materials you can find at local hardware and plumbing stores.

The Montgomery County DEP has compiled a generic list of hardware you will need if you decide to construct your own rain barrel at home.

Materials Checklist

- Downspout and diverter
- Overflow pipe and port
- Debris filter (optional)
- Lawn hose connection/full flow valve
- Blocks for the base
- Silicone sealer or teflon tape

Specific types of rain barrels require specific parts, so check the manufacturer's instructions for details.

Building Instructions

Step A

Cut a hole in the top of your barrel for the inlet drain. The hole should only be large enough to allow the diverter connector to fit. Cut the hole using either a drill or carefully measure and mark the area to be cut, start a pilot hole, and cut out the marked area with a jigsaw.

Step B

Cut a hole to accommodate the overflow adapter. You may need to sand the hole somewhat larger to screw in the adapter. Expect a snug fit. The diameter of the hole will vary based on your

overflow pipe size. This hole is not needed if you use the in-line diverter option.

Step C

Use a $1\frac{5}{16}$ -inch drill bit to cut a hole for the $\frac{3}{4}$ -inch brass hose bibb.





Downspout diverter and overflow adapter (on side)



Downspout connection using flexible extender



Hose connection



Hose connection

Step D

Insert the threaded end of the overflow adapter into the overflow hole. Keep the adapter straight as you prepare to screw it into the locking ring, inside the barrel/fullflow valve.

Step E

Insert the threaded hose bibb into the already drilled hole. Keep the hose bibb straight as you screw it into the barrel. Apply a bead of silicone caulk or wrap teflon tape around the bibb before inserting it to ensure a tight, drip-free connection.

Step F

If you are using a filter on the inlet, insert it between the diverter pipe and the barrel.

Step G

Attach the overflow pipe to the adapter and caulk as necessary.

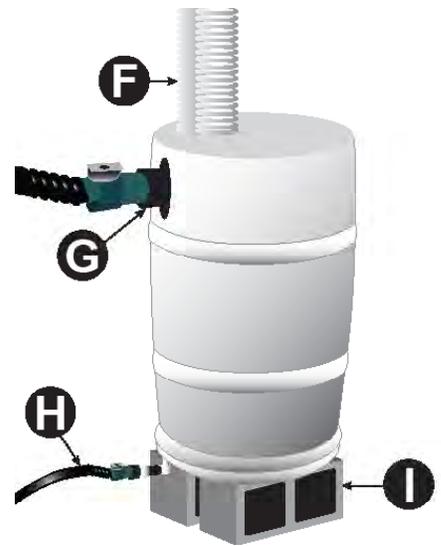
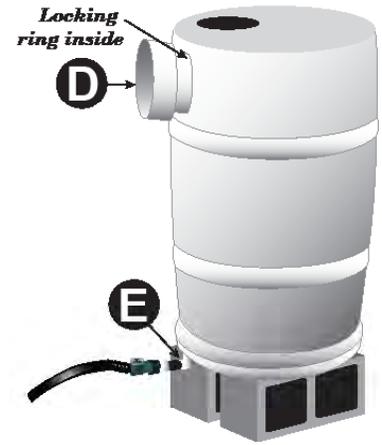
Step H

Attach a garden hose or soaker hose to your hose bibb.

Step I

Use cinderblocks or similar pavers to elevate the completed rain barrel off the ground to ensure easier access to the hose bibb and facilitate gravity-fed drainage.

To install the barrel, you will need to cut the downspout above the top of the barrel with a hack saw, attach a flexible downspout elbow over the downspout, and position the elbow above the rain barrel inlet. Make sure your base is level. For added security, the rain barrel can be secured to the building with a strap to prevent it from being tipped over.



Your rain barrels or cisterns can be left on slow drip to the designated receiving area to promote infiltration.

Note: Be sure to drain your rain barrel at regular intervals, and before the winter season. Keep rain gutters clean of debris to prevent mosquito eggs and larvae from entering your barrel. Check connections routinely; clean debris from the grate assembly as needed.

Costs

Basic do-it-yourself rain barrels can cost less than \$50. Commercial 55-gallon rain barrels may cost less than \$100, but some systems may cost as much as \$250. Commercially available rain barrels that come in colors to blend with your landscaping or that are designed to look like wooden barrels, terra cotta urns, and other containers. Other low-cost workshops are now being offered in the area. Check the www.rainscapes.org site for rain barrel “make and take” opportunities.

Cisterns are more expensive because they are more complex systems. Small cistern systems can cost hundreds of dollars and larger systems can cost thousands of dollars, but they may allow you to completely eliminate tap water use for landscaping needs and will more effectively control roof runoff.

Maintenance

Rain barrels require basic maintenance:

- Empty the barrel between rain events
- Regularly check the overflow area for clogs or other problems that could prevent water from flowing freely
- Keep gutters clean
- Remove leaves and other debris from the screen at the top of the barrel

- Periodically clean the barrel
- Check for leaks
- Ensure the filter screen is intact and securely fastened to keep out mosquitoes and mosquito eggs

Unless the rain barrel is made of a material specifically designed for freezing temperatures, it should be disconnected during the winter to avoid damage. Before the season’s first frost, disconnect the rain barrel from your downspouts, empty the barrel, wash out the barrel, and store it upside down in a protected location. We recommend that the piece of downspout that was removed be saved and reconnected with a suitable fastener for the winter, or use an in-line diverter. Hook up the barrel in mid-April and disconnect it in mid-November. Also remember to open the rain barrel spigot if you expect to be away from your home for an extended period of time.

Different Applications

Multi-Barrel Systems

Rainwater storage capacity can be increased by connecting multiple rain barrels in a series. The barrels can be linked with a PVC pipe, rubber tubing, or hose to allow overflow from the first barrel to discharge into the next barrel. You may also link them near the bottom, allowing the barrels to fill simultaneously.

Multi-System Approach with Other RainScapes Techniques

Rain barrel overflow can be directed to other RainScapes techniques such as rain gardens, dry wells, or conservation landscaping.



Rain barrel using in-line overflow adapter



Linked rain boxes



Aboveground small cistern with solar pump

The Charles River Watershed Association’s Smart Storm Rainwater Recovery System is an example of a multi-system approach using rain barrels that discharge into a dry well: <http://www.crwa.org/projects/smartstorm/mainpage2.html>.

For More Information

The Maryland Green Building Program provides a vendor list for ready-made rain barrels in Maryland: <http://www.dnr.state.md.us/ed/rainbarrel.html>

To view the Fine Gardening 5-minute video *How to Build a Rain Barrel*, visit <http://www.taunton.com/finegardening/how-to/videos/build-a-rain-barrel.aspx>

A rain barrel calculator is available from <http://www.greatergoods.com/rainbarrelcalc.html>



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Conservation Landscaping Techniques

Why should I implement conservation landscaping?



Each year, Americans spend countless hours tending to over 30 million acres of grass on

their lawns. Millions of pounds of pesticides and millions of tons of fertilizer are applied annually. Lawn mowers use a quart of gasoline each hour and emit as much as 10 times the amount of hydrocarbons as a typical car. Thousands of gallons of water are used to water a single yard during one summer. On the East Coast, an estimated 30 percent of residents' total water use is for lawn irrigation. Traditional lawn and garden care takes time and uses non-renewable resources. What if there was a way to reduce these practices while maintaining a healthy, aesthetically pleasing landscape?

In Montgomery County, much of the native topsoil is stripped during the development process, and if this soil is not carefully replaced, many homeowners are left with soil that is mostly compacted clay. The clay is typically planted with non-native turf grasses which lack the deep roots to penetrate compacted

(continued on page 2)

What is conservation landscaping?

Conservation landscaping is a type of landscaping that benefits the environment by improving water quality, preserving native species, and providing wildlife habitat. Conservation landscaping replaces some of the turf grass of a traditional lawn with native plants that have adapted to Montgomery County's local rainfall and soil conditions and require less water and maintenance than the lawn grasses. Montgomery County, Maryland is located in the Piedmont region.

The Chesapeake Conservation Landscaping Council defines conservation landscaping through "Eight Essential Elements."

A conservation landscape:

1. Is **designed** to benefit the environment and function efficiently and aesthetically for human use and well-being
2. Uses locally **native plants** that are appropriate for site conditions

3. Institutes a management plan for the removal of existing **invasive plants** and prevention of future nonnative plant invasions
4. Provides **habitat for wildlife**
5. Promotes healthy **air quality** and minimizes air pollution
6. Conserves and cleans **water**
7. Promotes **healthy soils**
8. Is managed to **conserve** energy, reduce waste, and eliminate or minimize the use of pesticides and fertilizers.



Newly planted front yard turf removal project

(continued from page 1)

soils, and require a great deal of watering, mowing, and other maintenance to keep them green and healthy.

Conservation landscaping is able to reduce the negative impacts on the environment associated with conventional lawn management. Many native plant species are deeply rooted, more resistant to insects, plant disease, and drought. By replacing traditional grass lawns with native plants, you can reduce the use of pesticides, fertilizers, and water.

Conservation landscaping saves you time and money when compared to many other forms of landscaping. There is less area to mow, so environmentally damaging emissions and time spent mowing are reduced. Native plant landscapes that are well-designed are easy to maintain, visually pleasing, and environmentally friendly. Conservation landscaping benefits wildlife, the environment, neighborhoods, and homeowners. The aesthetics of conservation landscaping can vary from traditional (natural) to more formal.



Butterflies are attracted to sun-loving perennials

What are the benefits and incentives?

The RainScapes Rewards Rebate Program offers a rebate for residential properties, institutional, multi-family, or commercial properties for implementing this technique. This rebate applies to the purchase and installation of container-grown plants, not seeding. Conservation landscaping offers many benefits to the community and the local environment, which include:

- Aesthetics
- Improved air quality
- Improved water quality
- Enhanced wildlife habitat
- Water conservation
- Native species conservation
- Reduced erosion
- Reduced expense and time needed for mowing lawns and applying pesticides and fertilizers to conventional gardens

Conservation landscaping is a great way to help the environment and protect your local streams and the Chesapeake Bay.

To apply for a RainScapes Rewards Rebate, please visit www.rainscapes.org



Turf conversion to conservation landscape

How to...

Assess Your Property

Before adding conservation landscaping to your yard, assess your site's conditions.

You want to preserve any existing beneficial environmental features and add conservation landscaping to create new native features. The success of your new native landscape depends on whether you select the right plants for the right places in your yard. Carefully evaluate your property, so you can choose plants based on their sunlight, soil, and moisture requirements. Although native plants are adapted to our region, it is usually beneficial to add compost to the soil at the time of planting.

Take an inventory of your current landscape conditions:

- Identify north on your property. Your property will receive morning sun from the east, afternoon sun from the west, full sun from the south, and full shade on the north-side. Remember that trees and your house cast shade. This will help you select the best plants for your landscape.
- Measure your turf grass area that you wish to convert to conservation landscaping.
- Observe how well water drains in the proposed project location or if there is standing water after heavy rainfall.



Conservation landscape in partial shade catching runoff from adjacent property

Why do you want to use conservation landscaping?

- Capture stormwater runoff or sump-pump discharge
- Attract wildlife (butterflies, pollinators, etc.)
- Block an unattractive view
- Block winter winds
- Create focal points or views that can be enjoyed from your home
- Shade your home or A/C unit

Other site considerations:

- Estimate the area needed for recreational space in your yard
- Estimate storage area needs for firewood, snow piles, lawn furniture, etc.
- Identify any local ordinances, deed restrictions, or homeowners' association restrictions on landscaping

These observations should give you an idea of where to add conservation landscaping that will thrive and help to achieve your goals.



Native plants, grasses and shrubs catch runoff from large ballfield at Rockville High School

How to...

Design and Plan

Choosing the Area



To be eligible for a rebate, at least 250 square feet of your lawn must be converted to conservation landscaping.

The site assessment will help you identify appropriate areas for conservation landscaping in your yard.

Selecting Native Plants

To qualify for the rebate, 75% of plants selected must be native species, which are plants that have adapted to local climate, rainfall, and soil conditions. As a result, these plants require less water and no fertilizer or pesticides. The best choices of native plants have deep root systems that may grow up to many feet deep, whereas the roots of most turf grasses typically only grow 2 to 4 inches deep. Drainage through soil will improve over time with native plants. As the plants mature, the roots grow longer and leave “root channels” or holes in the soil where old roots decayed. These channels break up the soil, allowing water to flow through the channels and soak into the soil more quickly.

Excellent resources for choosing native wildflowers, grasses, and shrubs by region include:

- The U.S. Fish and Wildlife Service’s guide: *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*

<http://www.nps.gov/plants/pubs/chesapeake/pdf/chesapeakenatives.pdf>

or

<http://www.nps.gov/plants/pubs/nativesMD/pdf/MD-Piedmont.pdf>

- The National Park Service’s “Plant Lists for Maryland Regions”
<http://www.nps.gov/plants/pubs/nativesMD/lists.htm>
- *Natural Landscaping: Designing with Native Plant Communities*, by John Dickelmann and Robert Schuster.

To find plants that are adapted to Montgomery County’s climate, review the U.S. Department of Agriculture (USDA) Hardiness Zone maps, which divide the U.S. into zones based on temperature. Montgomery County lies in **Zone 7** (<http://www.ahs.org>). To search for plants that can succeed in hardiness Zone 7, visit: <http://www.rainkc.com/index.cfm/fuseaction/plants.search/index.htm>

Use these guides to select plants based on size (how tall and wide plants will grow when they are mature—space them accordingly), the soil moisture conditions you have (dry, moist, or wet), and the amount of sunlight your garden will receive (full sun, partial shade, or shade).



Complete yard conversion



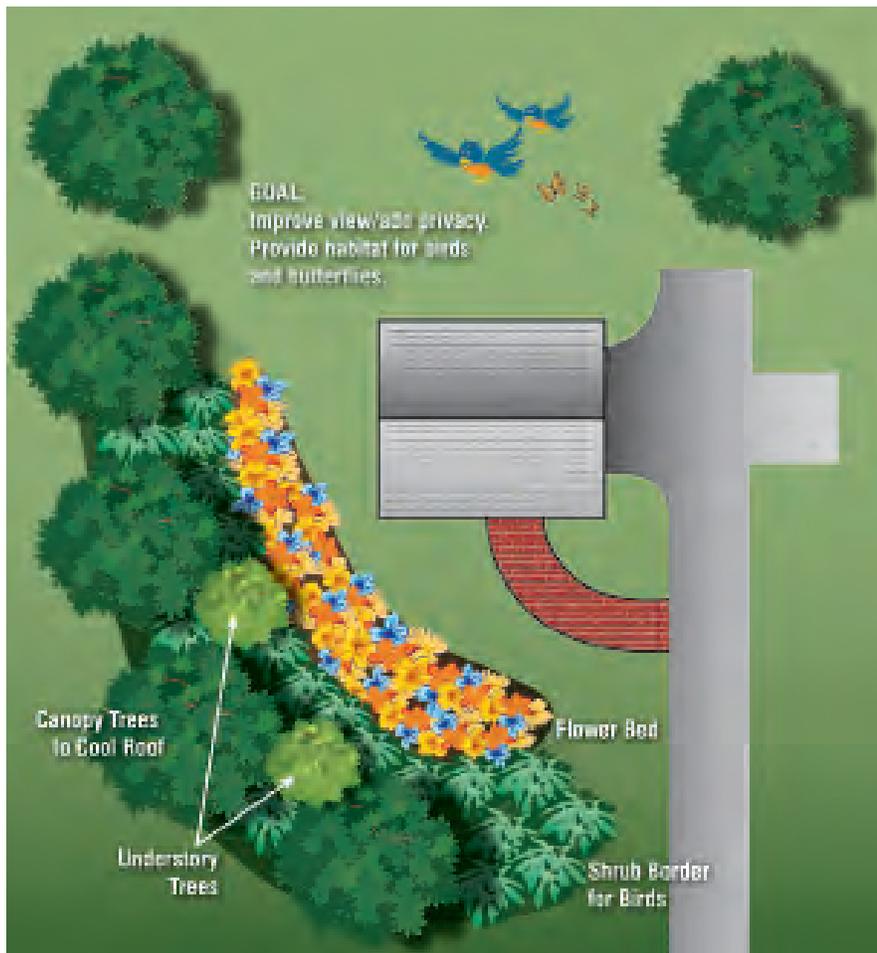
Native landscaping can be integrated throughout yard, along borders, edges, and entries

Developing a Planting Plan

Include a planting plan in your rebate application. The plan should detail the plant species, container sizes of purchased plants, number of plants, planting densities, planting materials, and soil amendments, and include a maintenance plan. If possible, plant canopy, shrub, and ground layer plants in your conservation landscape.



Baptisia australis - wild false indigo is a MD threatened plant species



Placement of the garden should be planned to achieve environmental and aesthetic goals

Sample List of 10 shrubs and herbaceous plants for a Sunny Conservation Landscape

arrowwood	<i>Viburnum dentatum</i> 'Emerald Luster' or 'Blue Muffin'
black-eyed susan	<i>Rudbeckia fulgida</i> , <i>hirta</i> or <i>triloba</i>
blazing Star	<i>Liatrus spicata</i>
bluestar Flower	<i>Amsonia tabernaemontana</i>
butterflyweed	<i>Aesclepias tuberosa</i>
New England Aster	<i>Aster novae-angliae</i>
redosier dogwood	<i>Cornus sericea</i>
sumac	<i>Rhus</i> 'Tiger Eye' or 'Gro-Lo'
switch grass	<i>Panicum virgatum</i>
thrift/ moss phlox	<i>Phlox subulata</i>

Sample List of 10 shrubs and herbaceous plants for a Shady Conservation Landscape

Christmas fern	<i>Polystichum acrostichoides</i>
doghobble	<i>Leucothoe fontanesia</i> 'Nana'
inkberry	<i>Ilex glabra</i> 'Densa'
Maple-leaf viburnum	<i>Viburnum acerifolium</i>
New York fern	<i>Thelypteris noveboracensis</i>
oakleaf hydrangea	<i>Hydrangea quercifolia</i>
Pennsylvania sedge	<i>Carex pensylvanica</i>
smooth hydrangea	<i>Hydrangea arborescens</i>
spicebush	<i>Lindera benzoin</i>
Upland seaots	<i>Chasmanthium latifolium</i>

See also:

<http://www.nps.gov/plants/PUBS/NATIVESMD/pdf/MD-Piedmont.pdf>

<http://mastergardener.umd.edu/files/NativePlantsofMDFeb%2005.pdf>

Can I do this project myself?

Yes. You can use this module as a guide.

If I decide to hire a contractor, what should I ask?

- What experience do you have planting conservation landscapes?
- Are you certified with any nationally recognized landscaping organizations?
- Can you supply references from previous clients?
- Do you intend to use subcontractors?
- Are you insured and bonded in Maryland?
- Do you have a portfolio of completed projects?
- What design do you envision for my conservation landscape?
- Will you develop a planting plan?
- Where will you get the plants?
- What technique do you use to remove turf grass?
- What is included in your services?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?
- Are you available to perform ongoing maintenance of the conservation landscape if needed?
- How much will your services cost?

How to... Add Native Plants to Your Landscape

Plan to install the landscaping project during either the Spring or Fall, generally from late March – early June, and September – Thanksgiving. Avoid planting too early in the Spring when the soil may be too wet, and during mid-summer when watering will be necessary. Woody plants may be planted through the winter as long as the soil is not frozen or saturated.

1. Outline a conservation landscaping area with rope or string.
2. Remove grass with a sod cutter or spade.
3. Loosen soil with a tiller, rake, or shovel. Add 2 inches of compost and till or dig in.
4. Plant native species.
5. Place 2 inches of shredded hardwood mulch over garden bed. Avoid placing mulch directly onto plant stems or tree trunks.
6. Water the landscaped area weekly during the first growing season, then in dry periods after first year to allow plant roots to establish.

Conservation Landscapes on Slopes

Converting turf banks to conservation landscapes can reduce time spent mowing and improve safety by not running a mower on a hill.

Planting on a slope requires creating a series of mini-terraces (see the graphic on page 8 of the Tree Canopy module) that allow

plants to be planted vertically, not on a slant. Each little terrace will soak in more water than the smooth face of the original grassy slope. Your area of turf conversion on the slope must be fully on your property and not in the right-of-way.

Steeper slopes require extra stabilization if turf is removed. On these steeper slopes, a better strategy is to remove pockets of turf (as opposed to all of the turf) and create the mini-terrace planting areas. The rest of the grass can be covered using mulch, allowing the existing grass roots to continue to stabilize the slope as the new plant root systems are developing. If you remove all of the existing turf, you should plan to replant within 2 weeks to prevent erosion.

Plants for slopes should generally be drought tolerant. Plants at the bottom of the slope however may experience wet soils and should be able to withstand “wet feet” in addition to drought.

Turf Grass Removal Techniques

Before you can add conservation landscaping, you must prepare the planting bed. Several methods are commonly used to



Sod removal

(continued on page 7)

(continued from page 6)

remove existing grass from your lawn.

Manual Removal with a Sod Cutter or a Shovel

If you don't mind the work, you can use a shovel to dig out the layer of grass on your lawn. Make sure you remove the roots of the existing grass and weeds so they do not grow back.

A quicker way to remove grass is with a sod cutter. A sod cutter (manual or powered) is a tool that slices off a thin horizontal layer of sod that can be rolled up for easy removal. Sod cutters are often available to rent from local home goods stores or equipment rental companies. You can recycle your sod elsewhere on your property, or you can donate it in your community.

"Lasagna" Method for Removal by Composting

The "lasagna" method is an easier, but slower way to prepare the planting bed for conservation landscaping. You are not removing grass with this technique. You pile layers of cardboard, compost materials, and mulch on top of your lawn to kill the grass beneath. The layering technique is similar to how you would make lasagna.

The basic steps are:

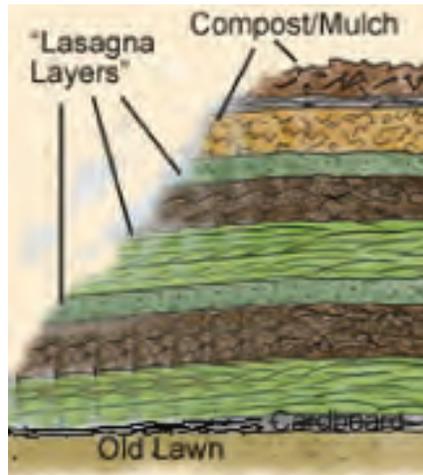
1. Cover an area of grass with cardboard (such as used boxes) or newspaper (4 to 5 layers). No sunlight should reach the grass below the paper.
2. Water the paper.
3. Add 2 to 3 inches of moist topsoil or peat moss over the paper.

4. Place a layer of 4 to 8 inches of compost materials over the top soil.

5. Continue placing alternating layers of peat moss and compost materials until the planting bed is 18 to 24 inches high.

6. Spread 4 inches of mulch on top of the "lasagna" layers.

Common compost materials include grass clippings, leaves, sawdust, manure, chopped up corn cobs, wood ash, hay, and household waste such as coffee grounds and fruit or vegetable peels.



Layering of 'green' and 'brown' compost components

After creating the "lasagna" layers, plant the garden right away or leave the layers to break down the existing grass. Over 2 to 4 weeks, the height of the planting bed will decrease. When you plant your garden, simply dig planting holes and place plants directly into the "lasagna" garden bed.

If you are using this method, consult with RainScapes staff on your project timeline before you begin.



Completed 'lasagna' bed settling in to await planting

Fewer layers of compost components could work for turf removal, but would not provide as much soil conditioning.

Costs

Adding native plant species to your landscape is an affordable way to improve the environment and aesthetics of your property. Depending on the materials selected, a typical price range for conservation landscaping is \$0.10 to \$9 per square foot.

Maintenance

Conservation landscaping requires regular gardening maintenance. Overall, landscaping with native plants requires less maintenance than traditional lawns and gardens.

Typical gardening activities include:

- Annual mulching (no more than 2–3 inches)
- Weeding (by hand)
- Watering (if it has been more than 3 weeks without rain)
- Pruning (as desired)

Remember: pesticides or fertilizers are generally not required.

Different Applications



A more formal front yard



Newly installed conservation landscape with dry wells

For More Information

Where to Buy Native Plants:

Most local nurseries carry native plants. The U.S. Fish and Wildlife Service Web site lists some native plant nurseries in the Chesapeake Bay watershed:

<http://www.fws.gov/chesapeakebay/BayScapes/bsresources/bs-nurseries.htm>

The Maryland Native Plant Society also lists native plant nurseries in the Mid-Atlantic region:

<http://www.mdflora.org/publications/nurseries.html>

How to Avoid Deer Damage:

A list of deer-resistant plants is provided on page 73 of the U.S. Fish and Wildlife Service's guide: *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*

To download or order a free copy, visit:

<http://www.fws.gov/chesapeakebay/BayScapes/bsresources/bs-nativeguides.html>

How to Avoid Invasive (Non-Native) Species:

Review the National Park Service and U.S. Fish and Wildlife Service's guide, *Plant Invaders of Mid-Atlantic Natural Areas*:

<http://www.nps.gov/plants/alien/pubs/midatlantic/>

Additional Resources on Conservation Landscaping:

Brooklyn Botanic Garden Links to Sustainable Techniques: <http://www.bbg.org/gar2/topics/sustainable/>

U.S. Forest Service, Native Gardening Web site: <http://www.fs.fed.us/wildflowers/nativegardening/index.shtml>

U.S. Forest Service, *Wild Ones: Landscaping with Native Plants*: http://www.epa.gov/greenacres/wildones/wo_2004b.pdf

The Chesapeake Conservation Landscaping Council, *Conservation Landscaping Guidelines: The Eight Essential Elements of Conservation Landscaping*: <http://www.chesapeakelandscape.org/Guid1207%20.pdf>

U.S. Fish and Wildlife Service, *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*:

<http://www.fws.gov/chesapeakebay/BayScapes/bsresources/bs-nativeguides.html>

The "Lasagna" Method for Turf Grass Removal: <http://tbmastergardeners.homestead.com/Handouts/LasagnaGardening.html>

<http://organicgardening.about.com/od/startinganorganicgarden/a/lasagnagarden.htm>

http://ourgardengang.tripod.com/lasagna_gardening.htm

Grow Native! Provides various designs using native plants landscape: <http://www.grownative.org>

Invasive Plants: A Guide to Identification, Impacts and Control of Common North American Species by Sylvan Ramsey Kaufman and Wallace Kaufman

Bringing Nature Home: How you can Sustain Wildlife with Native Plants by Douglas Tallamy



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Dry Wells

Why should I install a dry well?



Directing roof or driveway runoff to a dry well is an effective way to reduce stormwater

runoff from your property, because you are capturing the stormwater and allowing it to soak into the ground. Dry wells are underground features that work well in areas where space is limited. Dry wells generally do not impact the visual appeal of your property as they are located along your driveway or underground and may be covered with soil and sod or other shallow-rooted plants.

What are the benefits and incentives?

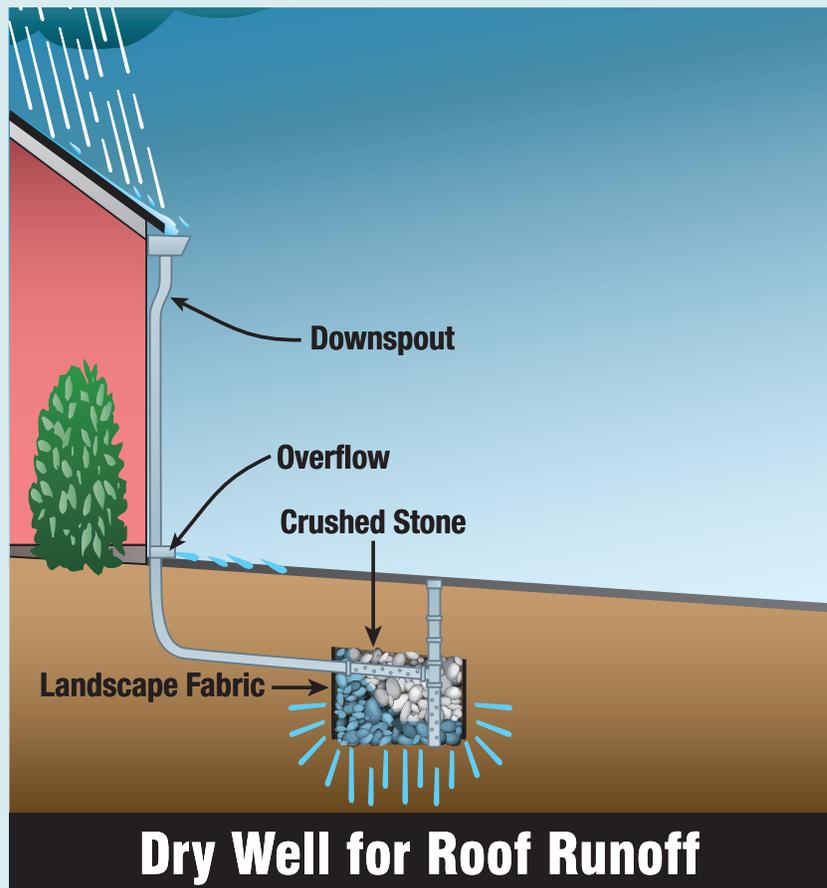
Dry wells reduce the amount of stormwater runoff and pollutants leaving your property, which can reduce downstream erosion, flooding, and water quality and stream habitat problems.

To learn more about the RainScapes Rewards Rebate, please visit

www.rainscapes.org

What is a dry well?

A dry well collects stormwater from rooftops or hard surfaces such as your driveway. An underground pipe directs runoff from roof downspouts into the dry well. The dry well is an underground area that is filled with stone or gravel. Once water enters the dry well, it passes through the stone or gravel and then seeps into the underlying soil. Dry wells often use filter fabric to keep separation between the stone and surrounding soil. Dry wells reduce stormwater runoff, promote infiltration and groundwater recharge, and filter pollutants. Sometimes a proprietary storage device is used to increase storage efficiency and decrease the footprint of the dry well.



How to...

Assess Your Property

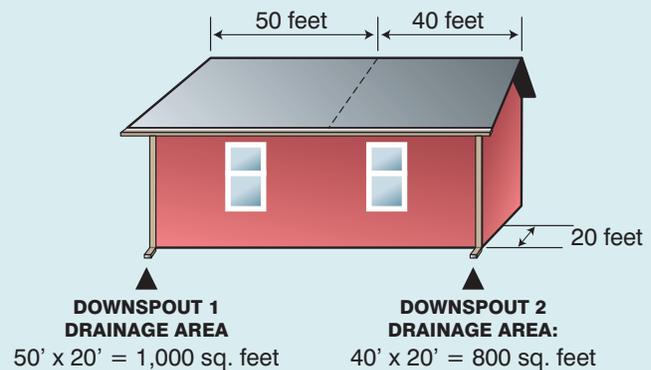
Assess your roof gutter and downspout system by walking around your property. Make your observations when it is raining, so you can see where the rain lands on your property and where it flows. Follow these basic steps to identify your site's drainage conditions:

To Collect Roof Runoff

1. Locate each downspout and determine where each downspout directs the rainwater. You may find that your downspouts are directed to your grassy lawn, a landscaped area, a storm drain, or your driveway. If a downspout currently discharges to a grassy or landscaped area, you may not need a dry well because some of the water is already soaking back into the ground. Dry wells should not be placed in poorly draining soil or placed perpendicular to steep slopes. The best place for a dry well is where downspouts discharge on or near a hard surface where the water cannot be easily absorbed (i.e., driveway, sidewalk, patio, poorly draining soils, etc.), or where the neighbor's yard is close and drainage is an issue.
2. Once you have identified downspouts for a dry well, you need to estimate the size of the roof area that contributes water to each downspout (see diagram). Based on your observations in Step 2 of where the rainwater flows, estimate the drainage area (square feet) to the particular downspout. Then estimate what percentage of the building's total roof area this amount represents. The drainage area and percentage of the building's roof area are required for the RainScapes Rewards Rebate application. See the figure below for an example calculation.

Calculating Percentage of a Building's Roof Area:

Total roof area for building:
 $20 \text{ ft} \times 90 \text{ ft} \times 2 \text{ sides} = 3,600 \text{ sq. ft.}$

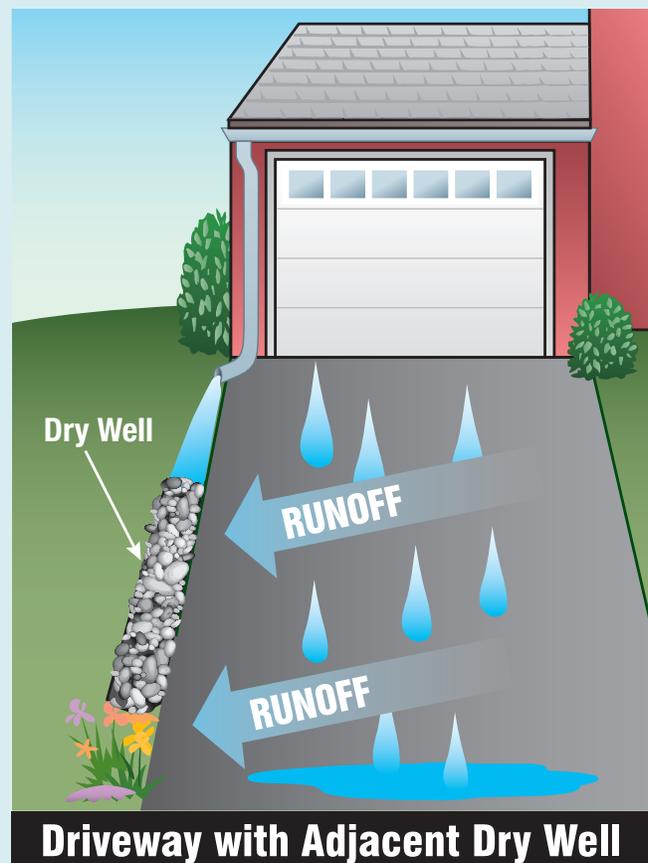


Downspout 1, total drainage area: 1,000 sq. ft.

Downspout 1, percentage of total roof area:
 $1,000 / 3,600 = 0.28$ (28%)

To Collect Driveway Runoff

Linear dry wells (infiltration trenches) can be added along driveways to collect and infiltrate runoff. You can capture runoff from part of your driveway using a trench drain or capture runoff from the entire driveway by relying on the slope of the driveway to send water to a dry well that runs along the side of the driveway.



How to...

Design and Plan



Determine locations on your property where excess water could be routed for infiltration.

Make sure you have enough space to fit a dry well on your property. The Montgomery County Department of Permitting Services (DPS) recommends the following sizing for dry wells that collect roof runoff. It is recommended that a dry well that is deeper than 2 feet be dug by a qualified professional.

Roof Square Footage	Dry Well Size (length by width by depth in feet)
100	3 by 3 by 3.5
200	4 by 4 by 3.5
400	6 by 6 by 3.5
500	6 by 6 by 4
1,000	9 by 9 by 4

Linear Dry Wells by Driveways

A do-it-yourself option for dry wells is a linear dry well. While the dimensions of a linear dry well along a driveway may vary, it is recommended that linear dry wells be approximately 1-foot wide and no more than 2-feet deep and be located to capture runoff from the driveway.

Follow these basic steps to identify the best location in your yard for a dry well:

- Before digging, have underground utility lines marked by calling “Miss Utility” at 1-800-257-7777 or submitting an Internet Locate Request for homeowners at <http://www.missutility.net/iticlite/>
- Avoid marked underground utilities by installing the dry well at least 4 feet from a marked utility line
- Locate your dry well a safe distance from adjacent buildings and properties to provide a safe overflow area:
 - » Downhill of building foundations or basements

Distance From	Length
Property lines	5 feet
Downslope from foundations	10-20 feet
Septic fields	30 feet
Well locations	100 feet
Buildings downhill of dry well	25 feet

Can I do this project myself?



Standard dry wells must be installed by certified contractors to be eligible for the RainScapes rebate. Linear dry wells along a driveway may be installed as a do-it-yourself project.

Linear dry wells along a driveway may be installed as a do-it-yourself project.

If I decide to hire a contractor, what questions should I ask?

- What experience do you have installing dry wells?
- Are you certified with any nationally recognized organizations?
- Can you supply references from previous clients?
- Are you insured?
- What is included in your services?
- What type of system would you recommend for my property?
- Will my dry well need an overflow drain?
- Do you intend to use subcontractors?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?
- Are you available to perform ongoing maintenance of the dry well if needed?
- Can you confirm whether a permit will be needed?
- How much will your services cost?

How to... Build and Implement

The Montgomery County Department of Environmental Protection (DEP) is currently accepting rebate applications for two types of dry wells: standard dry wells that collect roof runoff and linear dry wells that collect driveway runoff. Both types of dry wells have construction details developed by the Montgomery County DPS. These details are provided at the end of this module.

Dry Well to Collect Roof Runoff

Once you have selected the appropriate site for the dry well, your contractor may need to reroute your downspout. If necessary, they may cut the downspout, attach an elbow over the downspout, and connect the elbow to a perforated pipe.

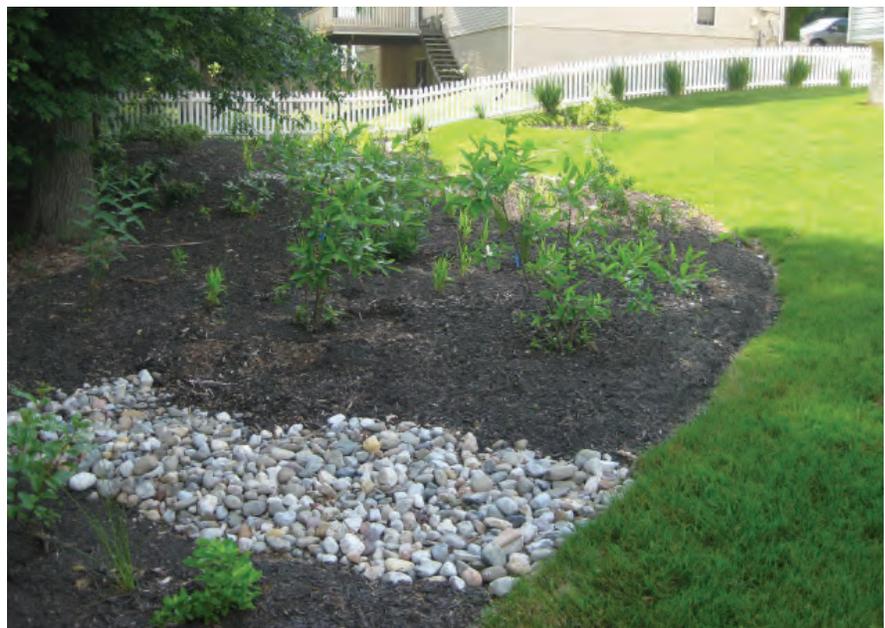
Dry Well to Collect Driveway Runoff

A linear dry well placed along a driveway may be installed as a do-it-yourself project.

Installation steps include:

- Dig out the dry well.
- Line the sides of the well with landscape fabric.
- Fill the well with crushed, clean stone. You can place decorative stone above the clean stone.

If you choose to use a pre-fabricated or proprietary dry well, check with DEP RainScapes to verify that it is County-approved.



Dry well paired with conservation landscape

Costs

Depending on the size of the dry well system, costs vary, but are typically at least \$1,500 including installation.

Maintenance

Minimal routine maintenance is required for a dry well:

- Remove debris from roof gutters and dry well. If debris is significant, or tree canopy is an issue, a debris filter in the gutter system may be necessary to prevent clogging.
- Clean and repair inlets and outlets.
- Visually assess to ensure that water is infiltrating and the dry well has not become clogged. Excess debris on top of the dry well can be removed by hand. Clogged dry wells should be refurbished or replaced.
- Weed, if needed.

Different Applications

Multi-System Approach with Other RainScapes Techniques

Dry wells can help absorb the overflow from other RainScapes techniques such as rain barrels or green roofs.

The Charles River Watershed Association's Smart Storm Rainwater Recovery System is an example of a multi-system approach that uses rain barrels/cisterns that discharge into a dry well: <http://www.crwa.org/projects/smartstorm/mainpage2.html>.

For More Information

<http://permittingservices.montgomerycountymd.gov/permitting/pdf/DrywellRoofDrain.pdf>

<http://permittingservices.montgomerycountymd.gov/permitting/pdf/DrywellDriveway.pdf>

A list of contractors who have completed the DEP's RainScapes Training Seminar is provided at www.rainscapes.org

As a reminder, dry wells and other Stormwater Management practices that are required by DPS through the County permitting process are not eligible for RainScapes Rebates.



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Green Roofs

Why should I install a green roof?



Typical rooftops are hard surfaces that cannot absorb rainwater, so they contribute

to stormwater runoff and increased pollution to streams. A green roof on a house or building allows rainwater to be absorbed by the plants and soil that are incorporated on the roof. This plant-based living roof reduces the amount of water leaving the property. This RainScapes technique reduces the environmental impact of a building roof, and usually provides energy savings and maintenance benefits.

Each green roof is unique and the type of benefits it provides will vary depending on the type of system installed. Studies have shown that 50 to 60 percent of annual rainfall at a site can be captured by green roofs, which significantly reduces runoff and harmful downstream ecological and environmental effects.



Green roof tray system - UMD Shady Grove campus

What is a green roof?

A green roof is a rooftop partially or completely covered with a specifically designed soil and vegetation system. Green roofs create living green spaces on top of buildings and structures that help to capture rainfall and reduce stormwater runoff. This captured water may be used by plants on the roof, released back to the atmosphere through evaporation, or it can be reused in other locations on the property.

Green roofs are a roof system that includes a waterproof membrane, filter fabric, drainage layer, root barrier, growing medium (soil), and plants. Green roofs may be constructed using modular units that contain all components listed above, or the components may be installed step-by-step directly on the building's roof deck.

The two main types of green roofs are extensive or intensive green roofs.

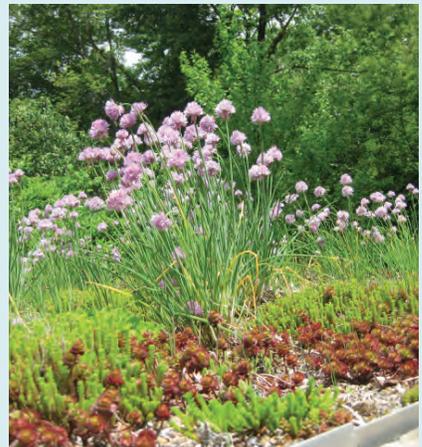
Extensive green roofs are typically lighter and thinner, which makes them more suitable to residential properties, while intensive roofs are thicker, heavier, and are designed to support trees and larger shrubs.



Green roof tray system

Extensive green roofs are designed to be lightweight and to maximize the performance and environmental benefits that a green roof can bring to a building. Extensive green roofs feature a layer of growing media that is 6-inches deep or less and are planted with drought-tolerant plants. Extensive systems require less maintenance and have simpler irrigation and drainage systems, if they have any at all. Existing roofs on porches, garages, sheds, and sunrooms are excellent candidates for extensive green roof retrofits.

(continued on page 2)



Green roof tray system

(continued from page 1)

Currently, only extensive green roofs constructed on existing buildings (retrofits), whether applied in an integrated approach (replacing the existing roof and applying the layered components directly onto the roof's surface) or in modular units (placed on top of the existing roof), are eligible for rebates under the RainScapes Rebate Program. Green roofs for new construction are not eligible for rebates at this time.

What are the benefits and incentives?

In a typical neighborhood, more than half of the impervious area is from rooftops.

Green roofs capture rainfall, and slow and reduce runoff. As stormwater filters through the soil and is taken in through plant root systems, pollutants are absorbed, reducing the volume of pollutants that enter nearby streams. Water (that is not used by the roof plants or released to the atmosphere) is filtered and can be directed to other RainScapes techniques such as dry wells or rain gardens, which provide additional treatment and infiltration. Excess water may also be directed to and stored in rain barrels or cisterns and used for irrigation of the roof itself or other landscaped areas in times of little rainfall. By doing things like this, the amount of runoff from your property is greatly reduced, which can help to protect your community's stormdrain system.

Green roofs provide building insulation, which often results in decreased heating and cooling costs. The soil and plants of a green roof protect the building's roof membrane from ultraviolet rays that break down conventional roofs. For this reason, green roofs have been shown to last up to twice as long as conventional roofs, reducing overall replacement and maintenance costs.

A green roof enables you to play a role in preserving the environment and conserving water resources. This practice may also increase your property value through increased visual appeal and lower energy bills.

The **RainScapes Rewards Rebate Program** offers a rebate for residential applications and commercial, multi-family, and institutional applications. To see the requirements and submit the RainScapes Rewards Rebate Application, please visit www.rainscapes.org



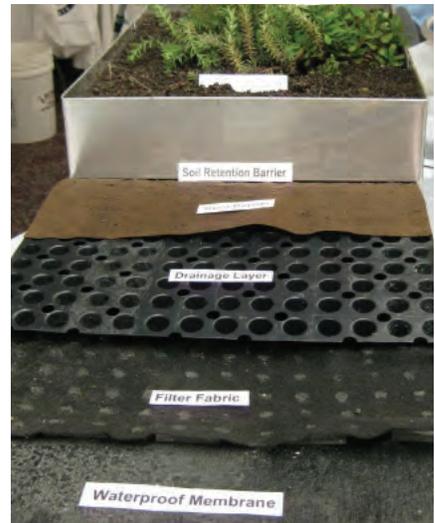
Shed green roof in shade



Green roof on addition



Steeper roof applications need a more engineered approach



Parts of a green roof

How to...

Assess Your Property

A qualified roofing contractor, who may be assisted by a landscape architect, is critical to the success of your system. A contractor who is experienced in green roof installations may assist with the selection of materials and placement of products, and help you assess your property. When considering installing a green roof you should evaluate the condition of your current roof and have a licensed professional evaluate its structural capacity. The amount of weight (load) your roof can sustain will determine the type of green roof product to select as well as whether you can cover the entire roof or only a portion of the roof. The load capacity of your roof will also determine the maximum soil depth your system can have. **The roof must be designed with a minimum of 4 inches of soil but no more than 6 inches, to qualify for the rebate.** You will also need to determine the slope and amount of drainage from your current roof. If your building has a flat roof, you will need an additional drainage layer and steeper roofs will require additional tools to hold soil in place. While it is possible to install a green roof on rooftops with slopes of up to 40 degrees, a 5 to 20 degree slope is optimal to ensure excess runoff can drain naturally.

If a green roof is feasible, assess the amount of sun and wind exposure your green roof is likely to experience. Green roofs are most successful with full or partial sunlight. Your plant selections will depend on these factors, as well as the amount of rainfall the roof is to receive and the soil depth your roof can support. It is also important to consider maintenance and accessibility of the system, and the amount of maintenance required for the plants you select. **To receive a rebate you will also need to ensure that your green roof area is at least 300 square feet or one-quarter of the roof area (whichever is smaller). The green roof must also replace an existing roof area rather than expand the original roof footprint.** For more information, please see the rebate application at rainscapes.org.

How to... Design and Plan

While a qualified green roofing contractor will help with determining the design of your green roof, you may also need to involve a landscape architect for assistance with the landscape design and plant selection. Plant selection should be based on climate, type and depth of growing medium, loading capacity of your roof, height

and slope of roof, maintenance, and presence or absence of an irrigation system. Your contractor will determine your maximum capacity, but the most consistent storage for extensive green roofs occurs in those with soil depths of approximately 4 inches. A runoff calculation report must be prepared by the certified green roof designer/

contractor to prove that the green roof will capture the required runoff. A statement on the structural analysis will also be provided by the contractor.

Can I do this project myself?

Green roofs are not recommended as a do-it-yourself project. To be eligible for the RainScapes Rebate, a certified green roof contractor must install your green roof.

What should I ask a potential contractor?

- What experience do you have installing green roofs (modular units or integrated systems)?
- Are you certified with any nationally recognized organizations?
- Are you a licensed roofing contractor, architect, landscape architect, or engineer who can perform a structural load analysis to determine the feasibility of installing a green roof on my existing roof?
- Can you provide a runoff calculation report for this roof?
- Can you supply references from previous clients?
- Do you intend to use subcontractors?
- Are you insured and bonded in Maryland?
- Do you have a portfolio of completed projects?
- What design do you envision for my green roof?
 - » What types of plants do you typically use?

(continued on page 4)

(continued from page 3)

- » Who installs the drainage systems for your green roof design?
- What is included in your services?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?
- Are you available to perform ongoing maintenance of the green roof if needed?
- How much will your services cost?

Build/Implement

Installation of a green roof requires a qualified roofing contractor with experience in green roof installation to install the non-living components. Whether it is a modular interlocking grid system or an integrated system in which components are installed directly on the roof surface, a green roof consists of several layers. From top to bottom a typical green roof consists of a vegetation layer, growing medium (soil), soil retention barrier, roof barrier, drainage layer, filter fabric, and waterproof membrane. The separation layer protects the membrane from root penetration, and the membrane itself protects the roof from leaks. The contractor must certify that a licensed professional has performed a structural load analysis for the green roof, and this documentation must be submitted with your RainScapes application. Any extensive green roof that requires a modification to the roof's structure must undergo a building permit review

through the [Montgomery County Department of Permitting Services](#).

This is separate from the RainScapes application and must be done prior to rebate processing.

Costs

Costs for green roofs will vary widely depending on the application selected, the size of the area to be planted, and the planting materials. Costs for extensive green roofs vary from \$10 to \$30 per square foot depending on the type of system, structural support, and plantings. Initial costs for green roofs are generally higher than traditional roofs, and retrofits may make projects more costly due to load limitations, but long-term savings can offset these costs.

Maintenance

Green roofs are designed to withstand harsh conditions and most require little maintenance. They may need to be irrigated during initial seasons until plants are established and during extreme drought periods. Although, plant selection can help reduce the amount of irrigation required. If irrigation is necessary, sprinkler systems or membranes that store rainwater can be installed. The water passing through the system can be captured through other RainScapes techniques and used for irrigation as mentioned above. Pesticides should not be used. The roof should be monitored closely to make sure vegetation remains healthy and that weeds are controlled.

Different applications

Extensive green roofs may be installed as integrated systems that are applied directly on the roof's surface in layers, or they may be installed in modular units. Each type has benefits and limitations, and your contractor can help you choose the type that is right for your application.

For more information

Green Roofs for Healthy Cities

www.greenroofs.org

GreenSave Calculator (long-term costs and benefits of green roofs compared to traditional roofs)

http://www.greenroofs.org/index.php?option=com_content&task=view&id=626&Itemid=116

Ecoroof recommended plant list

<http://www.portlandonline.com/shared/cfm/image.cfm?id=55831>

“Green Your Garage: Volume 1” <http://roofbloom.org/roofbloom-vol1-082007.pdf>

Modular Green Roofs
www.greengridroofs.com



Green roof plants



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Permeable Pavers

Why should I choose permeable pavers for my hard surfaces?



Patios, sidewalks, and driveways are hard surfaces that prevent water from soaking into the ground. Various changes, or retrofits, can be applied to these hard surfaces to help prevent stormwater runoff and pollutants from entering our streams. An effective retrofit to reduce runoff from residential properties is the installation of permeable interlocking pavers.

Permeable pavers

- increase onsite infiltration and reduce runoff
- are easy to install
- can be an effective alternative

Permeable surfaces address important environmental issues and support sustainable living. They not only have a positive environmental impact, but can also be economical and function well with little or no maintenance.

What are permeable pavers?

Permeable interlocking pavers are connected blocks with materials such as stone or gravel that let water pass through, filling the gaps between the paving blocks. Replacement of traditional concrete or asphalt driveways with permeable interlocking pavers allows rainwater to naturally filter through the ground and reduces stormwater runoff.

Permeable interlocking concrete pavers provide a strong, solid surface. They can be installed on driveways, walkways, and patios and can also serve as attractive landscaping features, raising property values.



Patio retrofit



Driveway retrofit



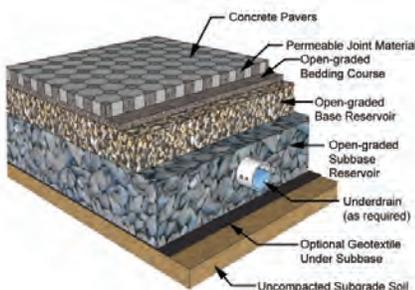
Sidewalk retrofit

What are the benefits and incentives?

Installing permeable interlocking pavers on your property reduces the stormwater contribution to our streams from driveways, walkways, and patios. The site drainage improvements you make with these techniques can be cost effective. You will play a positive role in preserving the environment and water resources. Replacing hard surfaces that do not allow water to infiltrate with permeable interlocking concrete pavers have also been shown to increase property values.

To receive a rebate for this technique for residential properties, you must hire a **certified contractor** and convert a **minimum of 150 square feet** of hard surface to a permeable interlocking paver surface. To receive rebates for commercial, multi-family, and institutional properties, a **minimum of 450 square feet** of hard surface area must be converted to permeable interlocking pavers.

The **RainScapes Rewards Rebate Program** offers a rebate for residential, commercial, multi-family, or institutional lots. To see the requirements and submit the RainScapes Rewards Rebate Application, please visit www.rainscapes.org



Cross-section of permeable paver system

How to...

Assess Your Property

Follow these basic steps to assess your property and determine the best location for a permeable interlocking paver project:

1. Locate your property's hard surfaces. Are there large areas of driveways or patios where you would like to improve either rainwater infiltration or visual appeal? Consider that the area may need to have a gradient or slope, away from your foundation.
2. If you choose to install permeable pavers, determine if there is adequate space for them to meet the minimum eligible project size. **The minimum project size to receive a rebate for residential properties is 150 square feet of existing hard surface that will be converted to permeable pavers.**
3. Assess your current landscaping features and choose products that will enhance the overall character of your property. Permeable interlocking pavers can be decorative as well as functional.
4. Choose a location where the practice best fits your budget. Larger applications will result in a higher cost. Smaller-scale projects may be more practical if you are looking to start simple and are working with a smaller budget.
5. You do not want to use pavers in areas that accumulate a lot of sediment and debris. They can clog and not let the water infiltrate.

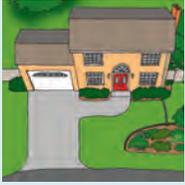


Brookside Gardens permeable walkway
Photo credit: Jann Rosen-Queralt

How to...

Design and Plan

Can I do this project myself?



The installation of permeable interlocking pavers is not recommended as a do-it-yourself project. **To be eligible for a RainScapes rebate, you must use a qualified contractor to install your**

permeable interlocking pavers, unless you can demonstrate that you meet the DEP's minimum criteria.

What should I ask a potential contractor?

- What experience do you have installing permeable interlocking pavers?
 - Are you certified to install permeable pavement by any nationally recognized organizations such as the Interlocking Concrete Pavement Institute?
 - What is your experience assessing soil types and amending soils if necessary?
 - What is your experience with soil reinforcement or stabilization techniques?
 - What design do you envision for my permeable interlocking pavement retrofit?
 - » What type of system will be the most effective and visually pleasing?
 - » What type of materials should be used to fill the gaps between permeable interlocking pavers?
 - » What type of edge restraint will be used?
 - Do you typically install underdrains in permeable interlocking paver projects?
- Do you install permeable pavers manually or mechanically?
 - Can you supply references from previous clients?
 - Do you intend to use subcontractors?
 - Are you insured and bonded?
 - Do you have a portfolio of completed projects?
 - What is included in your services?
 - » Will you haul away excavated material?
 - » Will you provide all equipment needed?
 - How long do you expect the project to take?
 - Do you offer a guarantee for your work?
 - Are you available to perform ongoing maintenance of the permeable interlocking pavement if needed?
 - How much will your services cost?

Various landscaping, soil type, and drainage issues must be considered as they can affect the stability of the surface and rainwater infiltration. Once the location has been selected, evaluate what type of system will be the most effective and visually pleasing. Your certified contractor can help you select a system that works best for your needs.



Permeable patio



Driveway showing transition from impermeable to permeable

How to... Build and Implement

Installation requires an experienced contractor, equipment, and proper technique.

Once you have selected your location and determined the technique that best fits your landscape, your contractor should outline the project area. Here are some items to consider and discuss with your contractor:

- You and your contractor should consider underlying soil types when selecting any of these applications, and amend the soil as needed to promote infiltration.
- Careful attention should be given to any soil reinforcement or stabilization needs, so soil does not wash onto and clog the area between the pavers.
- Permeable interlocking pavers should be placed at least 10 feet away from foundations.
- Slopes of less than 5 percent are easier and less costly to design and build.
- If an underdrain is installed to collect water that seeps through the permeable pavers, the underdrain should discharge into your landscape, rather than the street.
- Pavers can be installed manually or mechanically, depending on the type selected. The joints and drainage holes are filled with pervious materials using sweeping and

vibrating tools. Once the paver system is laid, holes or voids are filled with the material you have chosen: pea gravel, or washed aggregate. The choice of material will vary depending on the final look desired.

- The use of edge restraints made of plastic, pre-cast concrete, steel, or aluminum should be used to keep pavers from moving or separating.

Do not use sand on permeable interlocking concrete pavers because it will clog the pavement joints. Use deicing salt or washed #8 stone.

Costs

Costs for permeable interlocking paver projects will vary widely depending on the application selected, the size of the area chosen, and the condition of soils. Typically, permeable interlocking concrete pavers cost approximately 20% more than traditional concrete pavers.

Maintenance

Permeable interlocking pavers do not require a lot of maintenance when installed properly. Regular cleaning and sweeping of your pavers is recommended. A wet/dry vacuum may also be used to remove surface clogs. After sweeping or vacuuming, sweep fresh, washed, #8 stone into the clean joints, or call your



contractor for maintenance needs. Some natural buildup of vegetation or sediment may occur over time in paver gaps, and it may be necessary to clean out and replace the filler material. Dirt, debris, fall leaves, and sand from winter activities can clog the paver gaps. Refer to the selected manufacturer's recommendations for proper maintenance. The permeable interlocking pavers should be inspected frequently, especially after a large storm event, to ensure that the drainage spaces are not clogged, or that the gravel has not washed away.

For More Information

Numerous product vendors sell permeable pavers. Area installation contractors may be able to assist in product selection.

A list of contractors who have attended the DEP's RainScapes Training Seminars is provided at
<http://www.rainscapes.org>

A comprehensive list of national paver products and contractors is available at

<http://www.paversearch.com/index.htm>

or

http://www.icpi.org/homeowners/find_installer.cfm

These resources may be helpful for your contractor to review:

Permeable Interlocking Concrete Pavements

<http://www.ncsu.edu/picp/>

Permeable Interlocking Concrete Pavement Specification developed by the Low Impact Development Center

<http://www.lowimpactdevelopment.org/epa03/pavespec.htm>

New Jersey Stormwater Best Management Practices Manual: Standard for Pervious Paving Systems

http://www.njstormwater.org/tier_A/pdf/NJ_SWBMP_9.7.pdf

Interlocking Concrete Pavement Institute

<http://www.icpi.org/>

Design specifications developed in coordination with the Interlocking Concrete Pavement Institute are provided at [rainscapes.org](http://www.rainscapes.org).



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Pavement Removal

Why should I remove pavement from my property?



Replacing pavement with turf, native plants, or native trees can help prevent

stormwater runoff and pollutants from entering our streams. This water that runs off can carry pollutants such as dirt, lawn care fertilizer and chemicals, pet waste and trash into our streams. Depending on how your yard is graded, the water flowing from these paved areas may be leaving your property and entering the stormdrain system or causing drainage concerns for a neighbor. By reducing the amount of rainwater leaving your property, you can help improve local streams by reducing stream channel erosion and water pollution. Reducing paved surfaces also supports sustainable living, and adds attractive landscaping to the area.

What are the benefits and incentives?

The RainScapes Rewards Rebate Program offers a rebate payment for converting a minimum of 100 square feet on property used for residential purposes and a minimum of 300 square feet for a commercial, institutional, or multi-family property. Your rebate amount will be calculated per square foot of pavement converted to turf. If the pavement is replaced with native plant species, your rebate will be calculated at a higher dollar amount per square foot. Visit rainscapes.org for additional rebate details.

Replacing pavement with natural vegetation offers many benefits to the community and the local environment, which include:

- Improved aesthetics with more green space
- Improved air quality
- Improved water quality
- Enhanced wildlife habitat
- Native species conservation
- Reduced stormwater runoff
- Reduced erosion

Pavement removal is a great way to help the environment, restore the natural water cycle, and protect your local streams and the Chesapeake Bay.

To apply for a RainScapes Rewards Pavement Removal Rebate, please visit www.rainscapes.org



Sidewalk pavement removal - recycled sidewalk into a stacked wall

How to...

Assess Your Property

Follow these basic steps to assess your property:

1. Locate your property's hard surfaces. The next time it rains, go and look at where the rainwater goes after it lands on the surfaces. Look for opportunities to better manage the water runoff. Your home may have more paved surfaces than you need or even want to maintain. Are there patios, driveways, or walkways that could be replaced by vegetation? Did a previous owner pave extra parking space that you do not use? Consider narrowing your walkways, making your patio smaller, or reducing your driveway to two paved tire tracks with gravel or vegetation in the middle to let the rain soak into the ground.
2. Measure the hard surface area you wish to convert to natural vegetation. Determine if there is adequate space to meet the minimum eligible project size. To receive a rebate, the minimum project size is **100 square feet** for residential properties and **300 square feet** for commercial, institutional, and multi-family properties.
3. Before removing any pavement, decide what type of landscape project you would like to use to replace the pavement. Options for driveways include a grassy strip, short native plants or, when appropriate, gravel. For pavement removal areas that are not driveways, trees or conservation landscapes are recommended.



Remove center of driveway to reduce paved area



Create a conservation landscape after removing pavement



Remove excess driveway and create area to soak in downspout drainage

How to...

Design and Plan

Can I do this project myself?

Yes. Removing pavement can be labor-intensive, but you can rent equipment and use this module as a guide.



Hiring a contractor to remove pavement

If I decide to hire a contractor, what should I ask?

- What experience do you have with removing, disposing and replacing pavement with vegetation or permeable surfaces?
- Can you develop a planting plan? What experience do you have with native plants?
- Can you supply references from previous clients?
- Are you insured and bonded?
- What is included in your services?
 - » Will you haul away excavated materials?
 - » Will you provide all equipment needed?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?
- How much will your services cost?
- What equipment will you use? (Check and follow noise ordinance requirements)

Developing a planting plan

You must include a planting plan in your rebate application. The plan should detail the plant species, container size, number of plants and planting densities, plant material source, soil amendments, and a maintenance plan.

To qualify for the higher rebate, at least 50 percent of plants selected must be native species, which are indigenous to

the Chesapeake Bay Watershed. They are best adapted to local climate, rainfall, and soil conditions.

Review the *Conservation Landscaping RainScapes* module for instructions on how to select native plants. The sample lists of 10 native shrubs and herbaceous plants for sunny and shady landscapes can get you started on choosing plants.

Review the *Tree Canopy RainScapes* module for a list of approved tree canopy species. You could also plant smaller trees for this rebate planting project.

Reserving equipment

Contact your local equipment rental service for a walk-behind pavement saw or jackhammer, pick axe, or excavator, depending on your needs.

Wear proper personal protective equipment

Wear a facemask and protective goggles to prevent pieces of pavement from contacting your eyes, nose, and mouth while you work. Wear appropriate clothing/footwear and use ear protection as needed. You can buy these items at local home improvement stores.

Consider how you will dispose or reuse your pavement:

- Recycle materials on-site
- Use the Metropolitan Washington Council of Governments (COG) Builders Guide to Reuse and Recycling to find a local company who will take the material. www.mwcog.org/buildersrecyclingguide
- Take the excavated materials to the Shady Grove Processing Facility and Transfer Station located at 16101 Frederick Road, Deerwood Maryland 20855, 240-777-6560) For more information visit [Montgomery County Transfer Station](#).
- Hire a licensed solid waste transportation service

How to...

Build and Implement

Once you have selected your location, outline the area using stakes or chalk.

- Notify Miss Utility prior to digging – call 811 or use online tool.
- Remove pavement by breaking it up into pieces using a walk-behind pavement saw or a jackhammer and air compressor. Another option is to rent an excavator.
- Remove the compacted gravel base that is beneath the layer of pavement with a pick axe and shovel. You may need to protect adjacent base of remaining tire tracks if there is no slope to the drive.
- Some traditional paving stones have liners underneath to prevent weeds from growing between the paving stones. If you have a liner, make sure to remove it to allow water to soak into the soil of your new planting bed.
- Dig down to break up the compacted soil below the gravel base. Loosen the soil that remains to a depth of at least 6 inches. This helps create spaces in the soil that will allow the rain water to easily soak into the soil.
- Spread out 2 inches of compost and then mix in the compost with the existing soil to a depth of 6 to 9 inches. Make sure you amend the entire planting bed and not just the planting holes.
- Protect the excavated area from eroding. If project is not stabilized or planted at the same time as pavement removal, cover with

mulch or straw until planting. Replant as soon as possible after pavement removal. If your slope is greater than 5 percent, you must provide erosion control.

To avoid erosion:

- Use straw bales, compost blankets, or commercial silt fencing to reduce erosion during construction.
- As soon as possible, seed or sod the bare lawn areas and place mulch in garden areas.
- Plant and maintain dense plant cover on sloped areas.
- Stockpile areas should be protected from rainfall and runoff by covering.
- If stockpiling, cover the pile with a tarp when not working with the material to reduce the risk of wind and water erosion of materials.

Planting instructions

Review the RainScapes *Conservation Landscaping* and *Tree Canopy* modules for detailed instructions on how to plant native plants and trees.

To prepare the lawn for sod, till the soil, rake the area level, and remove any weeds. Roll the sod with a heavy roller to establish root contact with the soil.

During the first two weeks, water once to twice a day depending on the temperature. For the next three to four weeks, water every other day to allow the sod to establish its root structure.



Breaking up pavement



Preparing a new garden bed

Costs

Costs for pavement removal projects will vary widely depending on the size of the paved area and the types of plants or trees chosen. Costs will increase if the pavement is removed by a professional.

Maintenance

For two track driveways, observe track edges at least twice a year to ensure that tires are not eroding the planted area. Fill and stabilize any ruts as they occur. Adding green space to your landscape requires regular gardening maintenance. Overall, landscaping with native plants and trees requires less maintenance than traditional lawns and gardens.

*Typical gardening activities for **native plants** include:*

- Annual mulching (no more than 2 to 3 inches)
- Weeding (by hand)
- Watering (if it has been more than 3 weeks without rain)
- Pruning (as desired)

*Typical gardening activities for **trees** include:*

- Mulch
 - Place 2 to 4 inches of mulch in a 3-foot-wide ring around the tree, but make sure that mulch does not touch the tree.
 - Re-mulch annually. If trees are part of a larger planting bed, you may allow leaves to remain, which reduces the frequency of needing to add mulch to the tree to conserve water.
- Water trees
 - Keep soil moist, but not soaked.
 - Water trees once a week (less frequently if it rains and more often when it's hot and dry).
- Provide wind protection (using stakes for added stability during the first year). Remove all tree stakes after the first growing season.
- Rake leaves in the fall.
- Properly prune limbs (to protect nearby structures).
- Use pest control if necessary.



Landscaping with native plants

- Use tree-wraps to protect trees from deer rub if necessary.

*Typical gardening activities for **sod** include:*

Watering

- Shady areas require less watering, so adjust your watering patterns to conserve water.
- Water early in the morning to reduce water loss through evaporation.
- Use water from your rain barrel or cistern.
- Stop watering if you observe run off. Make sure that your soil soaks up the water.
- Watering less frequently, but more thoroughly is more efficient than a frequent light spray.
- Adjust watering patterns during periods of heavy rain or extreme heat.

Mowing

- Maintain a grass height of about 2 inches during the spring and fall and 2½ to 3½ inches in the summer. Longer grass blades help protect underlying growth, retain soil moisture, and serve as a natural barrier to weed growth.
- Avoid cutting more than ⅓ of the grass blade length at a time. This will slow growth so you will not have to mow as frequently.
- The best time of day to mow is in the evening, which allows grass to recover overnight before it is exposed to the sun.
- The rule of thumb is to only mow grass when it needs it!

For More Information:

RainScapes Resources: Plant Lists
<http://www.montgomerycountymd.gov/dectmpl.asp?url=/content/dep/water/rainresources.asp>

Environmental Landscaping: Getting Started
<http://www.envirolandscaping.org/howto.htm>

Chesapeake Conservation Landscaping Council's *Eight Essential Elements of Conservation Landscaping*
<http://www.chesapeakelandscaping.org/Guid1207%20.pdf>

Restoring Compacted Soil:
<http://www.soundnativeplants.com/PDF/Restore%20Compact%20Soil.pdf>

Slope Control:
<http://www.erosioncontrol.com/january-february-2010/challenges-slope-stabilization.aspx>

Chesapeake Bay Conservation Landscaping Web Resources
http://www.dnr.state.md.us/bay/cbnerr/download/BayScaping_WebLinks.pdf

American Institute of Architects Chesapeake Bay Foundation Bay Friendly Landscaping and Shoreline Resource List
http://www.aiacbcgreen.org/cbf_resource_list.php

Virginia Department of Conservation and Recreation: Native Plants for Conservation, Restoration, and Landscaping
http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml

Native Lawns: Buffalo Grass
Lady Bird Johnson Wildflower Center at the University of Texas at Austin
<http://www.wildflower.org/howto/show.php?id=19&frontpage=true>

Brooklyn Botanic Garden
Planting a Native Grass Lawn Step by Step
http://www.bbg.org/gardening/article/planting_a_native_grass_lawn/



Two-track driveway



Goal: healthy soils and watersheds



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Rain Gardens

Why should I install a rain garden?



One inch of rain falling over a 1,500 square foot home on a small lot can produce over

5,000 gallons of stormwater runoff. Typically, roof downspouts release runoff directly onto lawns or hard surfaces such as driveways, streets, and sidewalks that prevent the water from soaking into the ground. When water cannot soak into the ground, it flows over the surfaces and enters storm drains that flow to streams. As it flows over hard surfaces and lawns, the stormwater picks up pollutants such as sediment, grease and oil from cars, and pesticides and fertilizers from lawns. The storm drain pipes collect the stormwater and send it into the streams in surges, which can cause downstream erosion, flooding, and stream habitat problems.

Rain gardens are functional landscaping features. In addition to making your landscape look more attractive, they can address flooding and erosion problems in your yard and neighborhood.

(continued on page 2)

What is a rain garden?

Rain gardens are attractive landscape features constructed to capture stormwater runoff from hard surfaces such as your roof, driveway, patio, or sidewalk. A rain garden is a garden with a shallow depression that collects and drains stormwater. Rain gardens typically are planted with native plants with deep roots that loosen the soil, so stormwater can soak into the ground more easily. Rain gardens help to meet the RainScapes' goal of using innovative natural approaches to reduce water pollution, stream channel erosion, and drainage problems caused by stormwater runoff.



Sunny rain garden - first summer



Shady rain garden - first growing season, attractive overflow design



Fall rain garden

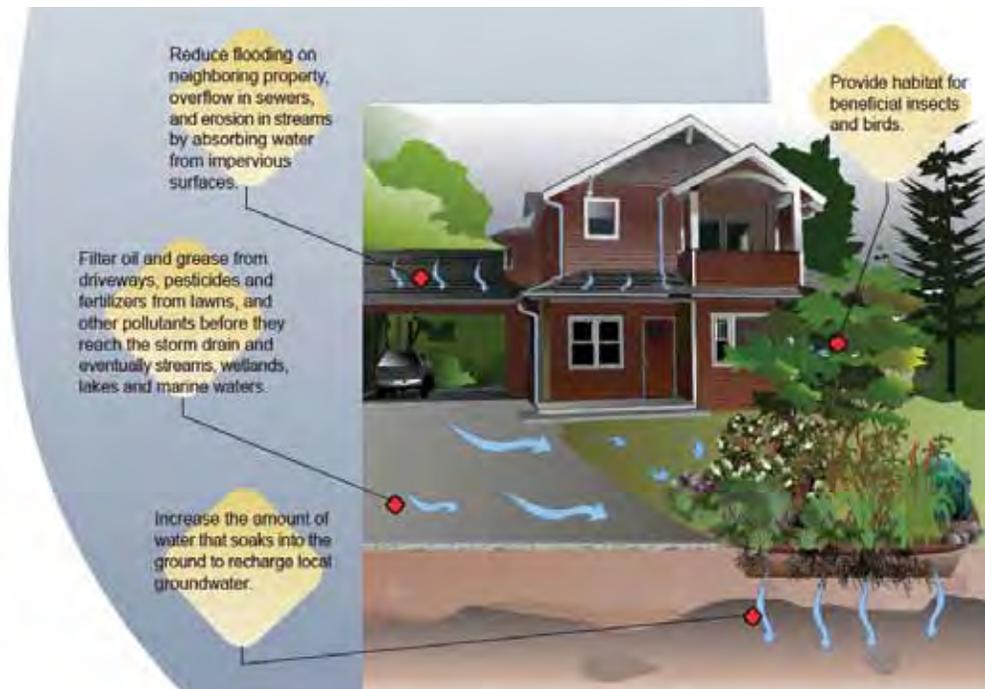


Image courtesy of Washington State University Rain Garden Handbook

Is my site right for a rain garden?

Not all sites are suitable for a rain garden and a conservation landscape may be a more appropriate project. If you have poorly drained soils, steep slopes, or space constraints, you should consider conservation landscaping. See rainscapes.org for more information.

(continued from page 1)

Stormwater is reduced because you are collecting the stormwater and allowing it to naturally soak into the ground.

What are the Benefits and Incentives?

Rain gardens allow about 30% more rainwater to soak into the ground than traditional lawns. Since rain gardens capture stormwater onsite, they can reduce the harmful effects to streams caused by large and rapid stormwater flows.

Rain gardens offer multiple benefits to the community and the local environment, which include:

- Reduced polluted stormwater runoff from yards into local streams

- Reduced localized flooding
- Reduced erosion
- Pollution prevention
- Groundwater recharge
- Enhanced wildlife habitat
- Aesthetics

However, the most important reason to install a rain garden may be that you are doing your part to help the environment and protect your local streams and the Chesapeake Bay.

The RainScapes Rewards Rebate Program offers a rebate for installing a rain garden on residential, institutional, multi-family, or commercial properties. Please visit rainscapes.org for additional rebate information.

How to...

Assess Your Property

Take some time to walk around your property to assess the drainage conditions. The best time to make your observations is when it is raining, so that you can see where the rain lands and where it flows. Consider these questions to help you identify where a rain garden could be placed to capture stormwater runoff on your property:

- Are there places on your property where rain regularly runs off of a hard surface such as your roof, driveway, patio or compacted lawn?
- Where does the rainwater go? Is the runoff directed to your lawn, the street, or a storm drain?

The rain garden should be placed so that it catches the runoff from your roof downspouts, driveway, sump pump outlets, patio, or sidewalk. The key is to place the rain garden between the point where rain falls on your property (i.e. your roof, driveway, or patio, etc.) and where runoff water would exit your property (i.e. an adjacent stream, storm drain, etc.).

Once you have identified the pattern of drainage on your property, you can narrow down the potential rain garden locations on your property. Follow these steps to identify the best location in your yard for a rain garden:

1. Measure the area that will drain to your rain garden. Use the tables (1, 2 or 3) on the next page to determine the size of your rain garden. The area is determined by the relationship between hard surfaces draining to the garden, the depth of digging in the garden and the amount of rain you are trying to catch.
2. Fit the rain garden into your current landscape. A well designed rain garden will improve the aesthetics of your property.
3. Avoid marked underground utilities and septic tanks
 - Identify and mark existing utilities before digging
 - Call “Miss Utility”: 1-811-257-7777 or submit an Internet Locate Request for homeowners: <http://www.missutility.net/iticleite/>
4. Place the rain garden at least 10 feet away from basements and 5 feet from concrete or asphalt slabs like sidewalks, driveways, patios and garages.
5. Avoid placing your rain garden under existing tree canopies
6. Avoid placing the rain garden in a soggy area in your yard, which indicates that the soil in that area cannot drain well. The best place for the rain garden is just uphill from the low spot in soil that passes the infiltration test. (See Testing the Soil).
7. Bedrock and ground water should be at least 2 feet below the rain garden surface. If you are concerned about these issues on your property, consult with RainScapes staff first.
8. If you place the rain garden to collect runoff from a downspout, make sure the edge of the garden is 10 feet away from your house and downhill from the foundation.
9. Make sure that when the rain garden overflows, the excess water will be directed away from your home and your neighbor’s property.

Consult with RainScapes staff or a knowledgeable professional to determine if the site is suitable for a rain garden.

Testing the Soil

Since rain gardens depend on water soaking through the ground, it is important that the soils drain well. After locating a place you wish to build your rain garden, you must test how well the soil drains to determine if the site is suitable. To determine if your soil is suitable for a rain garden, you must perform a soil drainage or infiltration test, which measures how fast the water soaks into the soil. Collected water in rain gardens should soak into the soil within 24 to 36 hours.

1. Dig a hole in the potential rain garden location that is about one foot in diameter and two feet deep (or as deep as your rain garden excavation will be).
2. Fill the hole with water.
3. Allow the water to naturally soak into the soil and wait until the water drains completely.
4. Within twelve hours, refill the hole with water and record the time it takes for water to drain. This should take no longer than 36 hours.

Consult with RainScapes staff or a qualified professional if it takes longer than 24 to 36 hours for water to drain through your test pit.

How to...

Design and Plan

1. Assess your site.
 - Determine the size of the garden
2. Design your garden
3. Build your garden
 - Layout the garden
 - Set your levels
 - Excavate
 - Build a berm/dispose of soil
 - Deliver/Add soil mix
 - Plant
 - Mulch
 - Water
4. Maintain your garden
 - Establishment
 - Ongoing

Sizing the Rain Garden

The amount of rainfall that will fill a rain garden depends on how large the rain garden is compared to its drainage area. The tables below provide guidance on how to properly size a rain garden. Montgomery County recommends that residential rain gardens capture 1.5 to 2.7 inches of rain.

Another consideration is planting bed depth, which is the depth of the rain garden soil media. More water can be stored with a deeper planting bed, but a shallower depth is easier and

faster to construct. Use the shallowest planting bed depth that can capture the desired amount of rain and may result in less soil that has to be removed.

Shaded areas indicate inches of rain captured for any combination of drainage area and rain garden area. In the top row, choose the drainage area closest to the measured area. In the left column, choose the closest rain garden area to the measured area. As an example, the blue box shows that a 50 sq. ft. rain garden with a one foot planting bed can store 3.0 inches of rain from a 200 sq. ft. drainage area.

Rain garden sizing tables

Table 1. Sizing table for 1 ft planting media.

Media footprint (square feet)	Drainage area (square feet)					
	100	200	300	400	500	600
Inches of rain stored						
5	1.1	0.6	0.4	0.3	0.2	0.2
15	2.2	1.1	0.7	0.6	0.4	0.4
30	3.8	1.9	1.3	1.0	0.8	0.6
50	6.0	3.0	2.0	1.5	1.2	1.0
60	7.1	3.6	2.4	1.8	1.4	1.2
75	8.8	4.4	2.9	2.2	1.8	1.5
100	11	5.7	3.8	2.9	2.3	1.9
125	14	7.1	4.7	3.6	2.8	2.4

Table 2. Sizing table for 2 ft planting media.

Media footprint (square feet)	Drainage area (square feet)					
	100	200	300	400	500	600
Inches of rain stored						
5	1.3	0.7	0.4	0.3	0.3	0.2
15	2.8	1.4	0.9	0.7	0.6	0.5
30	5.0	2.5	1.7	1.2	1.0	0.8
50	7.9	4.0	2.6	2.0	1.6	1.3
60	9.4	4.7	3.1	2.3	1.9	1.6
75	12	5.8	3.9	2.9	2.3	1.9
100	15	7.6	5.1	3.8	3.1	2.5
125	19	9.5	6.3	4.7	3.8	3.2

Table 3. Sizing table for 3 ft planting media.

Media footprint (square feet)	Drainage area (square feet)					
	100	200	300	400	500	600
Inches of rain stored						
5	1.5	0.7	0.5	0.4	0.3	0.2
15	3.3	1.7	1.1	0.8	0.7	0.6
30	6.1	3.1	2.0	1.5	1.2	1.0
50	9.8	4.9	3.3	2.5	2.0	1.6
60	12	5.8	3.9	2.9	2.3	1.9
75	14	7.2	4.8	3.6	2.9	2.4
100	19	9.5	6.4	4.8	3.8	3.2
125	24	12	7.9	5.9	4.7	3.9

Using the sizing tables

1. Estimate how much impervious area (roof, patio, driveway, or a combination) could be directed to the rain garden. For roof drainage, measure the footprint of the house to find the total area. Divide by the number of downspouts to estimate the roof area contributing to each downspout.
2. Look at the tables; start at the top and find the impervious area that you just calculated.
3. Decide how much rain you wish to catch in your rain garden (for a rebate, this should be at least 1.5 inches).
4. Tables 1-3 give you rain garden areas, but start with Table 1, since it involves the least amount of excavation. Determine your rain garden area by looking at the left column that lists rain garden square feet based on the impervious area and the inches of rain treated in the garden.
5. If you know you don't have enough land for the ponding area, then move to Table 2 or 3.
6. Make a note of the selected planting bed depth to use in construction.

Remember, the rain garden depth equals the depth of the soil media (planting media) plus an additional 6” for a temporary ponding area. So a Table 2 rain garden would actually be 30 inches deep. See Rain Garden Footprint on page 6. The wet zone is the planting media footprint. The dry zone is the extent of the ponding footprint. The figure at the bottom of page 6 also shows these zones and the rain garden berm.

Most mosquitoes take 7 to 12 days to breed, however, a few species can lay eggs, hatch, and develop from larva to an adult in 4 days. If your rain garden is designed properly, it will drain within a few hours to a day, which is not enough time for mosquito eggs to hatch. Rain gardens are intended to dry out between rain storms; they are not intended to hold a permanent pool of water. Additionally, native plants in rain gardens attract wildlife such as dragonflies that are natural predators of mosquitoes.

Table 4. Media Footprint vs. Ponding Footprint (square feet)

Media Footprint	Ponding Footprint
5	24
15	37
30	56
50	81
60	94
75	112
100	144
125	175

Developing a Planting Plan

Basic garden composition principles apply to rain gardens. This means that it is desirable to have four seasons of interest, the color scheme and style of the garden should fit your needs, and garden maintenance should be considered when developing a planting plan. There are many resources that focus on composition; a rain garden can look like any style of garden once the soil and drainage aspects are solved.

The best plants for rain gardens are plants that have fibrous, deep roots and are able to withstand periods of drought and periods of extended wet conditions. This manual includes a list of recommended rain garden plants and some sample rain garden planting design templates. Other templates are available online and links to those are included in the “For More Information” section.

Plant Selection

Plant selection is critical to the success of your rain garden. The most important step is to match a plant’s water tolerance to its location in the rain garden. Some plants are adapted to their “feet” (roots) getting wet, while other plants prefer drier soil conditions. Different locations within the rain garden will have different levels of water after a storm. The center of the rain garden is the lowest point, so



Native plants support pollinators

it will be the wettest area. Plants in this part of the rain garden should prefer moist soil. Plants placed along the sides of the rain garden should prefer average to dry soil conditions. Plants at the top (edge) of the rain garden should prefer dry soil conditions but be able to tolerate brief periods of flooding. Avoid selecting plants that require wet conditions—these plants are wetland plants and need wet soils for the majority of the growing season. Plant soil moisture tolerance information can be found in most nursery catalogs, and is labeled as wet, moist, average and dry, though you may need to look at additional references in this section.

Remember that rain gardens are designed to drain within 24-36 hours, so they will be dry for most of the season. Some native plant guides list

ranges of “flood depths” that particular plants can tolerate. Knowing the depth of standing water that a plant can handle will help you know where the plant should be placed in the rain garden (bottom, side, or top).

Other considerations are plant size (how tall and wide plants will grow when they are mature—space them accordingly), the amount of sunlight the plant needs (typically full sun, partial shade, and shade), and plant aggressiveness (you want your plants to stay where they are planted instead of taking over your garden).

Native plants have deep root systems that are much bigger than the root depth of conventional turf grass. Typical turf grass typically has roots that are 2-4 inches deep. Rain garden plant roots will usually grow to the depth of the garden and may extend further, depending on local soil conditions. As the plant matures, plants grow new roots looking for water and nutrients and discard about 30 percent of the roots annually, leaving “root channels” or holes in the soil where old roots decayed, which break up the soil. Water flows through the “root channels” and soaks into the soil more quickly. Drainage through soil will improve over time with native plants. To be eligible for a rebate, at least 75% of plants must be native species, which are plants that have adapted to local climate, rainfall, and soil conditions.

Helpful resources for choosing native wildflowers, grasses, and shrubs for our region include:

- The U.S. Fish & Wildlife Service’s guide called “Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed.” <http://www.nps.gov/plants/pubs/chesapeake/>

Or

<http://www.nps.gov/plants/pubs/nativesMD/pdf/MD-Piedmont.pdf>

- The National Park Service’s “Plant Lists for Maryland Regions” <http://www.nps.gov>



Shade tolerant plants - first year

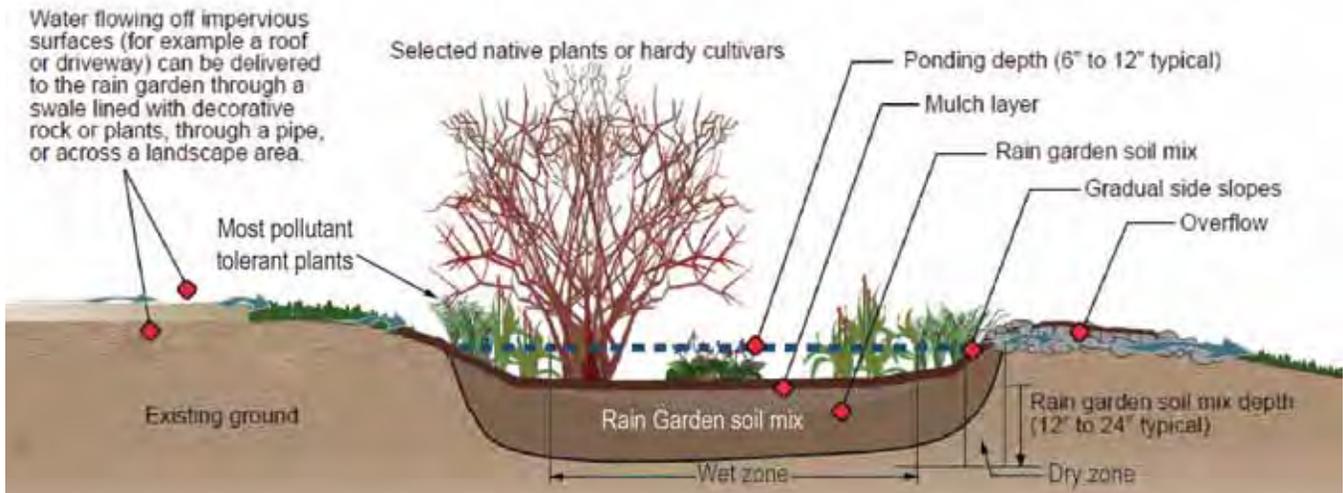
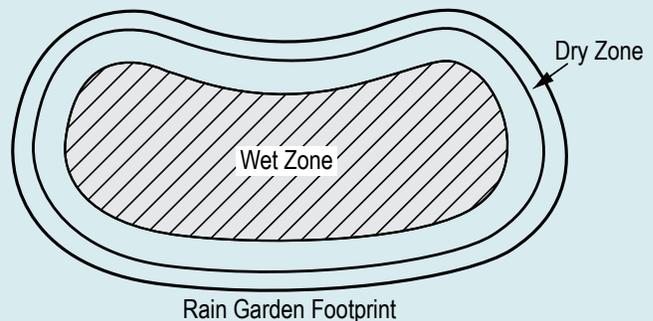


Image courtesy of Washington State University Rain Garden Handbook

Plan how water will get to the rain garden

There are a variety of ways to direct stormwater to your rain garden:

- Direct a roof downspout to the rain garden through a grass or rock-lined swale
- Direct a roof downspout to the rain garden through a buried PVC pipe (place a “splash guard” or large rock under the pipe outlet to avoid erosion in the rain garden)
- Collect driveway runoff in a shallow trench drain and pipe water to the rain garden
- Install a 1-inch speed bump in your driveway to send runoff to rain garden (requires hand shoveling in the winter)
- Direct rain barrel overflow into the rain garden

Plan where water will go when the rain garden is full

All rain gardens will overflow during periods of heavy rainfall. Overflow from your rain garden can be released through a “notch” cut in the berm. The notch should be reinforced with either turf or stone to prevent erosion. The water should go where it would normally have flowed before the rain garden was constructed. A soft surface, such as a lawn or shrub planting area is usually the best location for overflow because it will provide additional opportunities for water to soak into the ground. Avoid sending the excess water towards your home’s foundation or neighboring home’s foundation.



Brookside Gardens - signs help explain the rain garden



2-celled rain garden just after installation



and during first growing season

Can I do this Project Myself?

Maybe. Detailed design templates are provided at [rainscapes.org](https://www.rainscapes.org):

You may need to consider hiring a qualified designer and/or installer if:

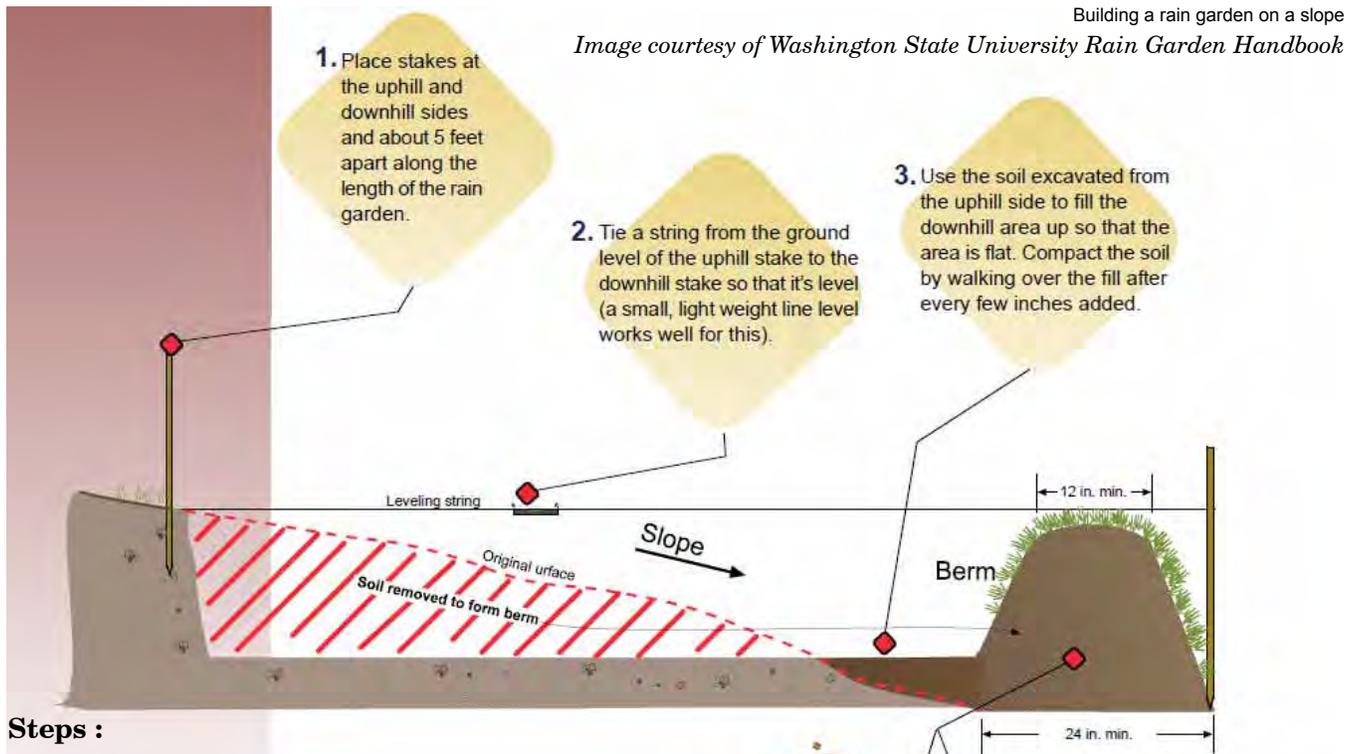
- you are trying to treat off-site drainage
- your site has a steep slope
- you are considering terracing
- you have a lot of trees

If you are hiring a contractor to build a more complex rain garden, you can give the contractor these plans.

How to Build and Implement

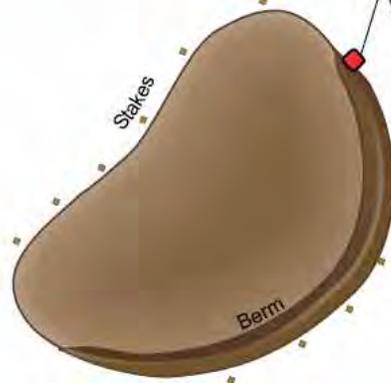
Equipment:

- Rope, string, or garden hose
- Stakes
- Lightweight line level
- Sod-cutter (optional- you can rent these)
- Shovel and rake (if done on a slope, shovel will not be needed)
- Tiller or back hoe (use teeth to till)
- Edging machine (optional- helps to keep grass out of the rain garden)



Steps :

1. Outline the footprint of the rain garden with rope, string, or a garden hose.
2. Pull up the sod with a sod-cutter or a shovel. The sod-cutter is preferred so that you have rolls of sod to finish the site or dispose easily.
3. Dig out the garden bed (to the depth determined from the sizing chart for the planting bed depth plus an additional 6 inches for



4. Create a berm at the downhill side to confine water in the rain garden. For the correct height, build the berm up to the string. To keep the top level, the berm will be highest at the downhill end and then become shorter up the sides until tapering off at the uphill end. The berm should be a minimum of 24 inches wide at the base, have gently sloping sides, and be well compacted.

the ponding depth). Set aside the excavated material to use for the berm.

4. Create a flat-bottomed bowl.
5. Add the planting media one foot at a time, up to the chosen planting depth from Table 1. Make sure that each layer is perfectly level. Water the area gently, so that the soil is not displaced. Recheck the level of the surface after wetting the planting bed to make sure the surface is flat.
6. If your rain garden is built on a hill, you will want to build a mound of soil (a berm) on the downhill side to hold the water in. Cut a “notch” in the berm to let water out during the first year to allow plants to establish their roots. The hillside garden is the easiest to build by just raking the soil from the garden after tilling to the berm, with no shovel required. (See figure above).
7. Protect the berm notch and the inlet area with cobbles, an erosion control blanket, or rock placed in a step-like condition.
8. Place edging or a small wall around the garden to keep grass from creeping in, keep the mulch in, and enhance the aesthetic. Whatever edging you use, it needs to be lower than the grass edge or inlet to allow water to enter the garden.
9. Fill the rain garden with water to make sure it will drain within 24 hours and overflow in the direction you intended.
10. Before planting, place double shredded hardwood mulch over the garden bed to a depth of 3 inches; mulch prevents weeds, adds nutrients to the soil, and captures pollutants.
11. Remove plants from containers. If the plants are “root bound,” break up the roots with a knife or your fingers. Make sure that the roots are pointing downwards when you place the plant in the soil.
12. Plant native species based on moisture preferences (average to moist or dry conditions).

*Avoid compacting soil by standing or placing heavy equipment in the rain garden bed, which makes it harder for water to drain through the soil.



Rain garden with curvilinear grass berm



Watering is necessary for newly planted gardens, but established gardens are drought tolerant

Costs

Rain garden costs vary greatly and depend on the size, materials, and design of the garden. A typical price range is between \$4-35 per square foot. The lower figure is likely if you are a “do-it-yourselfer” with no hardscape and are using smaller plants. Factors that influence price include:

- access to the site
- labor
- the use of heavy equipment or hand tools
- soil disposal offsite
- size of plants selected
- size of the garden overall
- how much water it is designed to capture and soak in

When hiring a contractor, ask for referrals of successful projects and be clear about what the project entails.



Deer resistant plants are crucial to many landscapes

Maintenance

Most of the maintenance required for rain gardens occurs during the first year. Remember to:

- Water plants during the first growing season until plants are established. The garden should receive a minimum of 1 inch of water from the hose or rain per week (about 15.6 gallons/week for a 25-square-foot rain garden).
- Remove weeds.
- Remove litter, sand, and sediment that may have entered the rain garden.
- Remove and re-mulch (annually) with double shredded hardwood mulch to maintain 3 inches of cover.
- Prune dead vegetation (annually).
- Check where water enters the rain garden to make sure the area remains free of debris. Place rocks or a “splash block” to break up the water entering the rain garden to avoid washing out the garden during a major storm.

Different Applications

Rain gardens can have different appearances, dependent on your style preference and the level of maintenance you can do. Choose plants that you find attractive. You may want your garden to have a more manicured look or a “wild and wooly” look.



Rain garden in partial sun

For More Information

“Blue Thumb Guide to Rain Gardens: Design and Installation Guide for Homeowners in the Upper Midwest.”

http://metroblooms.org/store/product_details.php?category_id=10&item_id=19

Western Washington Rain Garden Handbook
Washington State University Pierce County Extension

http://county.wsu.edu/mason/nrs/water/Documents/Raingarden_handbook.pdf

Rain Garden Manual for New Jersey
Native Plant Society of New Jersey

http://www.npsnj.org/rain_garden_home.htm

Rain Garden Calculators <http://www.rainkc.com/index.cfm/fuseaction/home.showpage/pageID/17/index.htm>

Deer Tolerance

A list of deer resistant plants is provided on page 73 of the U.S. Fish & Wildlife Service’s guide to “Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed.”

To download or order a free copy of this guide, visit <http://www.nps.gov/plants/pubs/chesapeake/>

8-minute Video of Rain Garden Installation

Metro Blooms, July 24, 2008

http://metroblooms.org/raingarden_video.php

Where to Buy Native Plants

Most local nurseries carry native plants. The U.S. Fish and Wildlife Service website lists some native plant nurseries in the Chesapeake Bay watershed:

<http://www.fws.gov/chesapeakebay/BayScapes/bsresources/bs-nurseries.html>

Rain Garden Templates, Low Impact Development Center

http://www.lowimpactdevelopment.org/raingarden_design/templates.htm

Montgomery DEP Rain Garden templates

<http://www.rainscapes.org>



RainScapes

Environmentally-Friendly Landscapes for
Healthy Watersheds

Tree Canopy

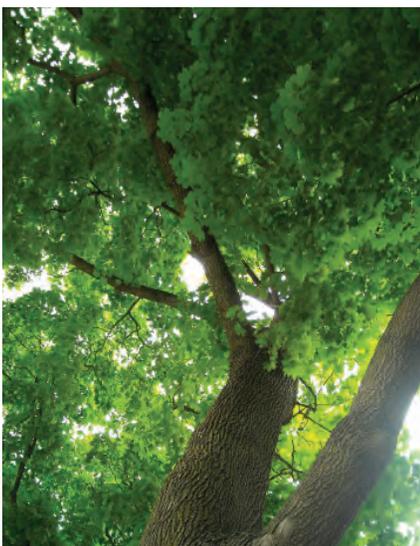
Why should I plant trees?



Planting trees is an easy, affordable way to benefit the environment.

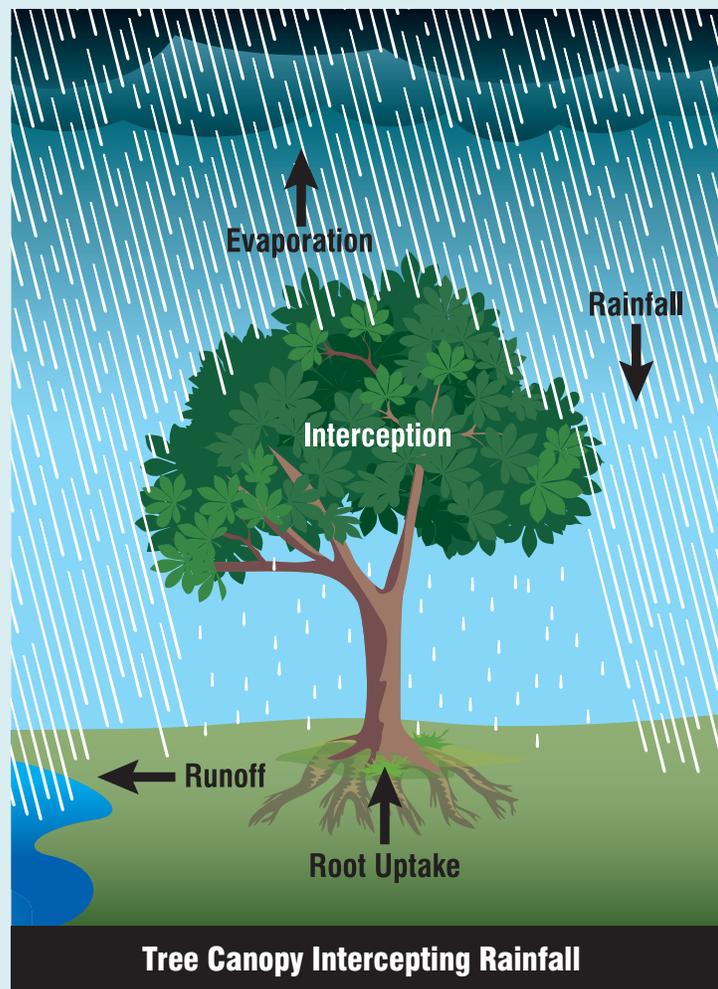
Tree canopies

reduce stormwater runoff by absorbing and collecting rainfall on leaves and branches. Water evaporating off the surface of leaves returns to the atmosphere. Tree roots promote rainwater infiltration through the soil. Studies that have measured the stormwater benefits of trees found that over 700 gallons of rainfall can be captured each year by a single mature tree with a 30-foot radius crown.



What is a tree canopy?

A tree canopy is the crown of one or many trees that create an “umbrella” or cover of leaves. The leaves and branches shade paved surfaces, such as sidewalks, driveways, and patios, reducing the temperature of rainwater runoff. Tree canopy intercepts rainfall before the water hits the ground and becomes stormwater runoff. Trees provide many benefits to the health and well-being of communities. Often, trees can easily be added to the landscape to provide stormwater benefits.



What are the benefits and incentives?



Important benefits that trees provide for the environment and local

community include:

- Reduced stormwater runoff
- Improved water quality
- Improved air quality
- Stream bank stabilization
- Enhanced wildlife habitat
- Perceived noise reduction
- Reduced energy costs as trees shade your home
- Wind breaks
- Increased property values and curb appeal

Trees also provide benefits that cannot be measured. Trees can improve community life and a person's overall sense of well-being.

To see the requirements and submit the RainScapes Rewards Rebate Application, please visit www.rainscapes.org

Eligibility

The Montgomery County Department of Environmental Protection (DEP) supports expanding and improving the amount of tree canopy in our watersheds. Rock Creek, Little Falls, Anacostia, Cabin John, Watts Branch, Muddy Branch,

and Patuxent watersheds are in greater need of tree planting than some of our other watersheds. If you are interested in seeing your area's current tree canopy, please visit

<http://www.montgomeryplanning.org/canopy>

In addition to Montgomery County's program, other programs may provide similar incentives for tree planting. See <http://www.montgomerycountymd.gov/dectmpl.asp?url=/Content/dep/climatechange/treelaws.asp>

To qualify for DEP's RainScapes rebate:

- Trees must be planted on private property. Rebates will not be awarded for trees planted in the public right-of-way (other programs exist for right-of-way trees).
- New trees must be:
 - » In a #7 pot (a container holding about 7 gallons of soil and the roots) or larger
 - » At least 8 feet tall
 - » At least 1 caliper inch (the trunk is 1 inch thick measured 6" above the base of the tree in the pot)
- Trees must be planted between September 15 and April 30



Shingle Oak

Large canopy tree above road pavement

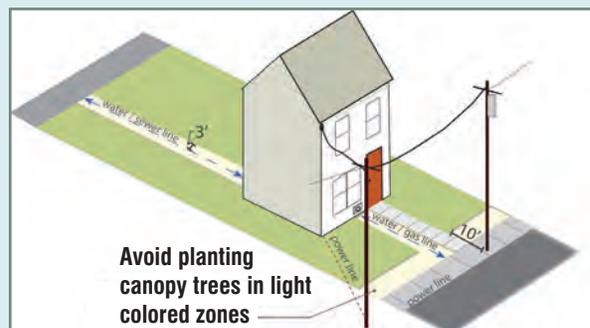
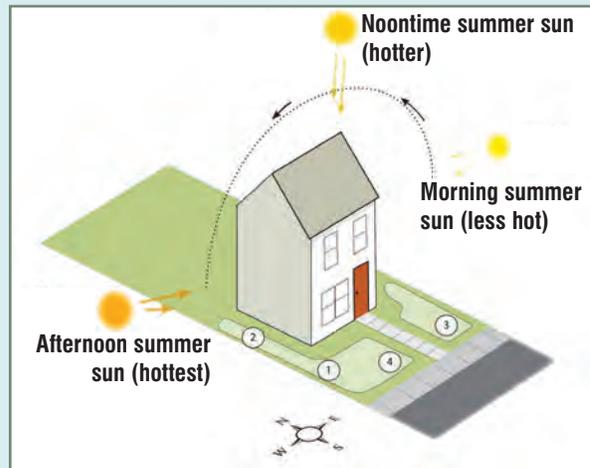
How to...

Assess Your Property

Follow these basic steps to identify the best location in your yard for a shade tree:

- **Identify Existing Utilities Before Digging**
 - » Mark underground utility lines by calling “Miss Utility” at 1-800-257-7777 or submitting an Internet Locate Request for homeowners: <http://www.missutility.net/iticle/>
- **Avoid Utilities**
 - » Plant at least 3 feet away from marked underground utilities (Montgomery County requirement)
 - » Plant at least 10 feet away from main overhead utility wires
- **Accommodate Tree Growth**
 - » Dig the tree planting hole
 - 15 to 20 feet away from structures
 - At least 3 feet away from driveways, sidewalks, patios, and fences
 - At least 20 feet from other large trees
 - At least 10 feet from small trees
- **Maximize Shade Provided by Trees**
 - » Plant trees along the southwestern or western sides of your home to lower cooling costs by shading afternoon sun
 - » Plant along the southeastern or southern sides to shade your home from morning sun
 - » Plant in an area that will shade air conditioning units to help reduce energy use
- **Maximize Wind Protection Provided by Trees**
 - » Plant along the northern and northwestern sides of your home to block winter winds and reduce heating costs

Remember that the best place to plant a tree is near a hard surface such as a driveway, sidewalk, or patio. When the tree canopy is mature, it will shade the hard surface and rainfall will be collected by leaves and branches.



Illustrations: © Casey Trees 2009

How to...

Design and Plan

Once you have identified an appropriate site for your tree, choose the type of tree to plant.

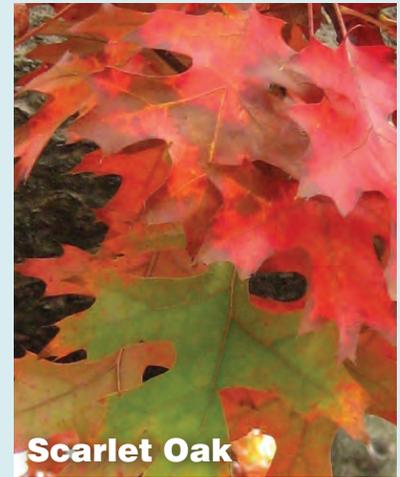
The RainScapes Rewards Rebate program currently accepts rebate applications for the tree species listed in the table below. Other native canopy trees will be considered by DEP on a case-by-case basis. To find the types of trees that will work for your property, compare the soil type, space, and sunlight requirements. Additional information can be found at rainscapes.org.



Red Maple



Black Oak



Scarlet Oak

Common Name	Scientific Name	Mature Height (feet)	Mature Spread (feet)	Light Exposure	Soil Texture Tolerance	Soil Moisture Tolerance	Drought Tolerance	Pest Resistance
Common Baldcypress	<i>Taxodium distichum</i>	60–80	25–35	Full sun, partial sun or partial shade	Clay, sand, loam	Extended flooding, well-drained	High	Resistant to pests/diseases
Yellow Buckeye	<i>Aesculus octandra</i>	50–75	25–35	Full sun	Clay, sand, loam	Well-drained, occasionally wet	Moderate	Resistant to pests/diseases
Kentucky Coffeetree	<i>Gymnocladus dioicus</i>	65–70	45–60	Full sun	Clay, sand, loam	Well-drained	High	Free of serious pests and diseases
American Elm (Valley Forge or Princeton)	<i>Ulmus americana</i>	70–90	50–70	Full sun, partial sun, or partial shade	Clay, sand, loam	Extended flooding, well-drained	High	Sensitive to pests/diseases
Black Gum	<i>Nyssa sylvatica</i>	65–75	25–35	Full sun, partial sun or partial shade	Clay, sand, loam	Extended flooding, well-drained	High	Free of serious pests and diseases
Common Honeylocust	<i>Gleditsia triacanthos</i>	30–40	30–40	Full sun, partial sun or partial shade	Clay, sand, loam	Well-drained, occasionally wet	High	Sensitive to pests/diseases
Common Honeylocust	<i>Gleditsia triacanthos</i>	30–40	30–40	Full sun, partial sun or partial shade	Clay, sand, loam	Well-drained, occasionally wet	High	Sensitive to pests/diseases
Littleleaf Linden	<i>Tilia cordata</i>	60–70	35–50	Full sun, partial sun, or partial shade	Clay, sand, loam	Well-drained, occasionally wet	Moderate	Resistant to pests/diseases
Red Maple	<i>Acer rubrum</i>	60–75	25–35	Full sun, partial sun or partial shade	Clay, sand, loam	Extended flooding, well-drained	Moderate	Resistant to pests/diseases
Silver Maple	<i>Acer saccharinum</i>	60–80	40–60	Full sun, partial sun or partial shade	Clay, sand, loam	Extended flooding, well-drained	High	Resistant to pests/diseases

(continued on page 5)

(continued from page 4)

Common Name	Scientific Name	Mature Height (feet)	Mature Spread (feet)	Light Exposure	Soil Texture Tolerance	Soil Moisture Tolerance	Drought Tolerance	Pest Resistance
Black Oak	Quercus veluntina	50–70	35–50	Full sun	Clay, sand, loam	Well-drained	High	Resistant to pests/diseases
Northern Red Oak	Quercus rubra	60–70	50–60	Full sun	Clay, sand, loam	Well-drained	High	Resistant to pests/diseases
Scarlet Oak	Quercus coccinea	60–75	45–60	Full sun	Clay, sand, loam	Well-drained	Moderate	Resistant to pests/diseases
Shingle Oak	Quercus imbricaria	40–60	40–60	Full sun	Clay, sand, loam	Extended flooding, well-drained	High	Resistant to pests/diseases
Swamp White Oak	Quercus bicolor	50–70	50–70	Full sun, partial sun or partial shade	Clay, sand, loam	Extended flooding, well-drained	Moderate	Resistant to pests/diseases
Willow Oak	Quercus phellos	60–75	40–50	Full sun	Clay, sand, loam	Extended flooding, well-drained	High	Resistant to pests/diseases
Tulip-Poplar	Liriodendron tulipifera	80–100	30–50	Full sun	Clay, sand, loam	Well-drained, occasionally wet	Moderate	Resistant to pests/diseases
American Sweetgum	Liquidambar styraciflua	60–75	35–50	Full sun, partial sun, or partial shade	Clay, sand, loam	Extended flooding, well-drained	Moderate	Resistant to pests/diseases
American Sycamore	Plantanus occidentalis	75–90	50–70	Full sun	Clay, sand, loam	Extended flooding, well-drained	High	Sensitive to pests/diseases
The following trees will be considered at this time, but are not commonly found at local nurseries in large sizes:								
Bigtooth Aspen	Populus grandidentata	50–75	25–35	Full sun	Clay, loam	Well-drained, occasionally wet	Moderate	Sensitive to pests/diseases
American Beech	Fagus grandifolia	50–75	40–60	Full sun, partial sun or partial shade, shade tolerant	Clay, sand, loam	Well-drained	Moderate	Resistant to pests/diseases
Pond Cypress	Taxodium ascendens	50–60	10–15	Full sun, partial sun or partial shade	Clay, sand, loam	Extended flooding, well-drained	High	Resistant to pests/diseases
Mockernut Hickory	Carya tomentosa	50–75	35–50	Full sun, partial sun or partial shade	Clay, sand, loam	Well-drained	Moderate	Sensitive to pests/diseases
Pignut Hickory	Carya glabra	50–65	30–40	Full sun, partial sun or partial shade	Clay, sand, loam	Well-drained, occasionally wet	High	Resistant to pests/diseases
Bur Oak	Quercus macrocarpa	70–90	60–80	Full sun	Clay, sand, loam	Extended flooding, well-drained	High	Resistant to pests/diseases
Overcup Oak	Quercus lyrata	30–40	30–40	Full sun, partial sun, or partial shade	Clay, sand, loam	Extended flooding, well-drained	Moderate	Resistant to pests/diseases
White Oak	Quercus alba	60–100	60–80	Full sun, partial sun or partial shade	Clay, sand, loam	Well-drained, occasionally wet	Moderate	Resistant to pests/diseases
Kentucky Yellowwood	Cladrastis kentukea	30–50	40–50	Full sun, partial sun or partial shade	Clay, sand, loam	Well-drained, occasionally wet	Moderate	Free of serious pests and diseases

Data adapted from “Northern Trees” tree selector developed by the U.S. Department of Agriculture (USDA) Forest Service Northeast Region with Rutgers University and the University of Florida [see “For More Information” section on page 9].



Can I do this project myself?

Yes. You can use this section as a guide. You will need the appropriate tools, site assessment, and physical ability.

If I decide to hire a contractor, what should I ask?

- What experience do you have planting trees?
- Are you certified with any nationally recognized organizations such as the International Society of Arboriculture or the National Arborist Association?
- Can you supply references from previous clients?
- Are you insured?
- What is included in your services?
- How long do you expect the project to take?
- Do you offer a guarantee for your work?
- Are you available to perform ongoing maintenance of the trees if needed?
- How much will your services cost?

If you buy your tree at a nursery, remember to cover the tree with a tarp or blanket during transportation to protect it from wind damage. If you bought your tree at a nursery that offers a warranty or guarantee, be sure to follow the nursery planting instructions.



Silver Maple

Large spreading canopy intercepts up to 1/4 inch of rain in leaves (Casey Trees)

How to... Build and Implement

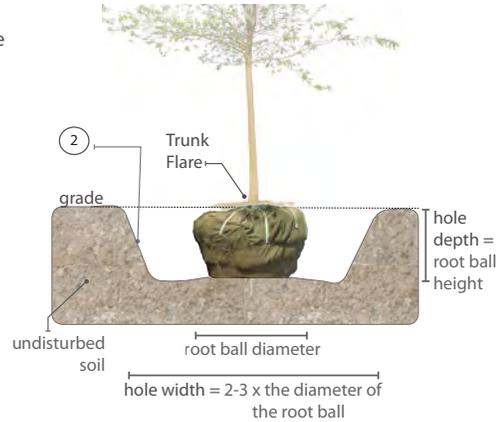
Planting a Balled in Burlap (B&B) Tree on Flat Ground

1) Digging the Planting Hole

HELPFUL TOOLS for DIGGING



- ① Dig planting hole no deeper than the root ball height. Excavate hole 2-3 times the width of the root ball diameter.
- ② Roughen the sides of the planting hole.
- ③ Before placing the tree in the planting hole, prune only dead or broken branches and remove any tree wrap, tape, string, and tags from tree trunk and branches.
- ④ Gently lower the tree into the hole so that the trunk flare is at or slightly above the original grade.

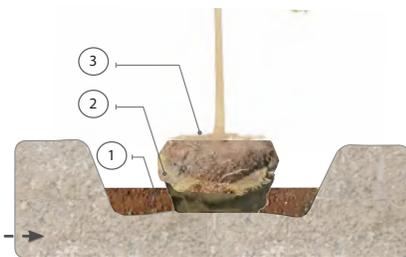


2) Planting the Tree

HELPFUL TOOLS



- ① Backfill 1/3 of the planting hole with original soil to stabilize root ball and keep tree upright.
- ② Cut and remove top 2/3 of the wire basket
- ③ Cut and remove top 2/3 of the burlap from the root ball
- ④ Completely backfill hole with original soil and add soil amendment if needed

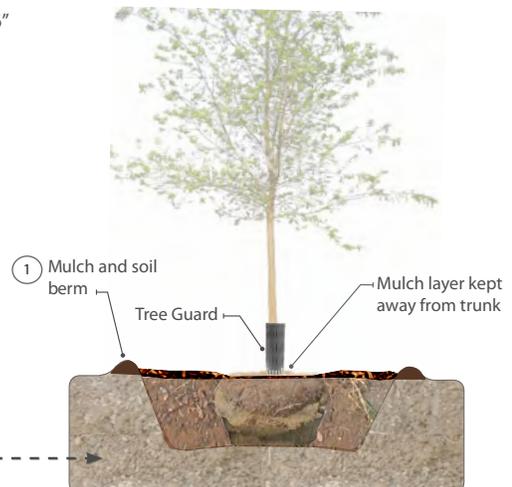


3) Mulching and Watering

HELPFUL TOOLS



- ① Create a mulch ring around the tree and a 3-6" high soil and mulch berm at the edge of the hole. Keep mulch away from the trunk.
- ② Water the tree thoroughly at planting and 15-25 gallons per week after the planting.



Please See Opposite Side for Staking Tools and Directions

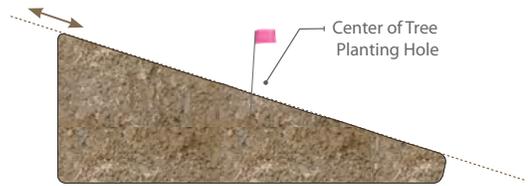
© Casey Trees 2009

How to... Build and Implement

Planting and Staking a Containerized Tree on a Hill

1) Choosing Where to Plant

HELPFUL TOOLS



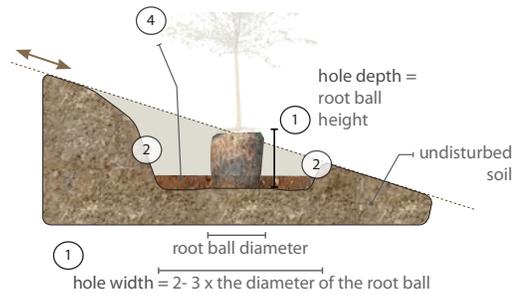
2) Planting the Containerized Tree



① Dig tree planting hole to depth of root ball so that the trunk flare is level with original grade. Excavate hole 2-3 times the width of the root ball diameter.

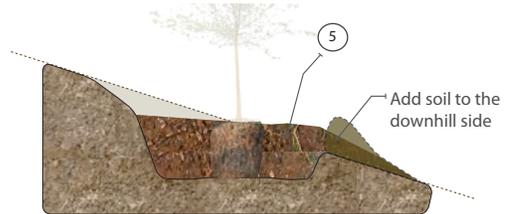
② Roughen the edges of the hole.

③ Carefully remove the tree's root ball from the container, and untangle and prune any circling roots.



④ Gently lower the tree into center of the hole so that the trunk flare is at or slightly above the original grade. Back fill 1/3 of the hole with original soil to stabilize root ball and keep tree upright.

⑤ Completely backfill hole with original soil and add soil amendment if needed. Add soil to the downhill side to help level the soil area around the tree.



HELPFUL TOOLS



3) Mulching and Staking the Tree - for trees on flat or sloped ground

HELPFUL TOOLS



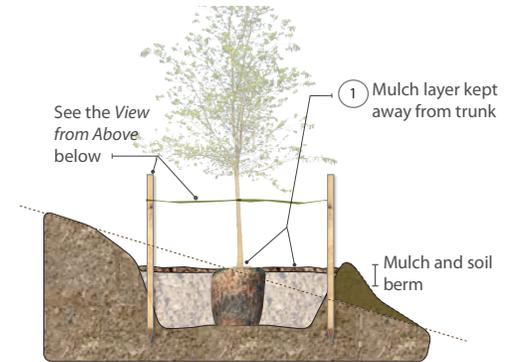
① Create a mulch ring around the tree and a 3-6" high soil and mulch berm at the edge of the planting hole, particularly on the downhill side. Keep mulch away from the trunk.

② Decide if stakes are necessary to help the tree remain upright. If so, drive stakes two feet deep into the soil at the edge of the hole.

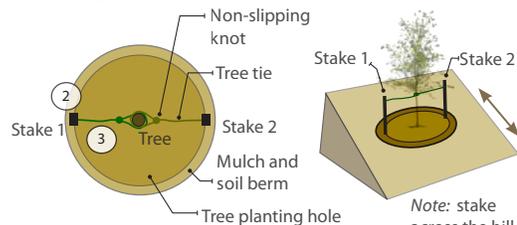


③ Secure tree trunk with tree tie with at least a 6" wide loop snugly around the tree trunk - tied with a non-slipping knot.

④ Stakes should be removed after one year.



Views from Above



Please See Opposite Side for Watering Tools and Directions

© Casey Trees 2009

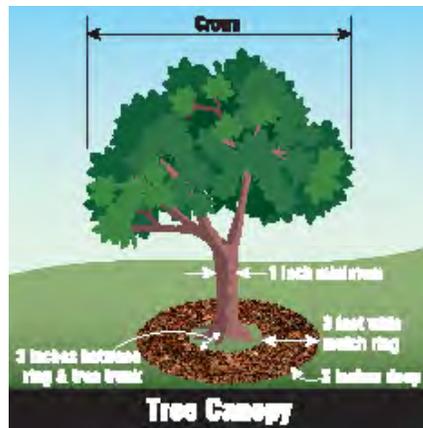
Costs

Cost will vary depending on the type and size of the tree you choose. Typical prices for 8- to 12-foot trees are \$75 to \$200 per tree for a do-it-yourself installation.

Maintenance

Trees require a few maintenance activities, which include:

- Mulch
 - » Place 2 to 4 inches of mulch in a 3-foot wide ring of mulch around the tree, but make sure that mulch does not touch the trunk
 - » Re-mulch annually, and rake the mulch to prevent hardening
- Water trees*
 - » Keep soil moist, but not soaked
 - » Water trees once a week (less frequently if it rains and more often when it's hot and dry)
- Provide wind protection (using stakes for added stability during the first year)
- Rake leaves in the fall
- Properly prune limbs (to protect nearby structures)
- Use pest control if necessary
- Use tree-wraps to protect trees from deer rub if necessary



To avoid trunk damage, do not use a weed whacker around trees.

Additional maintenance tips and a schedule to care for your trees can be found in *The Tree Owner's Manual* on DEP's Web site: http://www.montgomerycountymd.gov/deptmpl.asp?url=/content/dep/Forest/plantandcare_trees.asp#carefortrees.

* Newly planted trees require extra water in the summertime when it is hot and dry. Be sure to water young trees at least once a week if it doesn't rain, especially in July and August. While big trees rarely need extra water besides the rain, watering in the heat of July and August will help them too. Please visit the DEP Web site: <http://www.montgomerycountymd.gov/deptmpl.asp?url=/content/dep/Forest/wateringtrees.asp> for instructions on how to water "slow and steady" to best care for your trees and conserve water.

For More Information

Maryland Native Plant Society's List of Sources of Native Plants, *Identifying Local Nurseries/Landscapers and Native Plant Materials*:

<http://www.mdflora.org/publications/nurseries.html>

National Arbor Day Foundation Tree Store:

<http://www.arborday.org/shopping/trees/trees.cfm>

Reforestation, Nurseries, and Genetics Resources Plant Materials Directory: <http://www.rngr.net/Applications/directory>

Casey Trees, General Reference Materials:

<http://www.caseytrees.org/planting/SeasonalMaintenanceGuidance>: <http://www.caseytrees.org/planting/how-to/tree-care/documents/Almanacposter3010609.pdf>

Using a "Tree Benefits Calculator" to quantify your trees' annual economic and ecological benefits:

<http://www.treebenefits.com/calculator>

USDA Forest Service Northeast Region, Rutgers University, and University of Florida's Database for Northern Trees:

<http://orb.at.ufl.edu/TREES/index.html>

Watershed Forestry Resource Guide, *Planting and Maintaining Trees*:

<http://www.forestsforwatersheds.org/planting-and-maintaining-trees/>

USDA Forest Service, *Urban Watershed Forestry Manual – Part 3: Urban Tree Planting Guide*:

<http://www.forestsforwatersheds.org/storage/Part3ForestryManual.pdf>

CREP, Maryland's Conservation Reserve Enhancement Program

<http://www.fsa.usda.gov>