

Rain garden manual



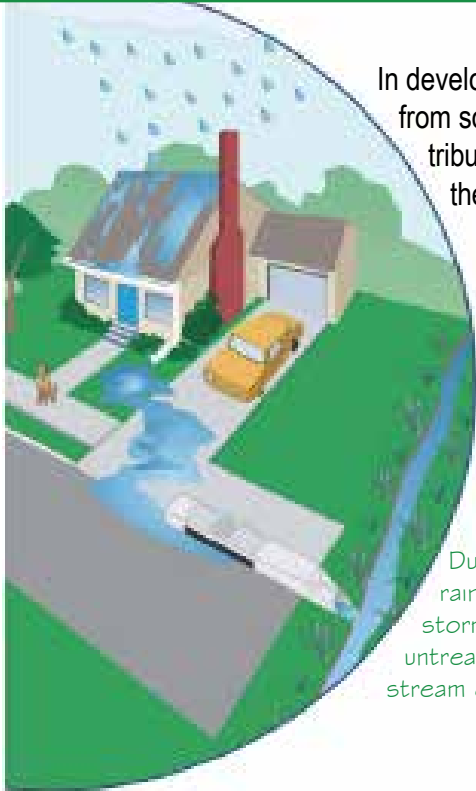
A Best Management Practice to:

- Reduce Stormwater Runoff
- Improve Water Quality
- Enhance Central Kentucky's Landscape

Using Rain Gardens to improve Central Kentucky's stormwater quality and prevent pollution

Register your rain garden at www.bgGreensource.org/rain-gardens/

The Price of Urbanization



In developed areas, roofs, pavement, and other impervious surfaces prevent stormwater from soaking into the ground. Instead, it runs over the land surface and directly into small tributaries and larger streams. Unable to handle the increased water volume and flow, these waterbodies often experience eroded banks, incised channels, loss of habitat and aquatic life, and increased flooding and property damage. In addition, stormwater can carry a broad mix of toxic chemicals, bacteria, sediments, fertilizers, oil and grease to nearby waterbodies. Retaining as much stormwater as possible on the land – rather than letting it run into storm drains – can help keep harmful flows and pollutants out of our streams and rivers. Rain gardens are one crucial tool to deal with the stormwater runoff problem.

– EPA. “Stormwater Management at EPA Headquarters.”

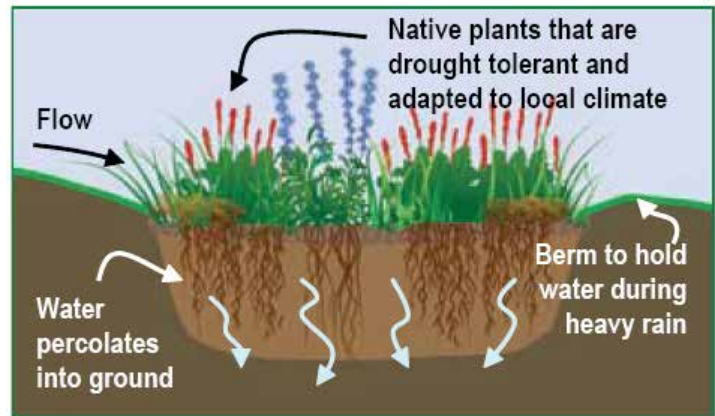
During rainfall events, rooftops, driveways, and yards collect rainwater (shown left). This water gathers pollutants and turns into stormwater runoff. Eventually it enters stormwater drains & flows untreated into Lexington’s streams and waterways, impacting the stream quality & local wildlife.

Courtesy of Tetra Tech

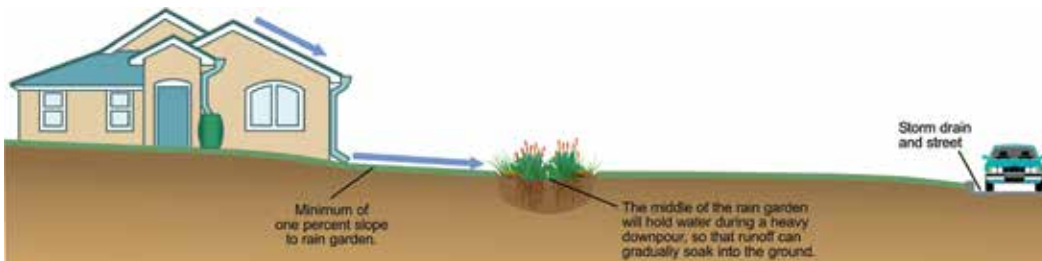
from the Rooftop . . .

A rain garden is a shallow depression that captures and treats runoff from impervious surfaces, such as rooftops, patios, driveways, and parking lots, before it enters the stormwater system. Rain gardens can be customized for your individual needs, limited only by the resources and time you want to put into them. They use natural processes to improve water quality by filtering pollutants and reducing the amount of stormwater runoff. The water easily infiltrates into the soil because of the deep roots of native plants, where it is filtered of pollutants and recharges the groundwater supply.

In an urban environment, this restored water table and added vegetation helps to reduce the Urban Heat Island Effect, a phenomenon that causes temperatures to be up to 5 °F warmer in urban settings. Additionally, these processes improve water quality before it enters Central Kentucky’s streams and waterways, promoting diverse ecosystems and a beautiful community.



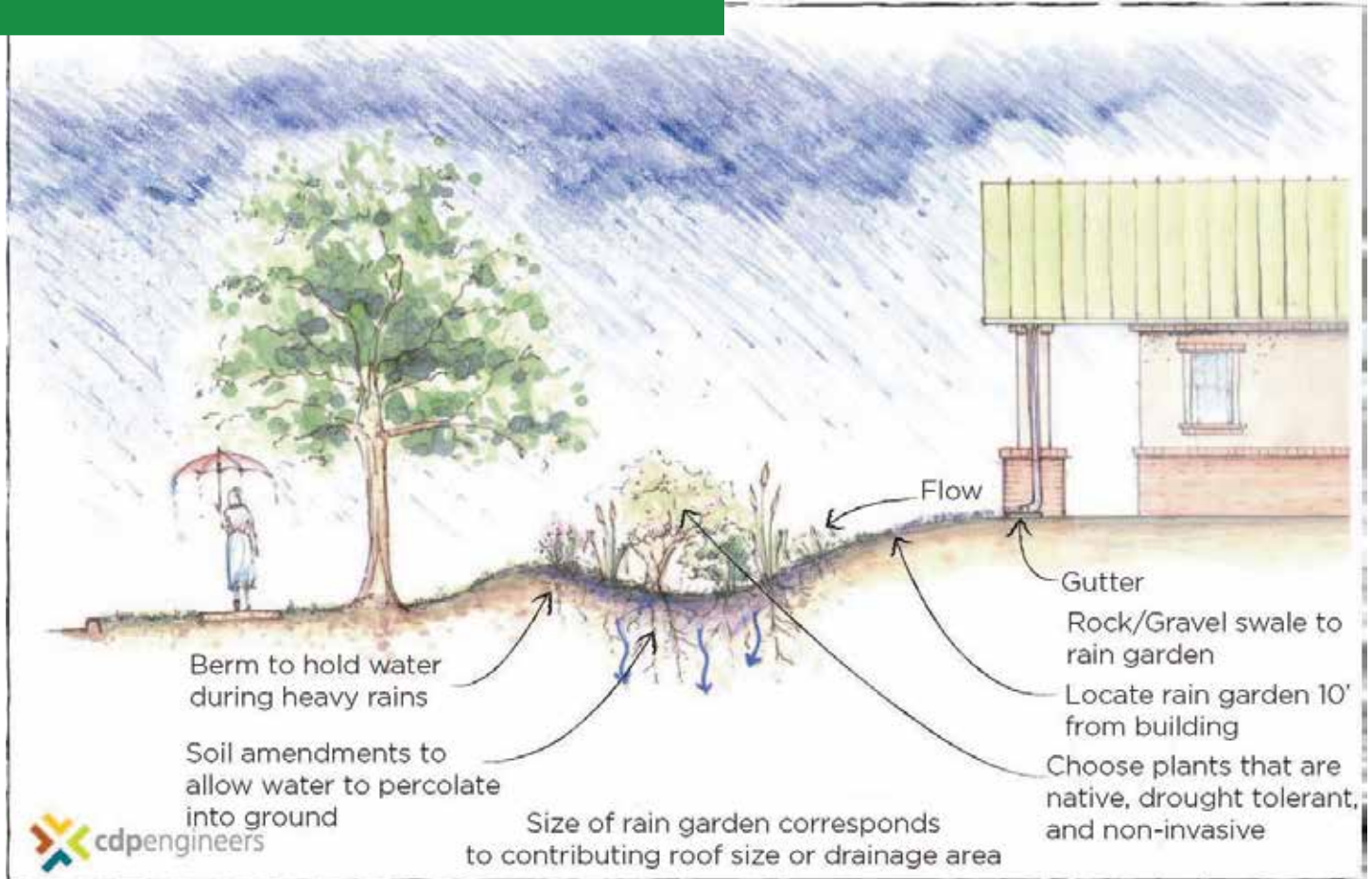
Construct your rain garden at least 10 feet from the base of your house to prevent water from seeping into the foundation!



Courtesy of Tetra Tech

. . . to the Rain Garden!

How does it work?



Benefits of a Rain Garden

A rain garden has many benefits:

- Significantly filters and reduces runoff before it enters local waterways and groundwater
- Decreases drainage problems and localized flooding
- Conserves water and reduces pollution
- Attracts birds, bees, and butterflies
- Recharges the groundwater supply
- Is a Best Management Practice (BMP) to improve Central Kentucky's water quality

Bring on the Butterflies!

Rain gardens not only look beautiful, but they also create a habitat for local wildlife, such as butterflies, dragonflies, and birds!



Purple Coneflower
(*Echinacea purpurea*)
Courtesy of Lucinda Reynolds
Mountain Home, Arkansas



Turk's-cap Lily (*Lilium superbum*)
Courtesy of Thomas G. Barnes
University of Kentucky, © 2006



Purple Stem Aster
(*Aster puniceus*)

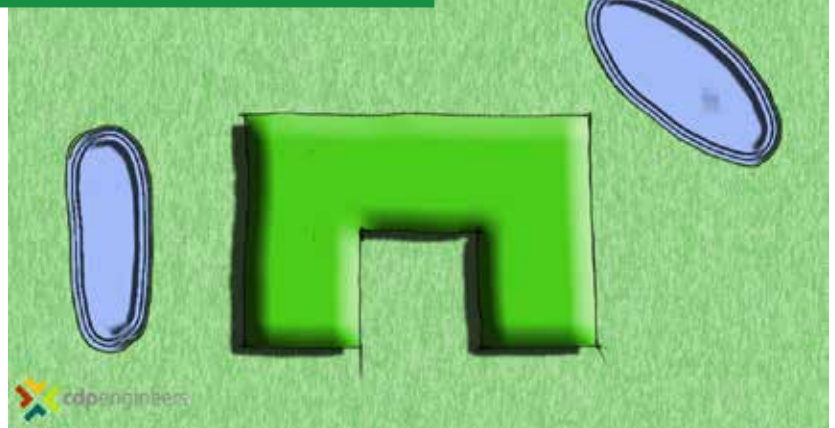
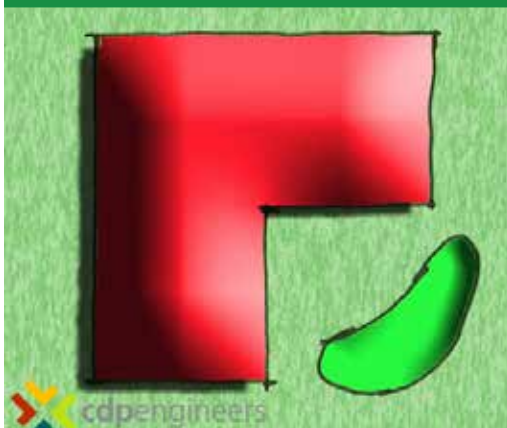
Finding the Natural Fit

The goal of a rain garden is to capture runoff before it enters the stormwater system, so position your rain garden between the source of the rainwater runoff and the nearest waterway or storm drain. To find the most logical place for your rain garden, keep these pointers in mind:

- Note the existing drainage pattern of your yard
- Find an area downslope from downspouts or impervious surfaces, such as driveways, where you can dig a shallow depression
- Avoid locations directly under tree cover or those prone to standing water
- Sunny or partly sunny areas are best for rain gardens, but shaded locations are also possible (make sure your plants are “shade tolerant”)
- Make sure your rain garden is at least **10 feet** from your house to prevent water from seeping into the foundation
- Rain gardens should not be placed over or near the drain field of a septic system
- Consider where the water will enter the garden and where it might overflow - prevent excess runoff from going to a neighbor’s property!



Overhead view of rooftop & potential rain garden placement



Customize the location of your rain garden to meet your yard’s needs. Use a single rain garden (shown left) or multiple rain gardens (shown right) to best capture stormwater runoff from your roof or yard.

Rain Gardens: A mosquito trap!

Rain gardens only contain standing water for 1 – 2 days, whereas the mosquito reproduction cycle takes 7 – 12 days to complete. As water filters into the ground and the rain garden dries up, any mosquito eggs are destroyed before they ever have a chance to mature into larvae.



Rain Garden Myths

- A rain garden is **not** a pond or wetland, as it only holds water for 1 – 2 days after a rainfall event.
- A rain garden is **not** a breeding ground for mosquitoes, which need 7 – 12 days in standing water to reproduce.
- A rain garden does **not** have to be expensive and is an excellent method for capturing and filtering stormwater runoff from your yard.

Rain Gardens: Can You Dig it?

Not all soil types have equal drainage capabilities, but you can still make them work for rain gardens. Rain gardens are sized to be large enough to hold water generated from a 1" rainfall event and infiltrate it into the ground in 1 – 2 days. The size of the rain garden depends on:

- The type of soil found in the rain garden.
- The rain garden depth.
- How much roof and/or lawn area will drain to the garden.

The soil type determines how deep the rain garden should be. Sandy soils are able to quickly infiltrate water, allowing for rain gardens in sandy soils to be shallow. Clayey soils infiltrate water a bit slower, meaning the rain garden has to be a bit deeper. The easiest way to determine the type of soil found in your yard and necessary rain garden depth is to perform a **percolation test**, which allows you to study how well your yard lets water soak into it.

Performing a Percolation Test



Dig a hole 8" wide and 8" deep (about the size of a coffee can) in an area where you plan to place the deepest part of your rain garden.



Fill with water. Mark the water level by sticking a popsicle stick into the soil at the top of the water surface. Allow the water to sit for 1 hour to completely saturate the ground. Top off again with water.



After 4 hours, measure the difference between the popsicle stick and the new water line. Multiply this water level change by 6 to calculate how much water the soil can soak up in a 24 hour period. This is your rain garden depth, to a maximum of about 10".

Soil Modifications •••••

In general, if your soil profile is sandy, you may simply be able to loosen the soil and improve percolation with yard waste compost to prepare the bed for planting. Silty soils (intermediate textured soils) drain better than clayey soils (fine textured soils), but both types have low percolation rates and more consideration should be given to the use of soil amendments. To improve your rain garden's percolation rate, one recommended consideration is to use soil modifications. While digging your rain garden, simply till in organic matter, such as peat moss or compost, to the bed of the rain garden about 12" deep.

For rain gardens calculated to be less than 5" deep, it is strongly encouraged to dig rain garden to 8-12" and improve percolation (the ability of water to move downward into the ground) by modification of the soil. Regardless of the rain garden depth, soil modifications dramatically improve the soil's ability to absorb water.

Sizing for Success

To appropriately size your rain garden, you first must determine if you want to:

- 1 – Capture water from a portion of your yard, or
- 2 – Capture water from a certain number of downspouts from your roof

Because they have to accommodate a larger volume of water, rain gardens that are designed to capture water from an entire yard have larger dimensions than those only intended to capture water from a limited number of downspouts.



This rain garden (seen above) is designed to capture water from the highlighted portion of the roof based on the downspout configuration and rain garden location.

1 Build a Rain Garden to Capture Runoff from Your Yard

- Measure the square footage of your yard where you wish to capture runoff.
- Calculate the necessary rain garden area based on how deep you are digging it:

$$\frac{\text{Yard Square Footage (ft}^2\text{)}}{\text{Rain Garden Depth (in)}} = \text{Rain Garden Area (ft}^2\text{)}$$

- This is the area your rain garden should be to contain runoff from a 1" rainfall event.
- Customize the dimensions of your rain garden shape to accommodate your yard's needs based on the calculated area.

Not a math guru but want to start digging?

Because your rain garden size doesn't have to be exact, it is possible to estimate dimensions if you want to avoid doing calculations. Assuming average conditions for Lexington's soil type and 2500 ft² of impervious area, a rain garden should be dug approximately 8" deep and have dimensions of about 8' x 10' to collect water captured from 1 downspout.

To capture runoff generated from an entire yard, the rain garden should be dug 8" deep, with one or more rain gardens totaling dimensions of 12' x 26'.

2 Build a Rain Garden to Capture Runoff from Your Downspouts

- Measure or research the roof area of your house.
- Estimate the amount of roof area gathering water for your rain garden. This is just an estimate, so don't worry about being exact. Remember that not all of your downspouts head to the same spot!

For example, if your rain garden collects water from 2 of your 6 downspouts, the contributing roof area would be 2/6, or 1/3 of your total roof area.

- Calculate rain garden dimensions necessary to capture water from the contributing area of your roof based on how deep you are digging it:

$$\frac{\text{Contributing Roof Area (ft}^2\text{)}}{\text{Rain Garden Depth (in)}} = \text{Rain Garden Area (ft}^2\text{)}$$

- Customize the dimensions of your rain garden shape to accommodate your yard's needs based on the calculated area.

How much will it cost?

Rain garden cost can vary greatly depending on the size, complexity and materials used. A small residential rain garden can cost from \$2-5 per square foot if constructed by the homeowner.

Bluegrass Greensource: Using Native Plants

Native plant species are recommended for rain gardens because of their extensive root systems and tolerance to local weather conditions and fluctuations. Their deep root structures break up the soil and help more water infiltrate into the ground.

These native plants are adapted to Central Kentucky's local climate, which make them more suited for rain gardens than non-native species.

A variety of native flowers, ferns, grasses, sedges, and shrubs can be used to customize the look of your rain garden. If possible, buy locally to support the Lexington community!



Purple Coneflower
Echinacea purpurea

Courtesy of Thomas G. Barnes
University of Kentucky, © 2006



Columbine
Aquilegia canadensis

Courtesy of Thomas G. Barnes
University of Kentucky, © 2006



Spiked Blazing Star
Liatris spicata

Courtesy of Thomas G. Barnes
University of Kentucky, © 2006

Plant	Sun/ Shade*	Moisture	Color	Height	Bloom Period
Flowers					
Aromatic Aster <i>Aster oblongifolius</i>		dry to average	blue/purple	1-3 ft.	Sept - Oct
Blue Flag Iris <i>Iris versicolor</i>		wet	blue	2-3 ft.	June - July
Black Eyed Susan <i>Rudbeckia hirta</i>		dry to moist	orange	1-4 ft.	June - July
Cardinal Flower <i>Lobelia siphilitica</i>		wet to moist	red	2-4 ft.	Aug - Oct
Columbine <i>Aquilegia canadensis</i>		dry to medium	red/yellow	1-3 ft.	May - June
Daylilies "Naturalized" <i>Hemerocallis spp.</i>		moist to dry	various	1-3 ft.	May - Aug
Dense Blazing Star <i>Liatris spicata</i>		medium to moist	purple/pink	3-6 ft.	Aug - Sept
Great Blue Lobelia <i>Lobelia siphilitica</i>		wet to moist	blue/purple	1-3 ft.	Sept - Oct
Lanceleaf Coreopsis <i>Coreopsis lanceolata</i>		dry to medium	yellow	1-2 ft.	June - July
Marsh (Spiked) Blazing Star <i>Liatris spicata</i>		wet to moist	purple	3-6 ft.	Aug - Sept
Mistflower <i>Eupatorium coelestinum</i>		medium to moist	blue/purple	1-3 ft.	July - Oct
Purple Coneflower <i>Echinacea purpurea</i>		moist to dry	purple	2-4 ft.	June - Aug
Dutchman's Breeches <i>Dicentra cucullaria</i>		medium to moist	white/pink	1-2 ft.	Mar - April
Grasses & Sedges					
Fox Sedge <i>Carex culpinoides</i>		saturated to wet	green leaves, brown in fall	2-3 ft.	May - July
Little Bluestem <i>Schizachyrium scoparium</i>		average to dry	green leaves	2-4 ft.	Aug
Shrubs					
Red-twigged Dogwood <i>Cornus sercea</i>		wet to dry	white flower, red bark	6-12 ft.	May - June
Blueberries, high bush var. <i>Vaccinium spp.</i>		moist	fruit, red fall foliage	4-6 ft.	June - Aug
Black Chokeberry <i>Aronia melanocarpa</i>		moist to dry	white flowers, red fall foliage	3-6 ft.	May

* **Full Sun** **Partial Shade** **Full Shade**

For an extensive list of native plants to use in your rain garden, refer to:
www.naturepreserves.ky.gov
<http://shootingstarnursery.com>

Layout & Construction

1 Preparing the Site.....

Outline the perimeter of the rain garden with spray paint or a garden hose. Stay at least 10 feet away from the building's foundation and avoid septic systems and utility lines. Think about where the water will flow in and where it will overflow out. The longer side of the garden should face up-slope to allow the garden to catch as much water as possible. The rain garden should be about twice as long as it is wide.



..... 2 Digging & Leveling



For small construction sites, no grading permit is required, but dirt & sediment control is a must!

Before you dig:

Check for any possible underground utilities that may impact rain garden location.

Call BUD (811).

- Make sure your rain garden is level so that any water spreads out evenly over the bottom surface.
- When the rain garden is excavated to the appropriate depth, lay a board in the rain garden with a carpenter's level on it. Correct the spots that aren't level by adding soil to the low places and by removing soil from the high places. Move the board to different positions throughout the rain garden, filling and digging as necessary to level the bottom of the garden.
- Once level, till the bottom of the rain garden up to 1' to break up the soil, adding soil amendments as desired. Take care to avoid disturbing the root systems of trees.
- Use the excavated soil to form a berm on the downslope side of the rain garden. The berm will need to be compacted and either planted with grass or incorporated into the planting plan of the rain garden.
- Shape the berm so that it ties back into the existing landscape and rake the entire rain garden so that it is ready for planting.
- Consider including a spillway, or notch, in the berm to provide an overflow path for water during larger rainfall events.



Make sure your rain garden bed is as flat as possible. If you wish, apply grass seed or additional drought-tolerant flowers to cover and stabilize the berm.

3 Planting & Plant Layout

- When choosing native plants for the garden, be sure to consider plant height, bloom time, color, and texture. Use plants that bloom at different times to create a long flowering season. Mix heights, shapes, and textures to give the garden depth and dimension. This will keep the rain garden looking interesting even when few wildflowers are in bloom.
- Place plants in pots on the bed, according to your design. After determining the plant layout, gently remove plants from the pot, break up the roots, and plant.
- Plants that like wetter conditions should be planted in the basin. Those that can tolerate drier conditions should go along the edge or on top of the berm.
- Add mulch around 2" deep to hold moisture, prevent erosion and add aesthetic interest to your rain garden (Do not mulch around Lobelias and Cardinal Flowers, as it will rot their root crown).



When planting, dig holes twice as wide as the root ball and deep enough to keep the crown of the young plant level with the existing grade.



Courtesy of U15 Prairie Restoration Project

Little Bluestem
Schizachyrium scoparium



Courtesy of Stephanie Cutler

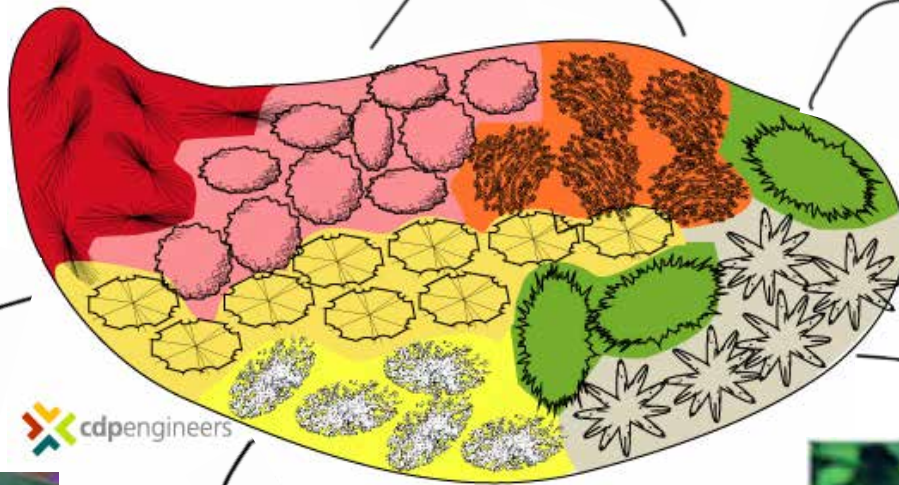
Black-eyed Susan
Rudbeckia hirta



Purple Coneflower
Echinacea purpurea



Cardinal Flower
Lobelia cardinalis



Courtesy of University of Wisconsin-Madison Arboretum © 2004 - 2007

New England Aster
Aster novae-angliae



Courtesy of Wildflower Farm, Inc. www.wildflowerfarm.com © 1999 - 2007 All Rights Reserved

Lanceleaf Coreopsis
Coreopsis lanceolata



Courtesy of Gerald D. Tang © 1990 - 2007 All Rights Reserved

Blue Flag Iris
Iris versicolor

When planting flowers, plant in odd numbers - 3,5,7, etc. - to create a more aesthetically pleasing result!

Building your rain garden - from start to finish

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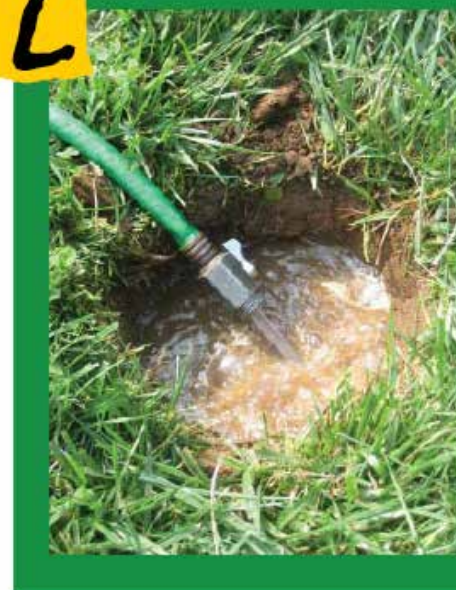
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Determine the placement of your rain garden(s) that will best address the needs of your yard.

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2



Conduct a percolation test to determine your yard's soil type and the necessary rain garden depth*

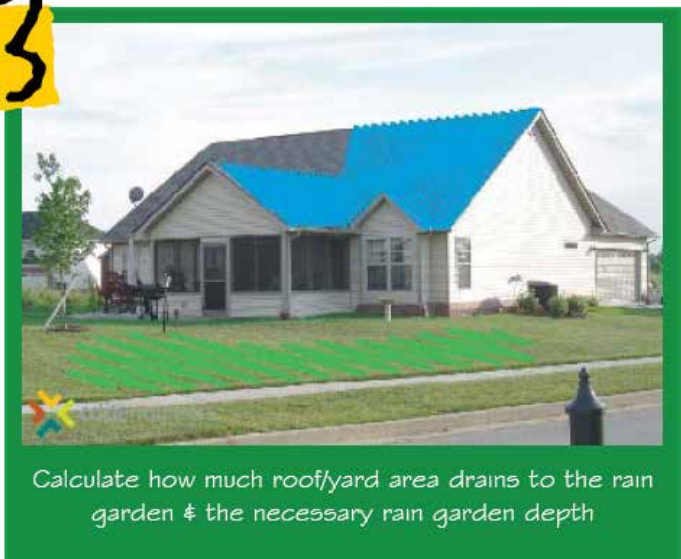
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8



Enjoy your new

3



Calculate how much roof/yard area drains to the rain garden & the necessary rain garden depth

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Maintenance is Important!

- Stick plant labels next to each individual group to help identify young native plants from non-desirable species as you weed the garden.
- Use shredded hardwood mulch to prevent weeds and to add nutrients to the rain garden.
- Irrigate the bed once a week with 1" of water until plants are established.
- Pull weeds as needed.
- Remove dead plants as needed.
- Each spring, prune plants that are too big and add more mulch.
- Once per year, clear out gutters & drainage system.

7



Arrange plants & plant vegetation - mulch if desired*

6



Build & stabilize the berm - include a spillway in the berm! *

5



Dig, add soil modifications, mix soil & level*

4



Outline the rain garden perimeter*



rain garden!*

*Rain garden pictures with asterisks are from a featured project at the The Arboretum State Botanical Garden of Kentucky at 500 Alumni Drive in Lexington, Kentucky.

Constructed by Daniel Shaw as an Eagle Scout project - Troop 220, Henry Clay District, Bluegrass Council of the Boy Scouts of America

Additional sources of information can be found

on the web ...

Bluegrass Greensource - Rain Garden Program:

www.bgGreensource.org/rain-gardens/

Rain Garden Network:

www.raingardennetwork.com

Kentucky Native Plant Society:

www.knps.org



BLUEGRASS
GREENSOURCE

Call 859.266.1572

or

visit www.bgGreensource.org

This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act.

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City of Lexington

livegreenlexington

WHAT'S DOWN THAT DRAIN?

Many people mistakenly believe that storm drains empty into the same sewer system that carries wastewater from toilets and sinks, but this is not true. **Storm drains lead into a separate system that empties directly into our streams, rivers, and lakes.** When motor oil is poured into the storm drain or pet waste is washed into an inlet, all of the bacteria and chemicals end up in the closest waterway.

Storm drain stenciling helps educate citizens about water quality and tells people not to pour any chemicals or wastes down storm inlets or drains. The stencil also provides a constant reminder that our storm drains lead straight to local waterways and that dumping can pollute.



Want to help?

If you would like to form a group to stencil storm drains in your area, visit www.bgGreensource.org/resource-library/

Brochure material prepared by:

