

Rain Gardens & Bio-retention Gardens

Design & Construction Principles




Adam M. Coulter
Urban Conservationist
Natural Resources Conservation Service



South Missouri Water Quality Project

Natural Resources Conservation Service
United States Department of Agriculture

Services

- Agricultural
- Forestry
- Urban
- Geographic
- Education




21 County Project Area Staff

Benefits of Rain Gardens & Bio-retention Gardens

- Filters runoff pollutants (*Water Quality*)
- Deters flooding impacts (*Water Quantity*)
- Conserves water (*Water Quantity*)
- Creates bird/butterfly habitat (*Wildlife*)
- Increases aesthetic benefits (*Quality of Life*)

What is a Rain Garden?

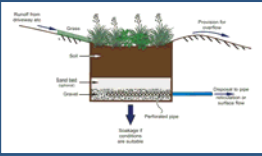
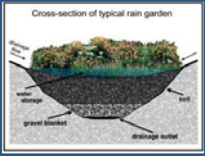
A landscaped area that receives storm water runoff from:

Roofs, Driveways, Sidewalks, Parking Lots & Compacted Areas




What is a Rain Garden?

It is a shallow depression or catchment structure that:
Is filled in with soil and mulch that absorbs and infiltrates storm water runoff
thus....
it deters potential flooding and contamination problems

What is a Rain Garden?

It is landscaped with *native plants* that are:
Tolerant to dry an wet conditions.

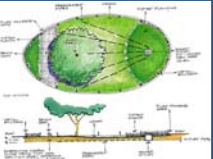





Wildflowers Shrubs Grasses

What is a Rain Garden?

And they come in all shapes and sizes.....
dependent upon the size of the hard surface drainage area

Rain Garden in a neighborhood setting



Designing a Residential Rain Garden

The best way to design a rain garden is to.....
Use your imagination



However, there are three simple steps that can help you.....

Designing a Residential Rain Garden

Step 1
Interpret your landscape to determine your garden location.

Step 2
Create and design the size based upon the hard surface area.

Step 3
Create and design the shape based upon topography.





Designing a Residential Rain Garden

Step 1

- Interpret your landscape to determine your garden location.
 - Where are the areas of concentrated flow?
(Side of the house, off the driveway, by the sidewalk, from the downspout)
 - What impacts are there?
(Flooding, pooling, wet spots, erosion, bare spots, etc.)
 - Where can I **intercept**, **detain** or **cover up** the problem?
(In this open area, along this drainage way, in this depression etc.)





Designing a Residential Rain Garden

Step 2

- Create and design the size based upon the hard surface area.
 - The garden size should be around 30% of the hard drainage surface area for rocky/sandy soils.
(Since they drain quicker)
 - The garden size should be around 60% of the hard drainage surface area for clayey soils.
(Since they drain slow)

Example

2000 square foot roof with 4 downspouts=500 square feet per downspout
60% (clayey soils) of 500 square feet = **roughly 300 square feet**

Designing a Residential Rain Garden

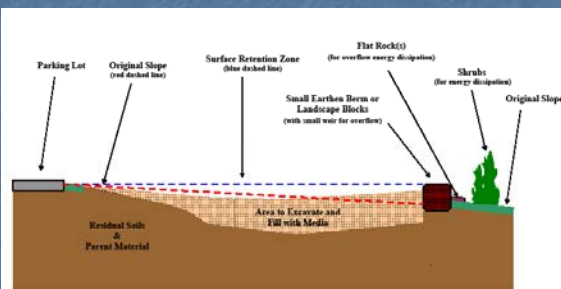
Step 3

3. Create and design the shape based upon topography.

- Will a depression rain garden be sufficient?
(If you have flat land and good drainable soil - may require excavation)
- Will a terraced rain garden be more appropriate?
*(Terraced rain gardens are usually required on slopes and with poorer soils.)
(A retaining wall or berm is required to hold soil and mulch in place.)*



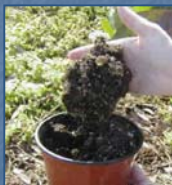
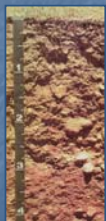
Building a Depressional Rain Garden



Limiting Factor.....Soils and Drainage

Low Organic Matter
Fragipan
Compacted

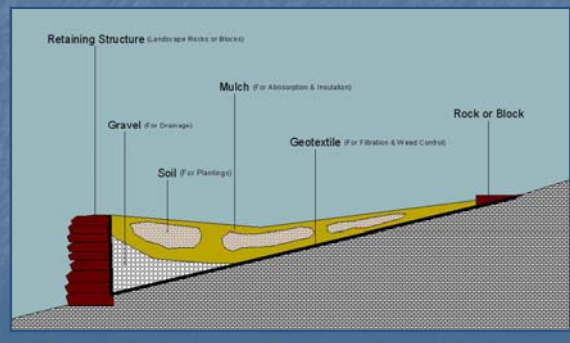
Our Goal....



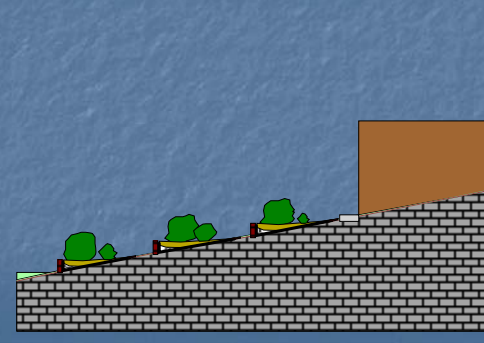
Example of Soils Impacting Drainage



Building a Terraced Rain Garden



Building a Terraced Rain Garden



Building a Terraced Rain Garden



Interpret slope, soil and space

Place geotextile and build rock wall

Place internal drainage (if necessary)

Fill with mulch, soil and then plants

This panel illustrates the construction process in four stages. The first image shows a site assessment. The second shows the installation of a geotextile fabric and a stone retaining wall. The third shows the placement of a drainage pipe. The fourth shows the final garden bed filled with mulch and soil, ready for planting.

Building a Terraced Rain Garden



Before

After

One Year Later

Two Years Later

This panel shows the progression of a terraced rain garden. The 'Before' image shows a flat, paved area. The 'After' image shows the completed garden bed with a stone wall. The 'One Year Later' and 'Two Years Later' images show the garden with established plants and a well-maintained appearance.

Building a Terraced Rain Garden



Before


After

One Year Later

Two Years Later

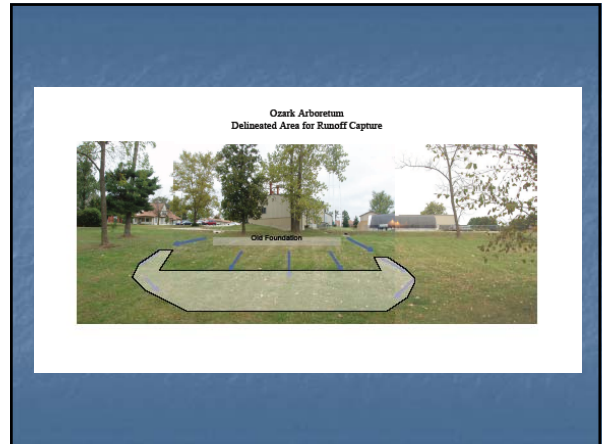
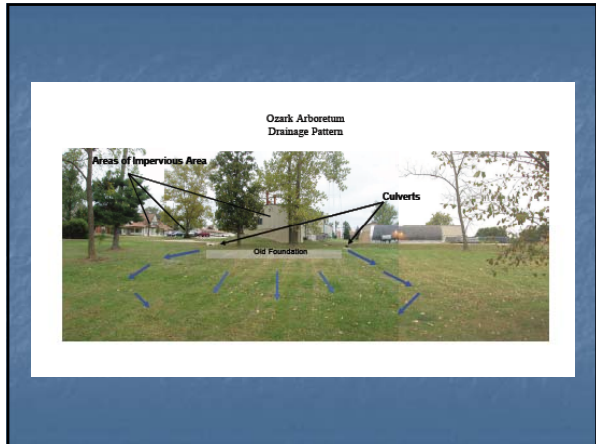
This panel shows the progression of a terraced rain garden. The 'Before' image shows a flat, paved area. The 'After' image shows the completed garden bed with a stone wall. The 'One Year Later' and 'Two Years Later' images show the garden with established plants and a well-maintained appearance.

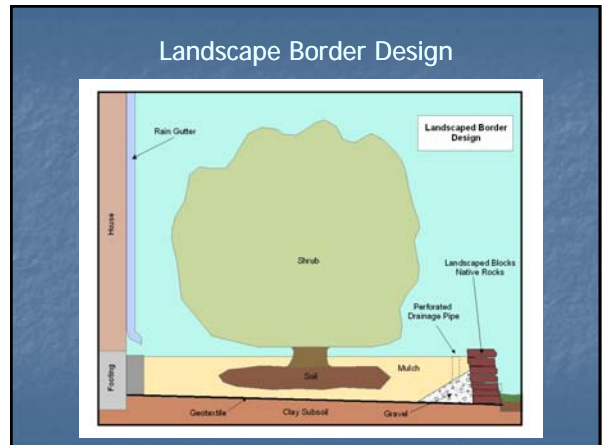
Example



This panel provides an example of a large-scale terraced rain garden. The four photos show the garden from different angles, highlighting its integration with the surrounding landscape and the building's architecture.







The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille large print, audiotape, etc.) should contact USDA's TARGET Center at 202-720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326W, Whitten Building, 14th & Independence Avenue, SW, Washington, DC 20250-9410 or call (202) 720-5964 (Voice or TDD). USDA is an equal opportunity provider and employer.