Rain Gardens 101

Charlotte Glen, Wendi Hartup, Bill Lord, Mitch Woodward
North Carolina Cooperative Extension

Andrew Anderson
North Carolina State University
What is a Rain Garden?

- A shallow depression in a **landscape** that captures **water** and holds it a **short time**
  - Runoff water is captured and infiltrated into the **soil**
- An attractive addition to a landscape
Rainfall
Storage
Infiltration
Why Are Rain Gardens Needed?

As rainwater washes across yards, roads and parking lots, and flows into streams, creeks and other water bodies, it can

Pick up pollutants…

Cause erosion…

Result in flooding…
Urbanization
NC 6\textsuperscript{th} fastest growing state, 10\textsuperscript{th} most populous
Pre- vs Post-Development Hydrology

PRE-DEVELOPMENT HYDROLOGIC BUDGET

POST-URBANIZATION HYDROLOGIC BUDGET

The Result
Benefits of Rain Gardens

• Low maintenance, low water use, attractive landscape feature

• Increases infiltration of rainwater in landscapes with impervious surfaces
  – Infiltrates as much as 30% more water than a flat or sloped lawn area

• Reduces flooding downstream

• Creates habitat in the landscape
Creating a Rain Garden

1. Find possible location(s)
2. Determine soil drainage
3. Design the garden
4. Construct and plant the garden
5. Maintenance
Step 1: Determine Potential Rain Garden Locations

• **Determine Constraints:**
  – Locate wells, septic systems, and utilities
Keep In Mind

Rain gardens will be very wet sometimes…

2-3 days (max)
Step 1:
Determine Potential Rain Garden Locations

- > 10 ft from house crawl space or basement
  - NEVER uphill
- > 10 ft from wellhead
  - NEVER uphill
- > 25 ft downhill or laterally from septic system drain field
  - NEVER uphill
- In full to partial sun if possible

Downhill from home, well, and septic field
Step 1: Potential Locations

Your rain garden should be between runoff source:
• downspout, roof, driveway

And runoff destination:
• curb, stormwater drain
• creek, ditch
Best Source of Water for your RG?

DOWNSPOUTS
Redirecting Flow: Typical Flow Patterns
Capture Runoff Onsite

• Redirect downspouts to lawn
Alter Downspout to Redirect Flow
Intercept Flow With A Rain Garden!
Step 2: Determine Soil Drainage

Ideally, soils should drain within 3 days. Drainage will determine:
1. "Wetness" period
2. Plant selection
Step 2: Determine Soil Drainage

**Infiltration Test**

Dig a hole to a depth of 1 foot and fill with water; Repeat 2-3 times.
Infiltration Test: The Results

<table>
<thead>
<tr>
<th>Drain Time</th>
<th>Appropriate BMP</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 12 hours</td>
<td>Quick-Draining R.G.</td>
</tr>
<tr>
<td>12 hrs – 3 days</td>
<td>Standard Rain Garden</td>
</tr>
<tr>
<td>&gt; 3 days</td>
<td>Wetland Garden</td>
</tr>
</tbody>
</table>

Note:
These are small-scale rain gardens and wetlands. Larger projects designed for regulatory purposes require design and approval by a P.E./R.L.A.
Wetland Soils: BAD for Rain Gardens!
Drainage Time > 3 Days

3 options:

1) Look for another location

2) Work with it! Install a backyard wetland

3) Install soil media & under-drain ($$$)
Step 3: Design Your Rain Garden

1. Determine the watershed size
2. Use “10/10” method to estimate size of rain garden ponding area
3. Design garden shape and size
4. Place the overflow weir
Watershed Size:
How much rain should a rain garden hold?

- Typically designed to capture first 1” of rainfall
- Use 10 and 10 rule
  - 10% of watershed
  - Ponding 10” deep
The “First-Flush” Phenomenon
**Watershed Size**

- Which impermeable surfaces (roof, driveway) will drain to the rain garden?
- Measure length (L) and width (W)
- Multiply L x W to determine watershed area in square feet
Watershed Size

Area A:
25 x 10 = 250 ft.²

Area B:
20 x 15 = 300 ft.²

Watershed size:
250 + 300 = 550 ft.²

Ponding area size:
550 x 0.1 = 55 ft.²,
10” deep
Ponding Area

Minimum ponding area size:
550 x 0.1 = 55 ft.², 10” deep

Ponding area can be:
- 5’ x 11’
- 3’ x 18’
- 7’ x 8’

Shaped to fit available space
What Happens When It Fills Up?
Overflow Weir
Overflow Weir

- Allows water to overflow
- Must be 10” above bottom of garden
- Minimum length = 1’
- Use rocks, blocks or other hardscape materials to prevent erosion
Overflow in Bioretention
Rain Garden Design

- **Location** determined by stormwater flow
- **Size of ponding area** determined by watershed area
- **Shape** – work with existing plantings and contour to blend into landscape

Intercept stormwater before it leaves the landscape
Plantings can extend beyond the ponding area
If rain garden is “on its own”, make large enough to be a landscape feature, in scale with size of yard.
Step 4: Construct and plant your rain garden

- Locate all utilities, septic tanks and drainfields before construction!
- Take note of construction in the area
- Add rain garden after all other construction and soil disturbance is complete

Clay and silt clog rain gardens!
Step 4: Construct and plant your rain garden

- Mark outline with hose, chalk or spray paint
- Remove sod – set aside for use on berm
- Excavation is the hardest part!
Step 4: Construction

- Excavation Depth = 13”
  - 10” ponding + 3” mulch
- Bottom typically bowl shaped/rounded
- Cultivate bottom 4”-6” to improve plant growth
  - NO compost
  - Lime if recommended by soil test
Are Plants Necessary?

Alternative to plants in the ponding area:

- Mulch
- Stone
- Turf
Purpose of Plants in Rain Gardens

• Nutrient and some heavy metal uptake
• Transpiration
• Enhance infiltration
• Soil stabilization
• Provide wildlife habitat – pollinators and beneficial insects
• Provide aesthetic appeal
Plants suitable for rain gardens...

- Tolerate periods of saturated soil, yet also thrive under drier conditions
- Persistent, long lived
- Low Maintenance
- Require little fertilization or irrigation once established
- Native or non-invasive

Texas Star, *Hibiscus coccineus*
Rain Garden Planting Design

- Groups of plants look better than 1 of this, 1 of that
  - Also provide better foraging habitat for pollinators
- Plan for something in bloom each season
- Generally, taller plants in middle or towards back
Match Plants to Expected Moisture Level

• **Quick Draining Rain Garden**, drain < 12 hours
  – Need greater drought tolerance, especially in deep sandy soils

• **Standard Rain Garden**, drain in 12 hours - 3 days
  – Plants tolerant of moist soil and “wet feet”

• **Wetland Garden**, drain > 3 days
  – Plants tolerant of extended flooding
Plants for Rain Gardens in NC

- Shrubs, Perennials
- For ponding area
- All for sun to part shade
- Natives and non-invasive non-natives
- Commercially available
Trees in Rain Gardens

- Place with care – increase shading over time
- Difficult for most perennials and ornamental grasses to grow within tree root zone
- Best placed outside of ponding area
Shrubs in Rain Gardens

- Most moisture tolerant shrubs are deciduous
- Plant evergreens outside of ponding area winter interest
- Too many shrubs may look overgrown

Too many shrubs – planted too close together
Beautyberry
Callicarpa americana

- Native
- 6’ x 6’ if cut back to 1’ every year in Feb/March
- Quick, standard
Virginia Sweetspire
*Itea virginica*

- Native
- Standard, wetland
- Suckering roots
- Cultivars:
  - ‘Henry’s Garnet’, 4’-6’ x 4’-6’
  - ‘Little Henry’, dwarf - 3’ x 3’
- Deer Love It!
Sweet Pepperbush

*Clethra alnifolia*

- Native
- 4’-6’ tall and wide
- Cultivars:
  - ‘Hummingbird’, ‘Sixteen Candles’, dwarf white, 3’ x 6’
  - ‘Ruby Spice’, upright pink, 8’ x 5’
- Very fragrant, suckering roots
- Quick, standard
Sweet Pepperbush

‘Ruby Spice’

‘Sixteen Candles’
Inkberry
*Ilex glabra*

- Native
- 4’-5’ x 3’-4’
- Evergreen
- Quick Draining, Standard

‘Shamrock’
Perennials and Grasses in Rain Gardens

• For color and seasonal interest
• Most dieback in winter – cut back after frost
• Grasses add texture and are tough!
• Flowers provide food and habitat for beneficials and pollinators
Bluestar
Amsonia tabernaemontana

- Native
- Grows 2’ tall and wide
- Cut back after flowering to prevent seeding
- Pollinators love it!
- Deer resistant
- Standard, wetland
Blue Flag Iris, *Iris virginica*
Native
2’-3’
Standard, wetland

Siberian Iris, *Iris sibirica*,
not native, not invasive

Yellow Flag Iris, *Iris psuedacorus*,
is not native and is potentially invasive!
Don’t plant!
Black Eyed Susan  
*Rudbeckia fulgida*  

- Native  
- Yellow flowers all summer, 3’ tall  
- Quick, standard  
- Cultivar: ‘Goldstrum’ most common  
- Deer love it!
Rose Mallow
*Hibiscus moscheutos*

- Native
- 4’-6’ tall and wide
- Standard, wetland
- Many cultivars and hybrids, ‘Disco Bell’ - seed strain
- Deer?

Red Star, Texas Star
*Hibiscus coccineus*

Red flowers, more finely cut leaves, less bothered by Jap. Beetles and caterpillars
Swamp milkweed  
*Asclepias incarnata*

- Native
- 3’ -4’ tall and wide
- Spring/early summer flowers, pink or white
- Sun to part shade
- Standard, wetland
- Monarchs! Attracts many pollinators
- Deer resistant
Joe Pye Weed

- Native
- Deer resistant
- Standard, wetland
- *Eutrochium dubium*
  - 4’-5’ tall x 3’-4’ wide
  - More common in coastal plain
- *E. fistulosum*
  - 5’-8’ x 3’-4’
  - More common piedmont
- *E. purpureum* and *E. maculatum* in Mountains
Cardinal Flower
*Lobelia cardinalis*

- Native
- Height: 3’
- Standard, Wetland
- Do not mulch over evergreen leaves in winter
‘Fireworks’ Goldenrod

- Native
- *Solidago rugosa*
- 2’-3’ tall and wide
- Pollinators love it!
- Standard
Panic Grass, Switch Grass

- *Panicum virgatum*
- Native
- Quick, standard
- ‘Shenandoah’ ‘Prairie Fire’, 3’ x 2’, burgundy leaves
- ‘Northwind’, 5’ x 2’, upright
- ‘Cloud Nine’, large, 8’ x 6’, strong stems
Sweetflag
*Acorus gramineus*

- Not native
- 8” – 12”, evergreen
- ‘Ogon’ – gold leaves
- Great for edges and underplanting
- Standard, Wetland
- *Acorus calamus* – is native, taller, green leaves
Need more plant info?
Plants Database

http://plants.ces.ncsu.edu/
Step 6: Maintenance

• All gardens need some maintenance - Rain gardens are no exception!

• Frequently inspect for and remove weeds, debris and trash

• Keep inflow and weir clear of debris and sediment
Watering Rain Gardens

- Right after planting
  - Every few days
- First growing season
  - Once a week
- During drought
- Soaker hoses or drip irrigation best
  - Place close to base
Do you need to fertilize???
Mulching Rain Garden

- Shredded hardwood or pine straw
- 3” maximum
- Don’t bury plants
- Remove mulch from drains/weir
Learn More!

NCCE Backyard Rain Gardens

http://www.bae.ncsu.edu/topic/raingarden/
Gardening News

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Charlotte Glen,
Horticulture Agent
NC Cooperative Extension – Chatham County
919-542-8202
charlotte_glen@ncsu.edu
http://chatham.ces.ncsu.edu/