RAIN GARDEN REBATE
EDUCATIONAL PROGRAM

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water.rutgers.edu
Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.
Our mission is to identify and address community water resources issues using sustainable and practical science-based solutions.
The Environmental County Agents teach people new skills and information so they can make better informed decisions and improvements to their businesses and personal lives.

- Michele Bakacs, Middlesex and Union
- Pat Rector, Morris and Somerset
- Amy Rowe, Essex and Passaic
- Mike Haberland, Camden and Burlington
- Sal Mangiafico, Salem and Cumberland
- Steve Yergeau, Ocean and Atlantic
What happens to the rain in our watersheds?

It runs off of rooftops and pavement...
What is stormwater?

Stormwater is the water from rain or melting snows that can become “runoff,” flowing over the ground surface and returning to lakes and streams.
Pollutants Found in Runoff

**Sediment**
- Soil particles transported from their source

**Biochemical Oxygen Demand (BOD)**
- Oxygen depleting material
  - Leaves
  - Organic material

**Toxics**
- Pesticides
  - Herbicides
  - Fungicides
  - Insecticides
- Metals (naturally occurring in soil, automotive emissions/tires)
  - Lead
  - Zinc
  - Mercury
- Petroleum Hydrocarbons (automotive exhaust and fuel/oil)

**Nutrients**
- Various types of materials that become dissolved and suspended in water (commonly found in fertilizer and plant material):
  - Nitrogen (N)
  - Phosphorus (P)

**Debris**
- Litter and illegal dumping

**Bacteria/Pathogens**
- Originating from:
  - Pets
  - Waterfowl
  - Failing septic systems

**Thermal Stress**
- Heated runoff, removal of streamside vegetation
Impervious surfaces
Impervious surfaces
The Impact of Development on Stormwater Runoff

- More development
- More impervious surfaces
- More stormwater runoff

10% 20% 30% 55%
Connected or Disconnected?
The Solution...

Place a rain garden between two impervious surfaces.

Reduce the amount of runoff entering storm sewers.
Rain Gardens

A rain garden is a landscaped, shallow depression that is designed to intercept, treat, and infiltrate stormwater at the source before it becomes runoff. The plants used in the rain garden are native to the region and help retain pollutants that could otherwise harm nearby waterways.
Rain Gardens

Capture: A rain garden catches runoff and holds standing water for no more than 24 to 48 hours.

Soak: Deep-rooted plants loosen the soil, creating a sponge zone. Water soaks in and groundwater aquifers are recharged.

Filter: In the soil, microbes break down pollutants and nutrients washed in by the rain.

LESS water down the storm sewer! Cleaner lakes & streams!

Courtesy of City of Maplewood, MN
PARTS OF A RAIN GARDEN

**BUFFER**
The buffer, or outer edge, of the rain garden slows down the flow of water, filters out sediment, and provides absorption of the pollutants in stormwater runoff. Plants located in this area of the rain garden tolerate and thrive in dry soil.

**SLOPE**
The slope of the rain garden pitches downward and connects the buffer of the rain garden to the base. It creates a holding area to store runoff awaiting treatment and infiltration. Plants situated in this area should tolerate both wet and dry soils equally.

**BASE**
The bottom area is the flat, deepest visible area of the rain garden and is planted with plant species that prefer wet soil. The base should be level so that the maximum amount of water can be filtered and infiltrated. It is very important that this area drains within 24 hours to avoid problems with stagnant water that can become a mosquito-breeding habitat.

**BERM**
The berm is a constructed mound, or bank of earth, that acts as a barrier to control, slow down, and contain the stormwater in the rain garden. The berm can be vegetated and/or mulched.

**OVERFLOW**
The overflow (outlet) area serves as a way for stormwater to exit the rain garden during larger rain events. An overflow outlet can be used as a way to direct the stormwater exiting the rain garden to a particular area surrounding the rain garden.

**PLANTING SOIL LAYER**
This layer is usually native soil. It is best to conduct a soil test of the area checking the nutrient levels and pH to ensure adequate plant growth.

**INLET**
The inlet is the location where stormwater enters the rain garden. Stones are often used to slow down the water flow and prevent erosion.

**ORGANIC MATTER**
Below the base is the organic matter, such as compost and a 3:1 layer of triple-shredded hardwood mulch. The mulch acts as a filter and provides a home to microorganisms that break down pollutants.
PLANNING YOUR RAIN GARDEN

SITE SELECTION & DESIGN
SITE SELECTION

1. Next to a building with a basement, rain garden should be located min. 10’ from building; no basement: 2’ from building
2. Do not place rain garden within 25’ of a septic system
3. Do not situate rain garden in soggy places where water already ponds
4. Avoid seasonably-high water tables within 2’ of rain garden depth
5. Consider flat areas first – easier digging
6. Avoid placing rain garden within dripline of trees
7. Provide adequate space for rain garden
CALL BEFORE YOU DIG

LOCATE YOUR UTILITY LINES!

Call BEFORE You Dig!

NJ One Call
1-800-272-1000

The different colors of the markout flags represent specific utilities.

- ELECTRIC
- GAS, OIL, STEAM
- COMMUNICATIONS, CATV
- WATER
- SEWER

- NJ One Call: 1-800-272-1000
- Free markout of underground gas, water, sewer, cable, telephone, and electric utility lines
- Call at least 3 full working days, but not more than 10 days, prior to planned installation date
- Do not place rain garden within 5’ horizontally and 1’ vertically from any utilities
DRAINAGE AREA CALCULATION

Surface Area
= (L1 x W) + (L2 x W)
= (15’ x 20’) + (10’ x 20’)
= (300’) + (200’)
= 500 ft²
DRAINAGE AREA:
THE ROOFTOP SCENARIO
CHECK YOUR SOIL

• Infiltration/Percolation Test

1. Dig a hole in the proposed rain garden site (12” deep, 4-6” wide)

2. Fill with water to saturate soil and then let stand until all the water has drained into the soil

3. Once water has drained, refill the empty hole again with water so that the water level is about 1” from the top of the hole

4. Check depth of water with a ruler every hour for at least 4 hours

5. Calculate how many inches of water drained per hour
DETERMINING THE DEPTH OF THE RAIN GARDEN

Typical depth: 3-8"

Moisture levels:
- dry
- moderate
- wet
- moderate
- dry

Buffer
Slope
Base
Outlet
Inlet
• Depth of rain garden is dependent upon the soil texture found at the site of the rain garden
• Depth is usually 3-8 inches
### DETERMINING THE SIZE OF THE RAIN GARDEN

- The size of the rain garden is dependent upon the amount of runoff entering the rain garden

#### Rain Garden Sizing Table
Based on New Jersey’s Water Quality Design Storm (1.25” of rain over 2 hours)

<table>
<thead>
<tr>
<th>Drainage Area</th>
<th>Size of 3” Deep Rain Garden CLAY SOIL*</th>
<th>Size of 6” Deep Rain Garden SILTY SOIL</th>
<th>Size of 8” Deep Rain Garden SANDY SOIL</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 ft²</td>
<td>200 ft²</td>
<td>100 ft²</td>
<td>75 ft²</td>
</tr>
<tr>
<td>750 ft²</td>
<td>350 ft²</td>
<td>150 ft²</td>
<td>112 ft²</td>
</tr>
<tr>
<td>1,000 ft²</td>
<td>400 ft²</td>
<td>200 ft²</td>
<td>149 ft²</td>
</tr>
<tr>
<td>1,500 ft²</td>
<td>600 ft²</td>
<td>300 ft²</td>
<td>224 ft²</td>
</tr>
<tr>
<td>2,000 ft²</td>
<td>800 ft²</td>
<td>400 ft²</td>
<td>299 ft²</td>
</tr>
</tbody>
</table>

*SOIL TEXTURE AMENDMENTS NEEDED
SOIL TEXTURE AMENDMENTS

- Soil texture amendments improve the rain garden’s infiltration rate.
SOIL QUALITY AMENDMENTS

- Soil quality amendments improve the rain garden’s growing conditions for plants
- Improve soil’s nutrient capacity

REMEMBER:
Your rain garden should NOT be permanently filled with water – it should drain within 24 hours.
DETERMINING THE INLET AND OVERFLOW

- Stormwater runoff enters the rain garden from an inlet
- Stormwater exits through the overflow
PREVENTING EROSION

• Slope no greater than 3:1
• Slow down velocity of water flowing through rain garden
  – Add rocks to inlet area
DETERMINING MULCH QUANTITY

- Allow for a 3” depth mulch (triple-shredded hardwood with no dye) to be spread throughout the entire rain garden
- Every 100 square feet of rain garden needs 1 cubic yards (3” depth)
RAIN GARDEN DESIGN

SHAPING YOUR RAIN GARDEN

• Use a garden hose or rope to outline the desired shape of your rain garden on the ground
• Many rain gardens are in the shape of a circle or kidney bean, but your rain garden can take on whatever shape you prefer

[Images of different shapes of rain gardens for May to October]
THE FUN PART!

INSTALLING YOUR RAIN GARDEN
STEP ONE

• Delineate rain garden area

• Remove existing grass with a shovel or machinery
STEP TWO

• Excavate to design depth based on necessary storage and soil amendment requirements
STEP THREE

• Add soil amendments, if necessary

• Combine amendments with existing soil using shovels or rototiller

• Loosen and prepare soil for grading and planting
STEP FOUR

- Prepare the berm, if necessary
STEP FIVE

• Prepare the overflow
STEP SIX

• Level the rain garden base
STEP SEVEN

- Plant native species
STEP EIGHT

• Apply mulch

• Allow for a 3” depth mulch (triple-shredded hardwood with no dye) to be spread throughout the entire rain garden

• For every 100 square feet of rain garden, you will need about 1 cubic yard of mulch (3” depth)
STEP NINE

• Water Plants
STEP TEN

• Appreciate a job well done
RAIN GARDEN PLANTING DESIGN
DESIGN AESTHETICS

• Formal or traditional design
  – Shrub bed
  – Perennial garden
  – Hedges

• Naturalized planting & design
  – Butterfly garden
  – Meadow (warm season grasses & wildflowers)
  – Buffer plantings
SITE CONSTRAINTS

• Sun vs. shade
• Exposure/wind
• Soil characteristics
• Hydrologic conditions
• Road salts
• Vehicle/pedestrian traffic
PLANTS IN THE RIGHT PLACE...

Courtesy of Pinelands Nursery & Supply
PLANTING DESIGN: Wet + Dry Conditions

Rain Garden Zones
SELECTING PLANT SPECIES

• Mature plant size
  – Proximity to buildings and utility lines
  – Pruning and shaping

• Seasonal interest
  – Flowers
  – Fall color
  – Winter character

• Beneficial wildlife
  – Flowers for butterflies
  – Fruits for song birds
GRASSES & GROUND COVERS

BUFFER
• Broomsedge
• Bearberry
• Panic grass
• Switchgrass
• Little bluestem
• Indiangrass

BASE
• Big bluestem
• Virginia wild-rye
• Switchgrass
• Wool grass

SLOPE
• Bluejoint grass
• Sedges
• Fowl mannagrass
• Softrush
GRASSES & GROUND COVERS

Switchgrass
(Panicum virgatum) - FAC

Tussock Sedge
(Carex stricta) - OBL

Woolgrass
(Scirpus cyperinus) - FACW+

Little Bluestem
(Schizachyrium scoparium) - FACU
WILDFLOWERS & FERNs

**Buffer**
- Butterfly milkweed
- Wild indigo
- Purple coneflower
- Beebalm
- Black-eyed susan

**Base**
- New England aster
- New York aster
- Columbine
- Coreopsis
- Joe-pye weed
- Blazing star
- Sensitive fern
- Cinnamon fern
- Ironweed

**Slope**
- Swamp milkweed
- Marsh marigold
- Turtlehead
- Boneset
- Rose-mallow/hibiscus
- Blueflag iris
- Cardinal flower
- Blue lobelia
- Monkey flower
WILDFLOWERS

Blueflag (Iris versicolor) - OBL

Black-eyed Susan (Rudbeckia hirta) - FACU-

Joe-Pye Weed (Eupatorium perfoliatum) - FAC

New England Aster (Aster novae-angliae) - FACW
TREES & SHRUBS

**BUFFER**
- Hackberry
- Red Bud
- Pepperbush
- American Holly
- Bayberry
- Witchhazel
- White Oak
- Red Oak
- Arrowwood
- Viburnum

**BASE**
- Red Maple
- Service Berry
- River Birch
- Silky Dogwood
- Red-twig Dogwood
- Inkberry Holly
- Winterberry
- Sweetbay Magnolia

**SLOPE**
- River Birch
- Buttonbush
- Silky Dogwood
- Green Ash
- Swamp White Oak
- Pin Oak
- Cranberrybush
- Viburnum
TREES & SHRUBS

Summersweet (Clethra alnifolia) - FAC+

Winterberry Holly (Ilex verticillata) - FACW+

River Birch (Betula nigra) - FACW

Inkberry Holly (Ilex glabra) - FACW-
PLANTING DESIGN: Mature Size of Plants

At time of installation
Springfield Township Municipal Annex Building
Springfield, NJ

First growing season

Second growing season
Third growing season
Fourth growing season
MAINTAINING YOUR RAIN GARDEN

INSPECTION AND MAINTENANCE
MAINTENANCE MEASURES

WEEKLY TASKS:
1. Watering
2. Weeding
3. Inspecting

ANNUAL TASKS:
1. Mulching
2. Pruning
3. Re-planting
4. Removing sediment
5. Soil Testing
6. Harvesting Plants
7. Cleaning of Gutters
8. Replacing materials (stone, landscape fabric)
• For detailed maintenance practices go to the Rain Garden Rebate Program [website](#) to view a Maintenance PowerPoint Presentation
Installed Rain Gardens by Past Rebate Participants
Design Example for Roof Runoff

Design

Installed Rain Garden
Design Example for Parking Lot Runoff

Design

Installed Rain Garden
Roof, Sump Pump and Driveway Runoff – WOW!

Design

Installed Rain Garden
Roof Runoff from Rain Barrel Overflow

Design

Installed Rain Garden
Take Home Handouts
Handout Guidance

Impervious Surfaces:
- Rooftop(s)
- Driveway(s)
- Walkway(s)
- Deck(s)
- Patio(s)
- Shed(s)

Drainage Area:

Surface Area
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CHECK YOUR SOIL

• Infiltration/Percolation Test
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  2. Fill with water to saturate soil and then let stand until all the water has drained into the soil
  3. Once water has drained, refill the empty hole again with water so that the water level is about 1” from the top of the hole
  4. Check depth of water with a ruler every hour for at least 4 hours
  5. Calculate how many inches of water drained per hour
With sandy soils, the water should descend quickly. With clay soils, the water should descend slowly.

If the drainage rate is less than 1.5 inches per hour, or the water does not drain within 24 hours, add soil texture amendments such as coarse sand during installation. Alternatively, consider placing the rain garden in a different location on your property.

It is important to note that sometimes an infiltration test provides a false reading of a site’s soil conditions. For example, during dry conditions, an infiltration test may demonstrate that the soil drains quickly and does not need amendments. However, during a rainy season, an infiltration test on that same soil may reveal that it is clayey and does not infiltrate well.
Prior to technical support session, please email this form along with your photos to Sara at saramellor@envsci.rutgers.edu

RAIN GARDEN
DESIGN FORM

I INTEND TO PLANT IN SEPTEMBER, 2014

HOW BIG DO YOU WANT YOUR RAIN GARDEN TO BE?
8 FEET LONG X 3 FEET WIDE

WHAT ARE THE GARDEN SITE'S CONDITIONS?

SUN
- Full shade
- Partial shade
- Sunny

SOIL
- Sandy soil
- Loam soil
- Clay soil

DRAINAGE
- Well drained
- Poorly drained
- Compacted

SLOPE
- Flat
- Slight
- Steep
(Backyard Only)

How much of your property is made up of impervious surfaces?

200 SQ. FT

What is the drainage area of your proposed rain garden site?

24 SQ. FT

Do you have a basement?

☐ YES  ☒ NO

Landscape Design Plan

Draw a plan of your Rain Garden location, including the maximum area you are willing to dedicate to the garden. Please also attach a photo or two of the proposed area and mark on the plan where each photo was taken and the view it shows. Consider and include these details in your sketch on the graph paper below.

- Activities in your yard (i.e.: kids playing, grilling, washing your car):
  PLAYING WITH DOG, BIRD FEEDER, GRILLING, MOWING LAWN

- Irrigation zones if applicable (i.e.: sprinkler systems, drip irrigation):
  NONE

- Sun/shade, wet/dry, steep slope, drainage patterns:
  AS INDICATED, ENTIRE BACK YARD SUBTLE SLOPE

- Color preference for plants:
  MIXED

- Plant height restrictions:
  DESIGNED, TIERED - LOW, MEDIUM, HIGH
- Block and hatch existing plants you want to keep.

**COMMON LANDSCAPE SYMBOLS**

- **Existing Shrub**
- **Existing Tree**
- **Fence Line**
- **Property Line**
- **Downspout**
- **Photo**
- **Drainage (flow direction)**
- **Area Draining**
- **Plants to Keep**
- **Paved Surface**