DIY Rain Gardens

Stop Streaming and Start Building

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https://www.water.rutgers.edu/

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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 (retired)
- 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.
Examples of Nonpoint Source Pollution

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment
The Impact of Development on Stormwater Runoff

more development → More impervious surfaces → more stormwater runoff
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.
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 abscorption 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.

**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.

**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.

**SAND BED**
If drainage is a problem, a sand bed may be necessary to improve drainage. Adding a layer of coarse sand (also known as bank run sand or concrete sand) will increase air space and promote infiltration. It is important that sand used in the rain garden is not play box sand or mason sand as these fine sands are not coarse enough to improve soil infiltration and may impede drainage.

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

after a storm

Two days later

Ref: https://youtu.be/h88RB0J_EqQ
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

\[ \text{Surface Area} = (L1 \times W) + (L2 \times W) \]

\[ = (15' \times 20') + (10' \times 20') \]

\[ = (300') + (200') \]

\[ = 500 \text{ ft}^2 \]
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
• 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 amendments improve the rain garden’s infiltration rate and help the plants grow.

- Compost
- Coarse sand
- River rocks
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 (River Stone)
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
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

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 plants 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 notch 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.

SAND BED
If drainage is a problem, a sand bed may be necessary to improve drainage. Adding a layer of coarse sand (also known as bank run sand or concrete sand) will increase air space and promote infiltration. It is important that sand used in the rain garden is not playbox sand or formation sand as these fine sands are not coarse enough to improve soil infiltration and may impede drainage.
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

BUFFER    SLOPE          BASE

Outlet
Inlet

TYPICAL DEPTH
3-8"

MOISTURE LEVELS
dry moderate wet moderate dry
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
Summersweet (Clethra alnifolia) - FAC+

Winterberry Holly (Ilex verticillata) - FACW+

River Birch (Betula nigra) - FACW

Inkberry Holly (Ilex glabra) - FACW-
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)
Demonstration Rain Gardens throughout New Jersey
Rain Gardens
from the Rain Garden Rebate Program
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
Rain Gardens from the Rahway River
Rain Garden Giveaway
1189 Jefferson Garden

Circle choices and write in comments:
- would really like design inspired by classical Japanese garden
- snow during winter gets shoveled onto front yard

Garden Form
Write in comments/notes:
1. Natural
2. Structured
3. Blend

Planting Layout
Write in comments/notes:
1. Natural (Masses)
2. Structured (Rows)
3. Blend

Plants Selection
Write in comments/notes:
1. Native
2. Native/Ornamental Blend
- tree-free design preferred

Hardscape Selection
Write in comments/notes:
1. Edging
2. Walls
3. Feature
- walls needed to prevent material from sliding down to the side

Hardscape Material:
Write in comments/notes:
1. Stone
2. Salvaged Stone
3. Concrete
4. Reused Concrete
- stone/re-used stone for features (round stones)
- for walls other materials could be ok

Hardscape Layout
Write in comments/notes:
1. Outline/Border/Edge
2. Freeform/Interior Edge
3. Blend
- walls needed to prevent material from sliding down to the side
- hardscape feature combination of stone, rocks and boulders, arranged to hint at cat-shape (see attached sketch)

Design Idea Rain-garden for 1189 Jefferson Ave, Rahway
by Anka G. Ehrhardt

Base: stone feature and none or very short ground covering plants
Slope: short plants
Buffer: short and medium plants plus bushes
Plant selection and placement inspired by Japanese garden

29-June-2014, Anka G. Ehrhardt
1189 Jefferson Garden

Design Idea Rain-garden for 1189 Jefferson Ave, Rahway
by Homeowner

Base: stone feature and none or very short ground covering plants
Slope: short plants
Buffer: short and medium plants plus bushes
Plant selection and placement inspired by Japanese garden

Existing raised flowerbed
Stone wall preventing material loss
Boulder
Soft rush
Stone
Rock
Boulder
Stone feature
Slope
Buffer
Walk
Walk
Rutgers Rahway Rain Gardens Project:
Final Design: The Ehrhardt Home, 1189 Jefferson

1189 Jefferson Avenue
Rutgers coordinates communication about the designs between homeowners and the contractor
What’s Going On Here?...

A rain garden is being built!

Rutgers Cooperative Extension and the City of Rahway are helping Rahway homeowners protect the Robinson’s Branch stream (part of the Rahway River watershed) by installing rain gardens. When it rains, roof runoff from the house will flow into the rain garden instead of going to the stormdrain. The rain garden helps reduce rain water runoff and pollution in our watershed. Rain gardens also provide habitat for birds and butterflies.

For more information call Rutgers Cooperative Extension of Union County at (732) 358-5274, or email bekacs@njaes.rutgers.edu. This project has been funded in part by the New Jersey Agricultural Experimental Station and by a grant from the New Jersey Department of Environmental Protection.

Scan code or visit www.water.rutgers.edu for more information.
1189 Jefferson Garden
1189 Jefferson Garden
1189 Jefferson Garden
Rutgers Rahway Rain Gardens Project:
Final Design: The Provda Home

1244 Briarcliff

New Jersey Agricultural Experiment Station
Rutgers Rahway Rain Gardens Project:
Final Design: The Provda Home
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Final Design: The Provda Home
A “Professional Services” model of Grant Funded Extension Outreach:

- Follow the homeowner’s wishes
- blending layout with existing beds
  - matching plant material
- use of hardscape materials for immediate and long-term “structure” in the garden
- leaving out standard elements (grasses)
Encourage the homeowner to “own the design” by interacting with it over time with modifications, additions and subtractions.
Stormwater Management in Your Backyard: Building a Rain Garden
Rutgers Cooperative Extension
https://youtu.be/hK9tOJIuda8

How Do I Build a Rain Garden?
New Hampshire Department of Environmental Services
https://youtu.be/Q2EoHBnCCII

How to Build a Rain Garden?
James City County Stormwater Department
https://youtu.be/h88RB0J_EqQ
Question: Does building a rain garden put me at risk of catching COVID-19?

Answer: According to the New York Times, “Interviews show a growing consensus among experts that, if Americans are going to leave their homes, it’s safer to be outside than in the office or the mall. With fresh air and more space between people, the risk goes down.” So get outside and build a rain garden.
Question: How do I get plants for my rain garden during the COVID-19 Pandemic?

Answer: Local plant nurseries and garden centers are still open, delivering, or offering curbside pickup. So put on a mask and head to your favorite garden center.
Question: How can I get help to design a rain garden without being exposed to COVID-19?

Answer: The Rutgers Cooperative Extension (RCE) Water Resources Program is offering online rain garden educational sessions. Or you can download the Rain Garden Manual for New Jersey at: http://water.rutgers.edu/Rain_Gardens/RGWebsite/RainGardenManualofNJ.html. Or you can get the Rain Garden App for your Iphone at the App Store.
Question: Is streaming Tiger King on Netflix better for our planet than building a rain garden?
Answer: NO! Get off the couch and get outside.