

# RUTGERS

New Jersey Agricultural  
Experiment Station



## Rain Gardens: A Simple Solution

*presented to the Borough of Caldwell, Essex County  
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# Rutgers Cooperative Extension

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.







# Water Resources Program

Our mission is to identify and address water resources issues by engaging and empowering communities to employ practical science-based solutions to help create a more equitable and sustainable New Jersey.





# What happens to the rain in our watersheds?



It runs off of rooftops and pavement...



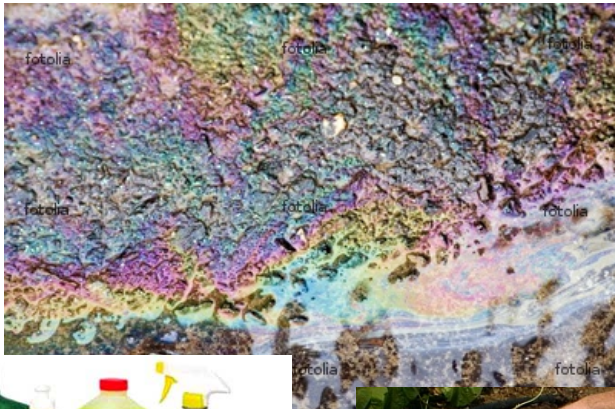
# What is stormwater?

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



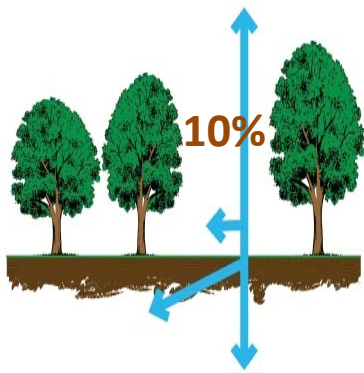
# Examples of Nonpoint Source Pollution

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment

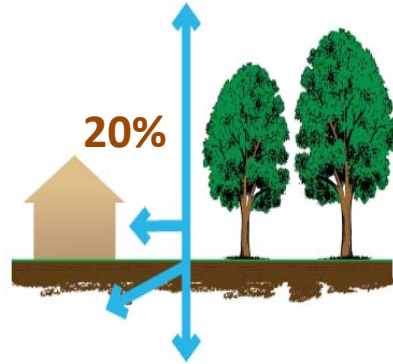




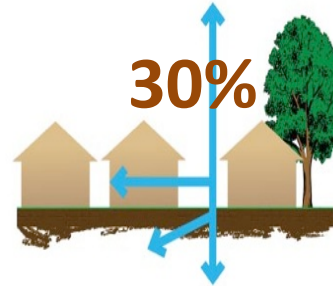
# The Impact of Development on Stormwater Runoff



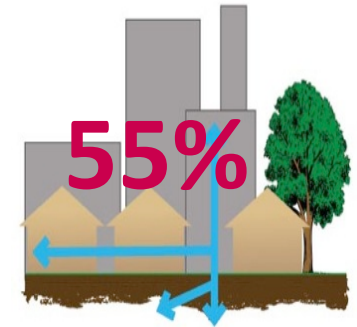
*more development*



→ *More impervious surfaces*



→ *more stormwater runoff*



# Green Infrastructure

...an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly.

Green Infrastructure projects:

- capture,
- filter,
- absorb, and
- reuse

stormwater to maintain or mimic natural systems and treat runoff as a resource.





# Green Infrastructure Practices

- Rain Gardens/Bioretention Systems
- Bioswales
- Downspout Planters
- Stormwater Planters
- Rainwater Harvesting
- Permeable Pavements
- Tree Filter Boxes
- Dry Wells
- Green Roofs
- Naturalizing Detention Basins
- Wetlands
- Infiltration Basins
- Sand Filters



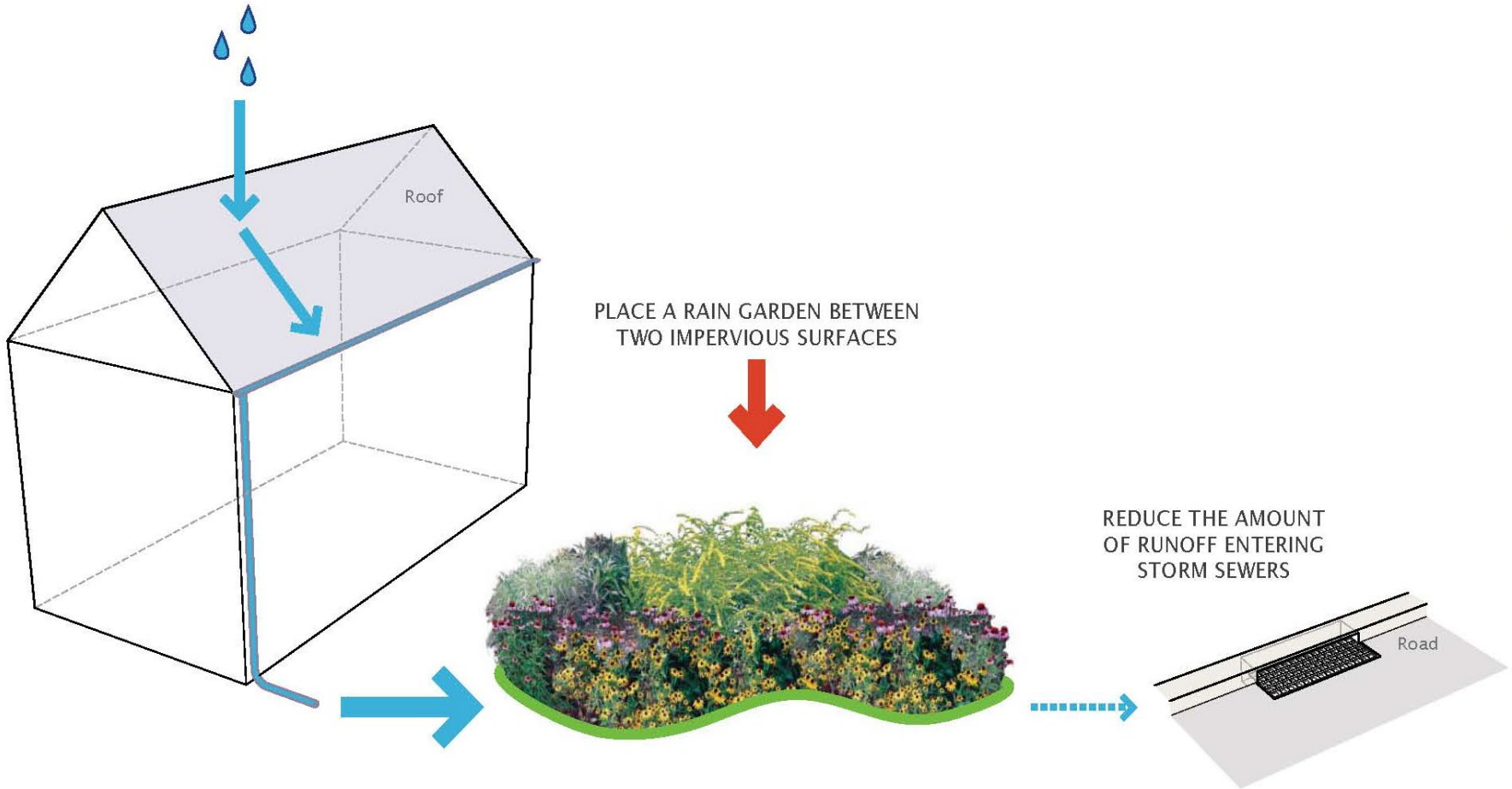


# Keep the Rain from the Drain





# Disconnect with a Rain Garden



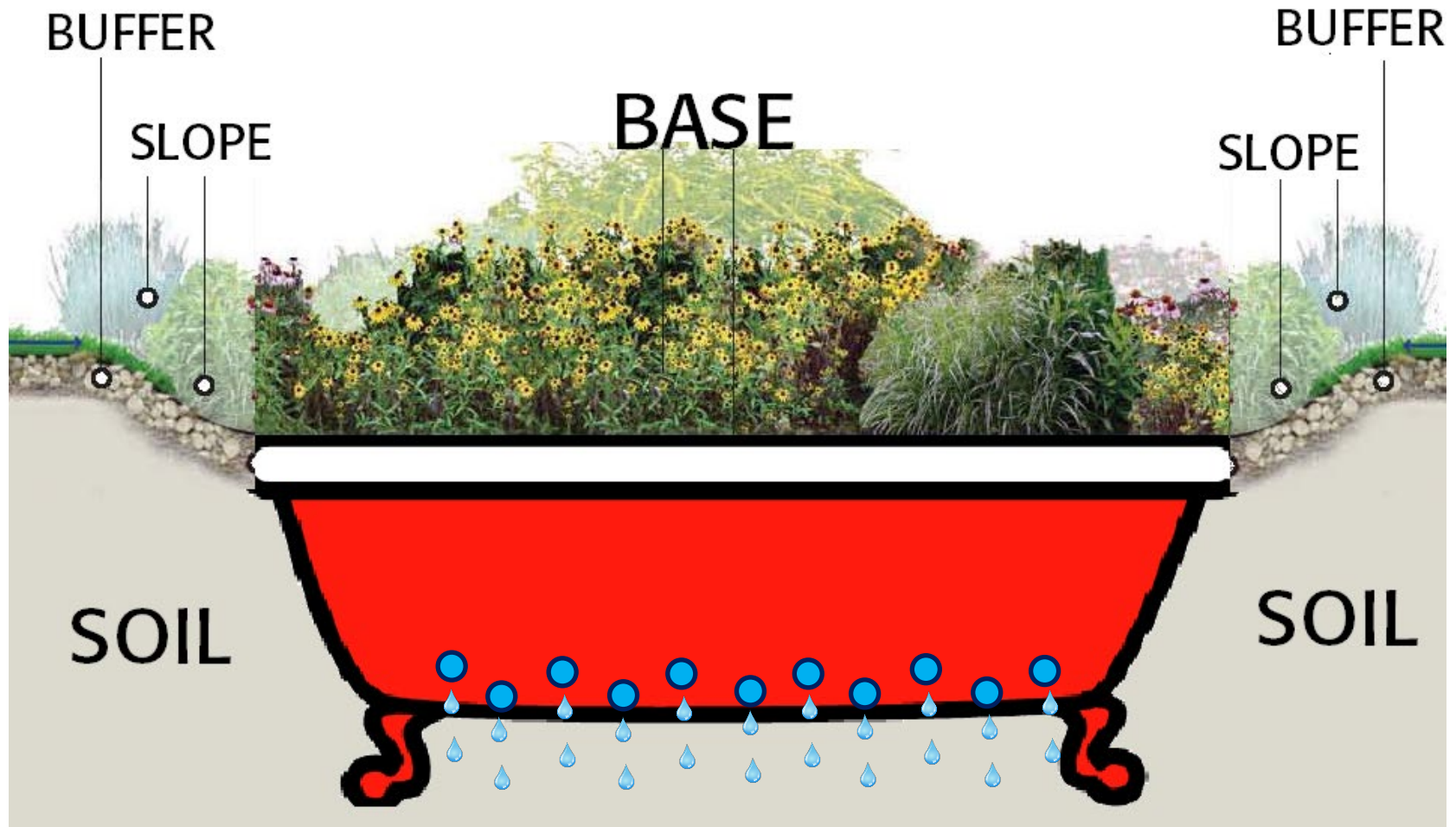
# Rain Gardens

A rain garden is a landscaped, shallow depression that is designed to capture, treat, and infiltrate stormwater at the source before it becomes runoff.





# Parts of a Rain Garden



# Rain Gardens

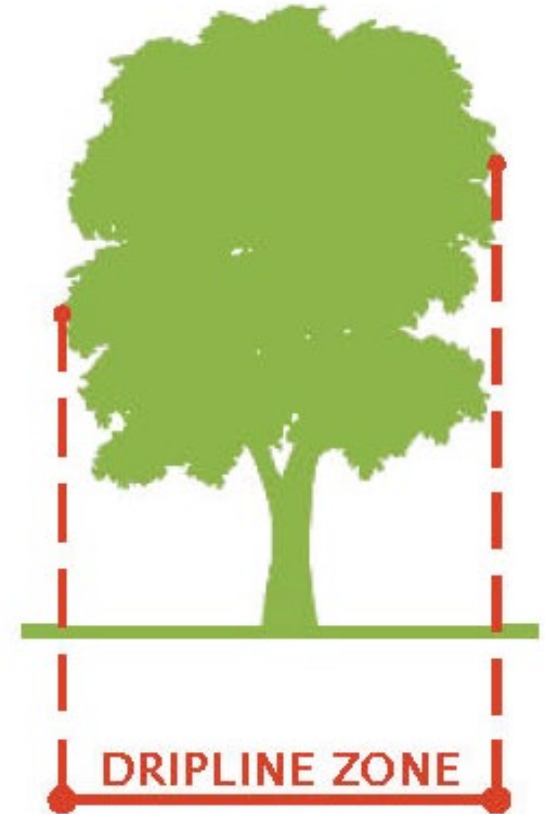
- Landscaped areas that treat stormwater runoff.
- Designed to merge two important goals: aesthetics and water quality
- Can be blended into the landscape and made to look natural.
- Water is directed into them by pipes, swales, or curb openings.





# 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



# Native Vegetation



























**Rain Garden**  
This garden is designed to capture and filter rainwater from the roof and driveway, reducing runoff to the street. It features a variety of native plants that thrive in wet conditions and help improve soil health. For more information, visit [www.mn.gov](http://www.mn.gov).









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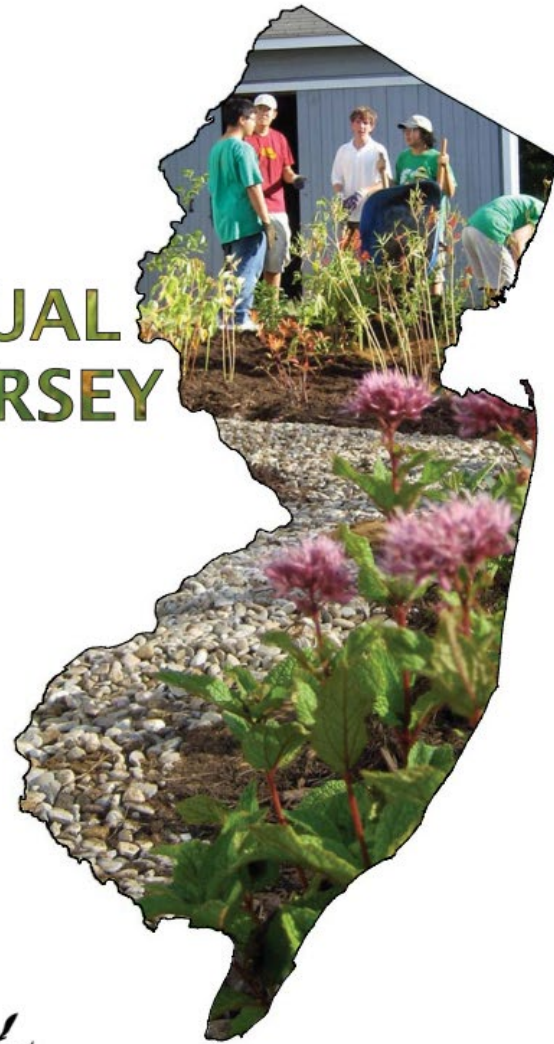








# RAIN GARDEN MANUAL OF NEW JERSEY



**RUTGERS**  
New Jersey Agricultural  
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Here is the website for the rain garden manual:

[http://www.water.rutgers.edu/Rain\\_Gardens/RGWebsite/RainGardenManualofNJ.html](http://www.water.rutgers.edu/Rain_Gardens/RGWebsite/RainGardenManualofNJ.html)





# Rain Garden App

A Mobile App for designing, installing, and maintaining a Rain Garden

Download the Rain Garden App first. "Rain Garden" is a **FREE app** designed to help you properly install a rain garden at your home, office, or job site. Through video tutorials, diagrams, text, and tools, the App guides you through determining the size and placement of your garden, selecting plants, digging and planting your garden, and maintaining your garden. It also includes tools for determining your soil type, measuring the size of the area that will drain to your garden, and managing multiple rain garden projects.



**Help Promote the App!** [Click here](#) to request App promo cards to display in your town hall or business.

To learn more about Rain Gardens visit the [NEMO Rain Garden Website](#).

For more information about the App, if you are interested in expanding the App's tools to your area, to make suggestions or to simply heap praise upon the heads of your humble App designers, please [contact us](#).

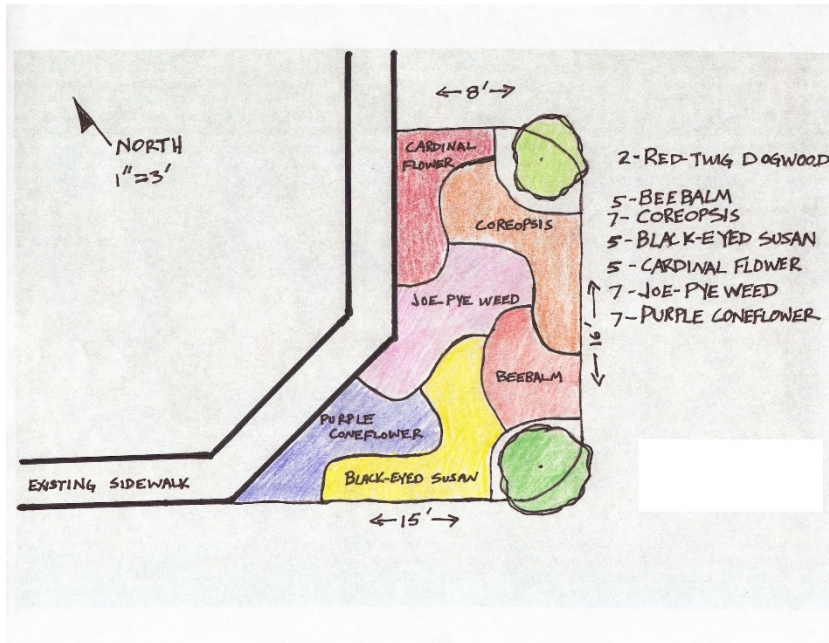
*Funding for national expansion of this app was provided by the United States Department of Agriculture/National Institute of Food and Agriculture, project #CONS2013-05768.*



# Example from Rain Garden Rebate Program

## Design

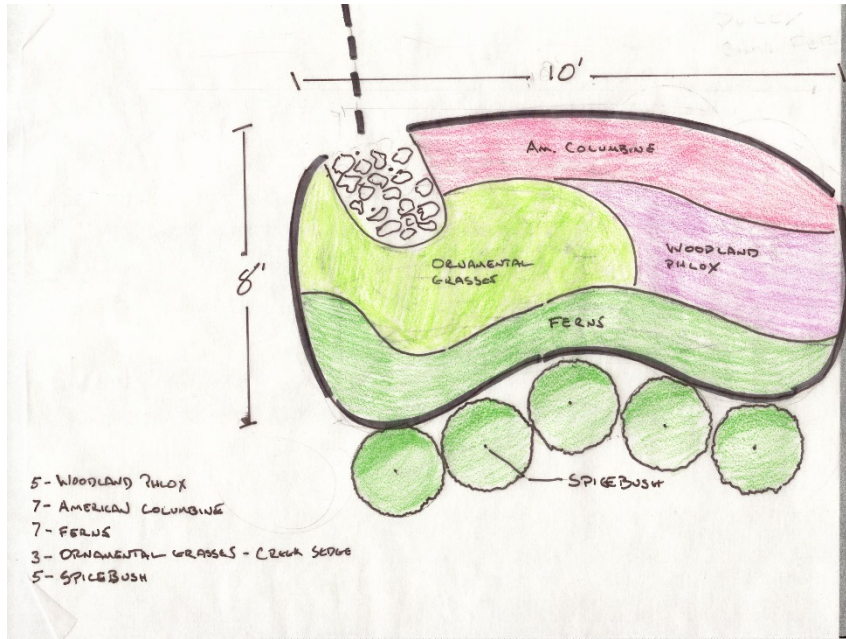
## Installed Rain Garden





# Roof Runoff Example

## Design

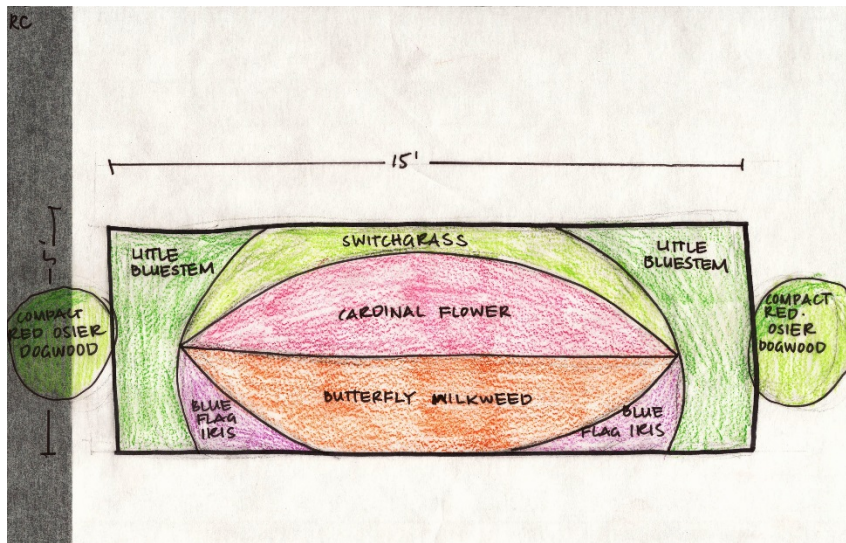


## Installed Rain Garden



# Roof Runoff from Rain Barrel Overflow

## Design



## Installed Rain Garden









# 1189 Jefferson Garden





# 1244 Briarcliff



NORTH



0

10

30



# CALDWELL BOROUGH: GREEN INFRASTRUCTURE SITES

## SITES WITHIN THE DEEPAVAAL BROOK SUBWATERSHED

1. Grover Cleveland Center for Senior Citizens

2. United States Postal Service

## SITES WITHIN THE UPPER PASSAIC RIVER SUBWATERSHED

3. Caldwell Municipal Complex

4. Caldwell United Methodist Church

5. Caldwell University

6. Center For Spiritual Living North Jersey

7. Congregation Agudath Israel

8. Essex Lodge No. 7

9. First Baptist Church

10. First Presbyterian Church

11. Gould Place & Bloomfield Avenue Right of Way

12. Green Acres: 27 Personette Street

13. Grover Cleveland Birthplace

14. Grover Cleveland Middle School

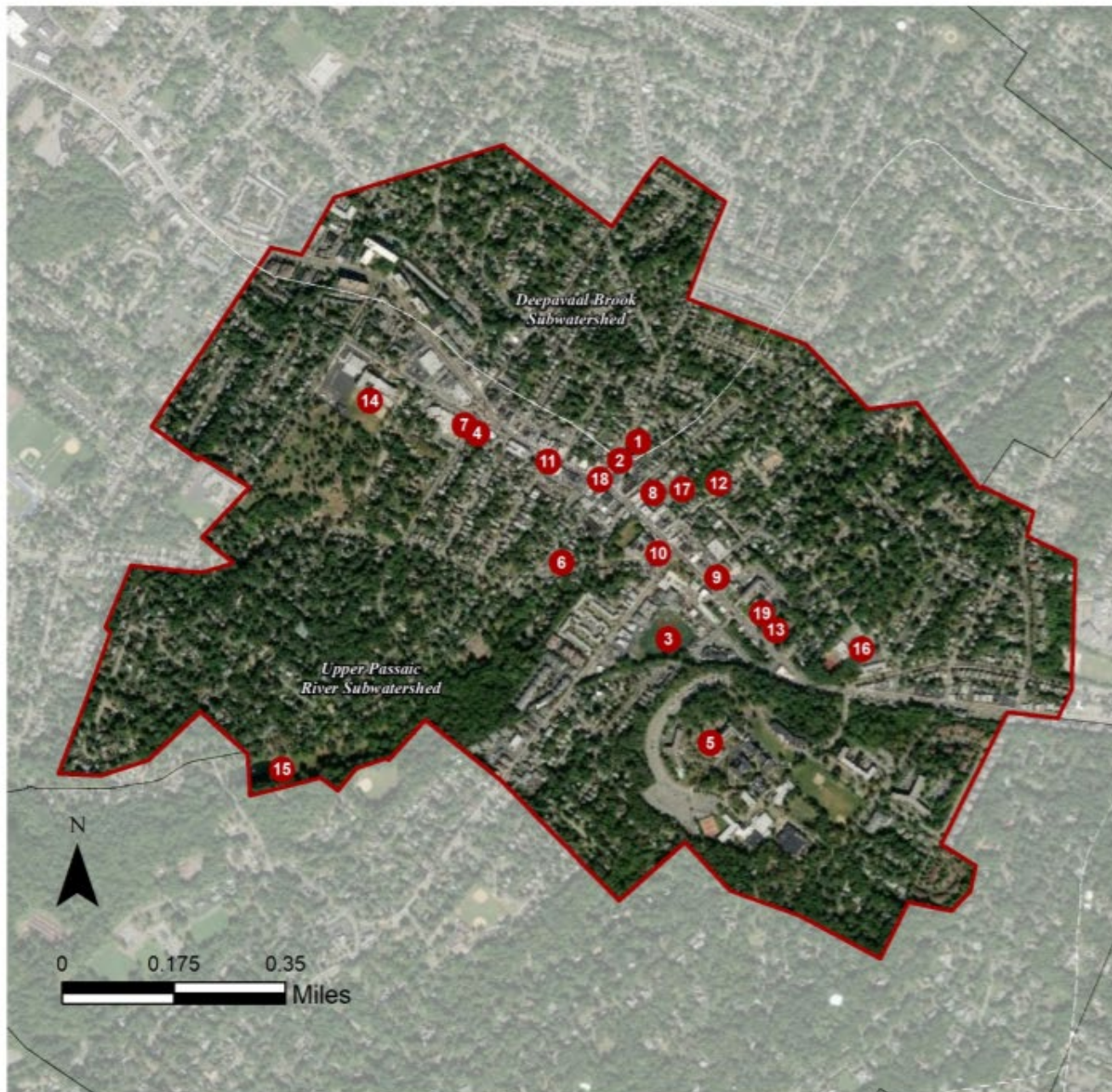
15. Grover Cleveland Park

16. Lincoln Elementary School

17. Municipal Parking Lot

18. Park Avenue & Bloomfield Avenue Right of Way

19. Saint Aloysius Roman Catholic Church





# CALDWELL MUNICIPAL COMPLEX



**Subwatershed:** Upper Passaic River

**Site Area:** 343,616 sq. ft.

**Address:** 1 Provost Square  
Caldwell, NJ 07006

**Block and Lot:** Block 56, Lot 1, 2, 3, 10.01,  
10.02, 0.03, 10.06, 17



Several rain gardens can be installed in the turfgrass area around the municipal complex to capture, treat, and infiltrate stormwater runoff from the field and help reported flooding in the area. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
90	307,669	14.8	155.4	1,412.6	0.240	8.44





Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.179	30	13,540	0.51	1,715	\$8,575



# GREEN INFRASTRUCTURE RECOMMENDATIONS



## Caldwell Municipal Complex

-  bioretention system
-  drainage area
-  property line
-  2015 Aerial: NJOIT, OGIS















# Caldwell Community Center Rain Garden





Before Construction





Excavated Rain Garden





Soil Amendments Added





Finished Rain Garden



# Quick Numbers

- **Rain Garden Size: 100 ft<sup>2</sup>**
- **Managed Impervious Area: 765 ft<sup>2</sup>**
- **Peak Discharge Reduction: 0.04 cfs**
- **Runoff Volume Managed per storm (1.25" rain): 500 gallons**
- **Annual Runoff Managed: 16,760 gal/yr**





# FIRST PRESBYTERIAN CHURCH

**Subwatershed:** Upper Passaic River

**Site Area:** 101,635 sq. ft.

**Address:** 326 Bloomfield Avenue  
Caldwell, NJ 07006

**Block and Lot:** Block 53, Lot 9



A rain garden can be installed in the turfgrass along the side of the church to capture, treat, and infiltrate stormwater runoff from the roof. An existing asphalt strip adjacent to the sidewalk can be replaced with a series of stormwater planters that could capture stormwater from the roadway. A preliminary soil assessment suggests that more soil testing would be required before determining the soil's suitability for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
33	33,845	1.6	17.1	155.4	0.026	0.93






Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.017	3	1,320	0.05	170	\$850
Stormwater planters	0.070	12	5,290	0.20	680	\$255,000



# GREEN INFRASTRUCTURE RECOMMENDATIONS



## First Presbyterian Church

-  bioretention system
-  stormwater planter
-  drainage area
-  property line
-  2015 Aerial: NJOIT, OGIS











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