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OF NEW JERSEY

Sea Grant
NJ Sea Grant Consortium

Impervious Cover Assessment (ICA) and Impervious Cover Reduction Action Plans (RAPs)

presented to Monmouth County CRS Users Group
at
NJ Sea Grant Consortium, Sandy Hook

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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

The Water Resources Program is one of many specialty programs under Rutgers Cooperative Extension.

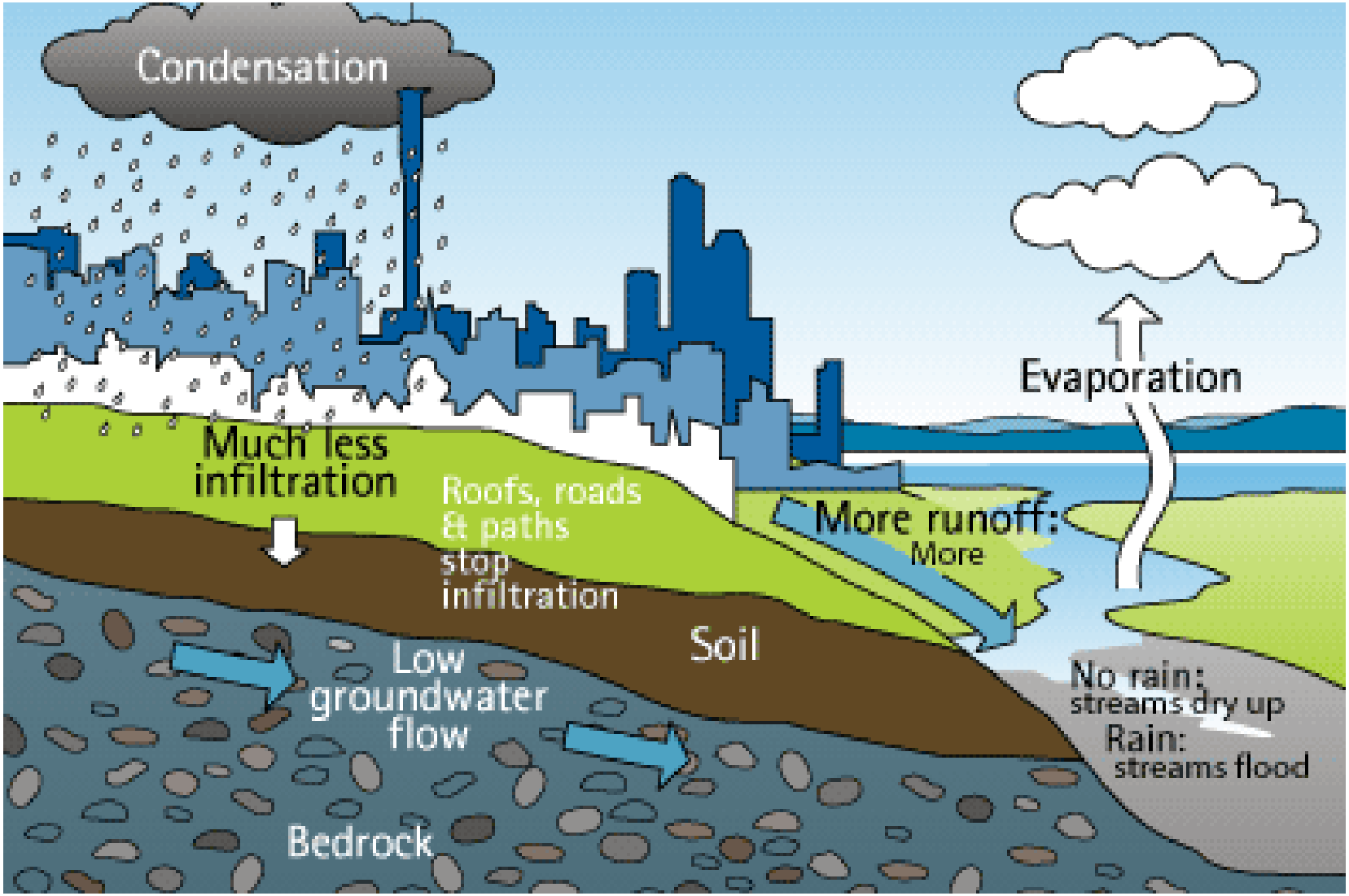
Our Mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

The Water Resources Program serves all of New Jersey, working closely with the County Extension Offices.

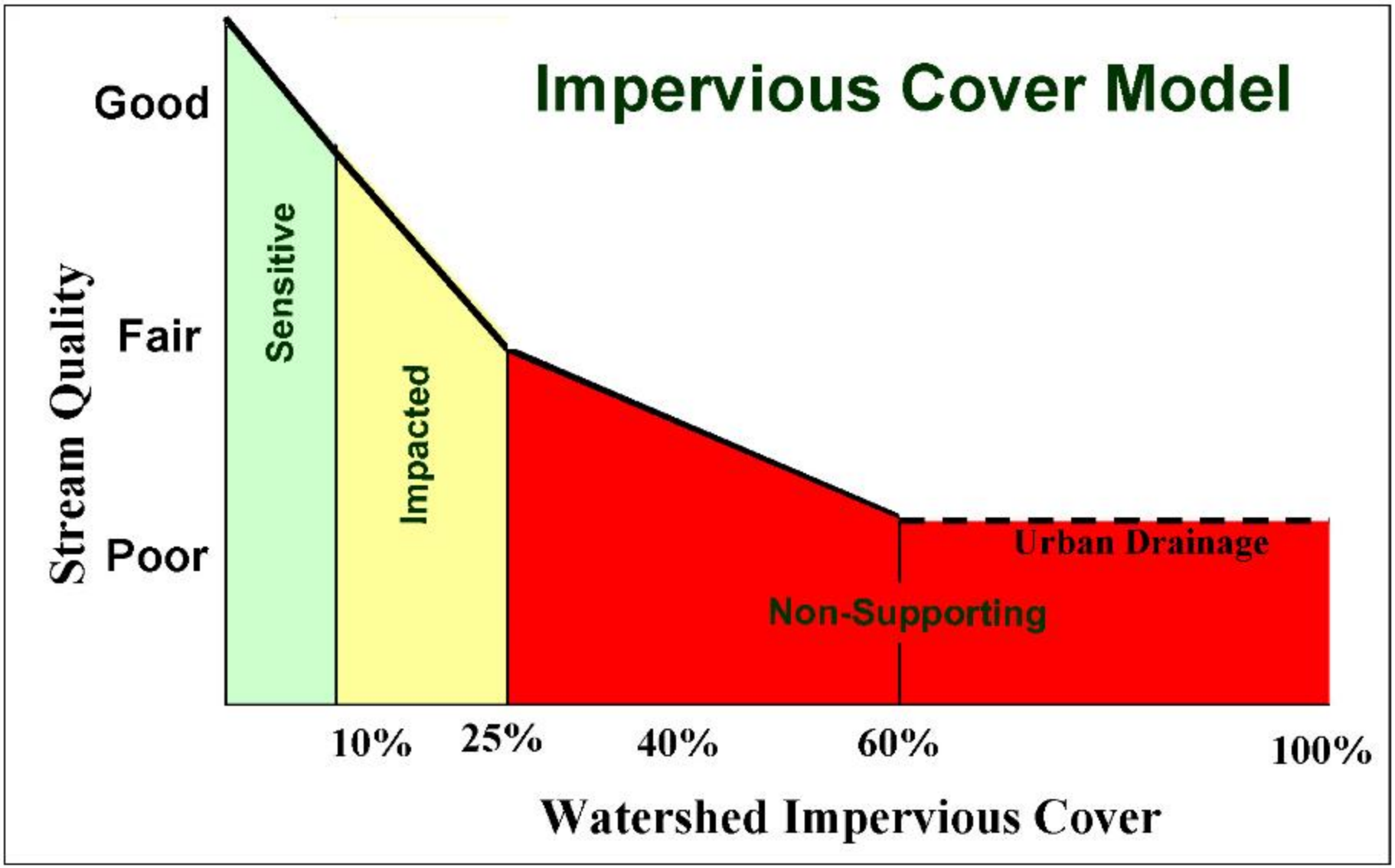
The Impact of Development on Stormwater Runoff

More development → *More impervious surfaces* → *More stormwater runoff*

The *Urban* Hydrologic Cycle



Original ICM developed based on 200+ reports and papers



Reference: Tom Schueler and Lisa Fraley-McNeal, Symposium on Urbanization and Stream Ecology, May 23 and 24, 2008

Green Infrastructure

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

Green Infrastructure projects:

- capture
- filter
- absorb
- reuse

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

Green Infrastructure includes:

- green roofs
- rainwater harvesting
- tree filter/planter boxes
- rain gardens/bioretention systems
- permeable pavements
- vegetated swales or bioswales
- natural retention basins
- trees & urban forestry
- green streets








Parker Urban Greenscapes. 2009.

We must deal with impacts from impervious cover

Are there impervious surfaces that you can eliminate?

If we can't eliminate it, can we reduce it?

If we can't eliminate or reduce it, can we disconnect it?

Are there impervious surfaces that you can harvest rainwater for reuse?

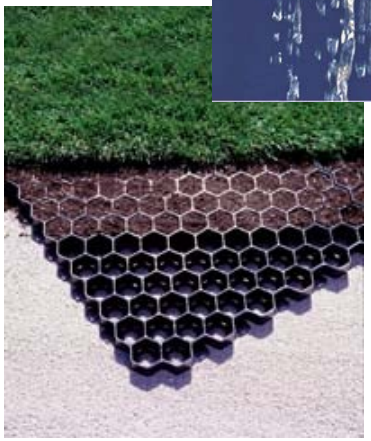
Are there conveyance systems that can be converted to bioswales?

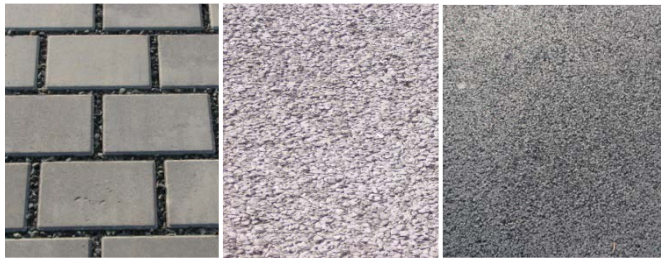
Eliminate it!

“Depaving”

Reduce It!
Permeable Pavements

- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without "fine" materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Ideal application for porous pavement is to treat a low traffic or overflow parking area
- Terminology: porous asphalt, pervious concrete, permeable pavers



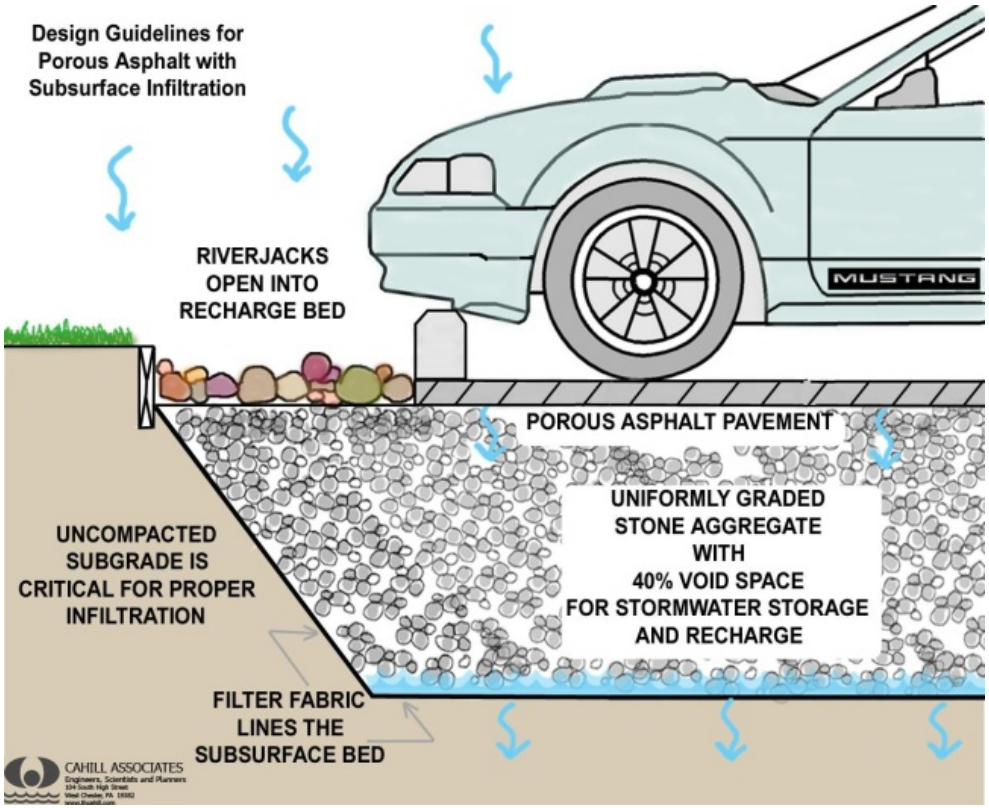


Permeable Pavements

FUNCTIONS

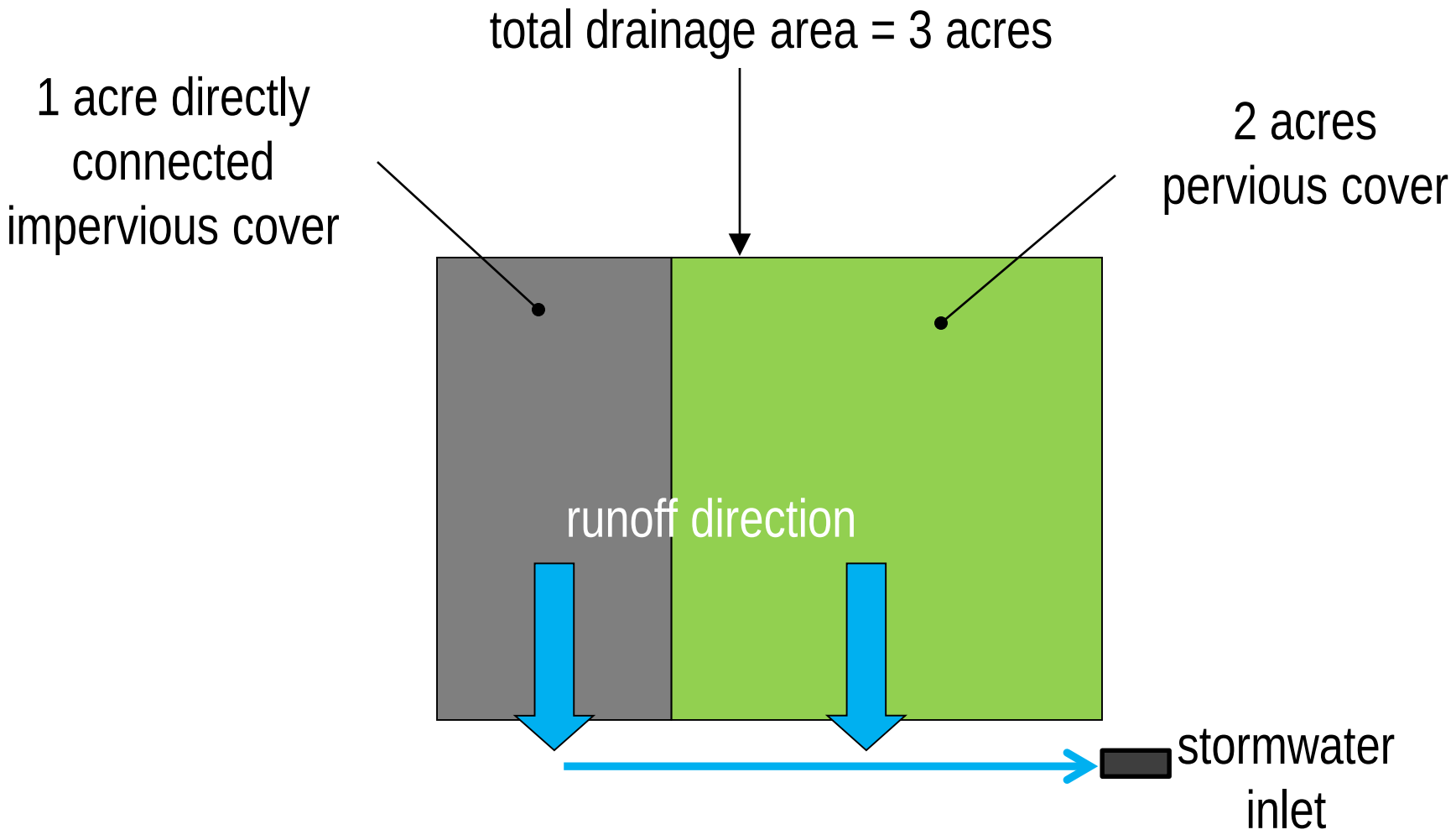
- Manage stormwater runoff
- Minimize site disturbance
- Promote groundwater recharge
- Low life cycle costs, alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

COMPONENTS

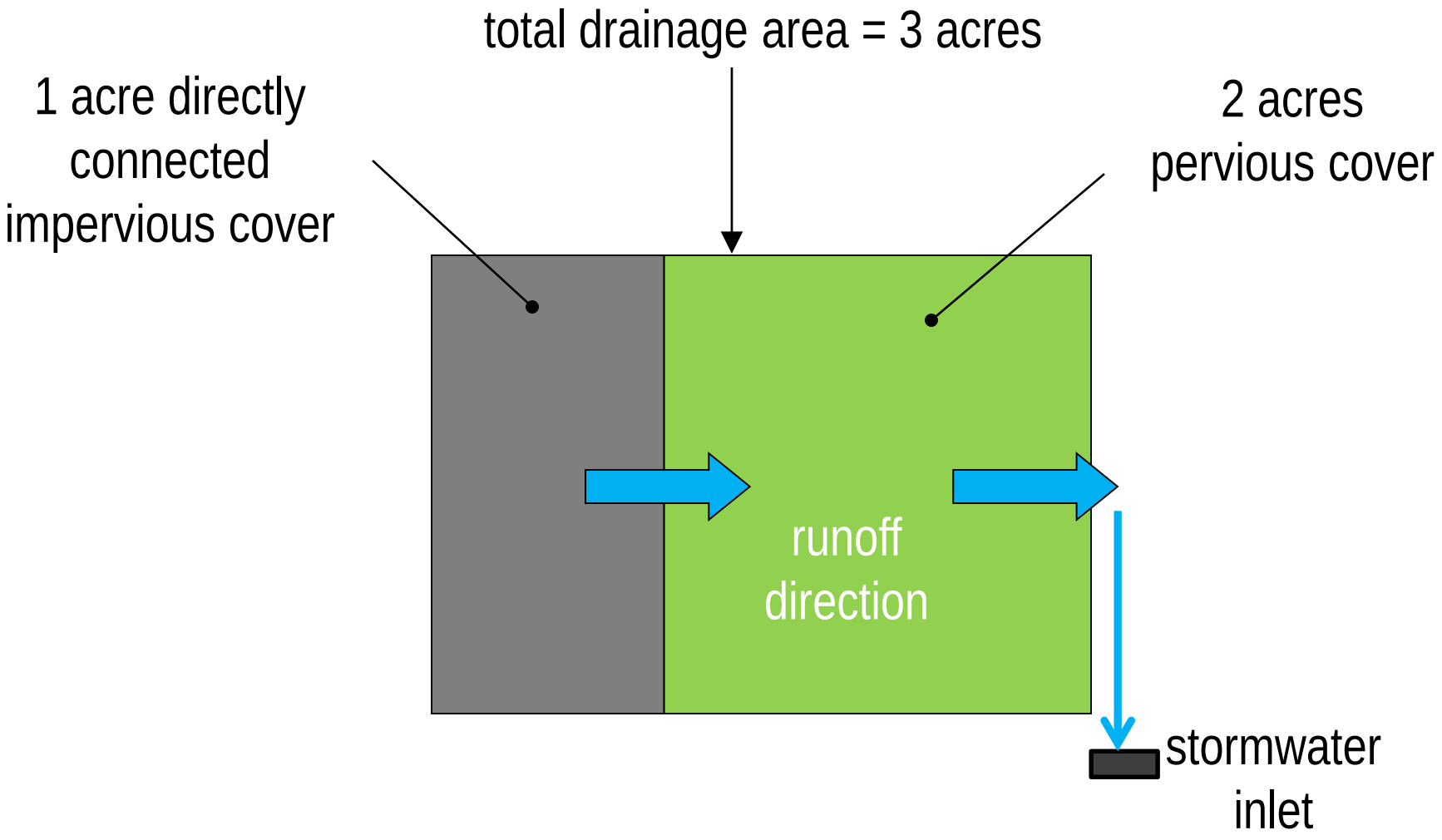


Disconnect It!

For 1.25 inch storm, 3,811 cubic feet of runoff = **28,500 gallons**

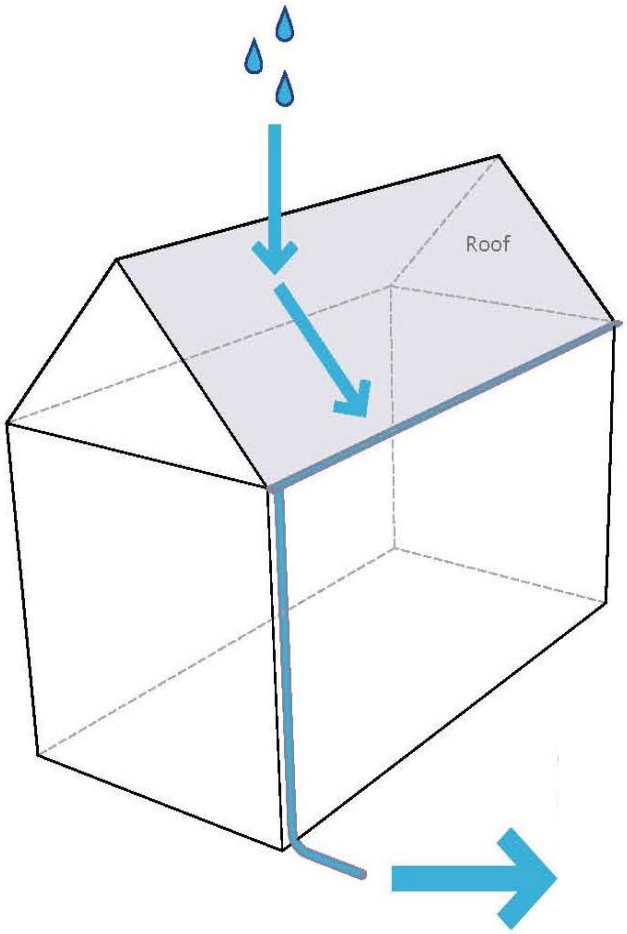


For 1.25 inch storm, 581 cubic feet of runoff = **4,360 gallons**



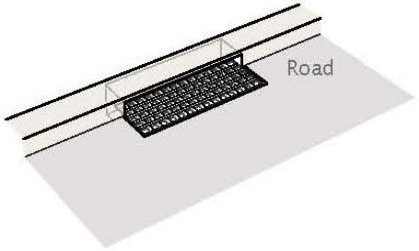
	Volume of Runoff		
Design Storm	**Connected (gallons)**	**Disconnected (gallons)**	**Percent Difference**
1.25 inches (water quality storm)	28,500	4,360	85%

Disconnection with Rain Water Harvesting



Disconnect your downspout by installing a rain barrel

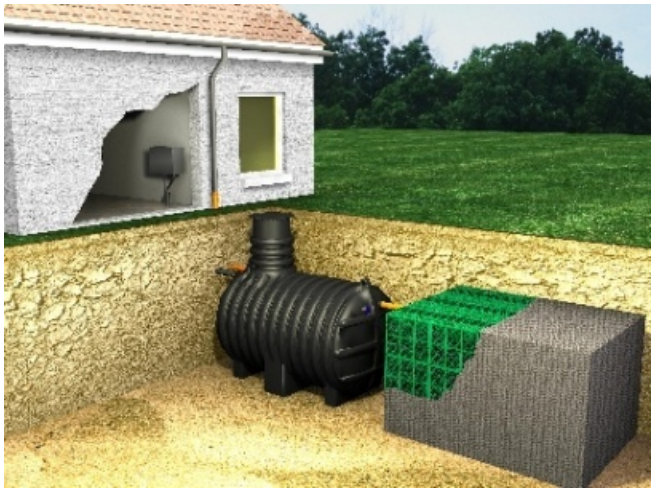
REDUCE THE AMOUNT OF RUNOFF ENTERING STORM SEWERS



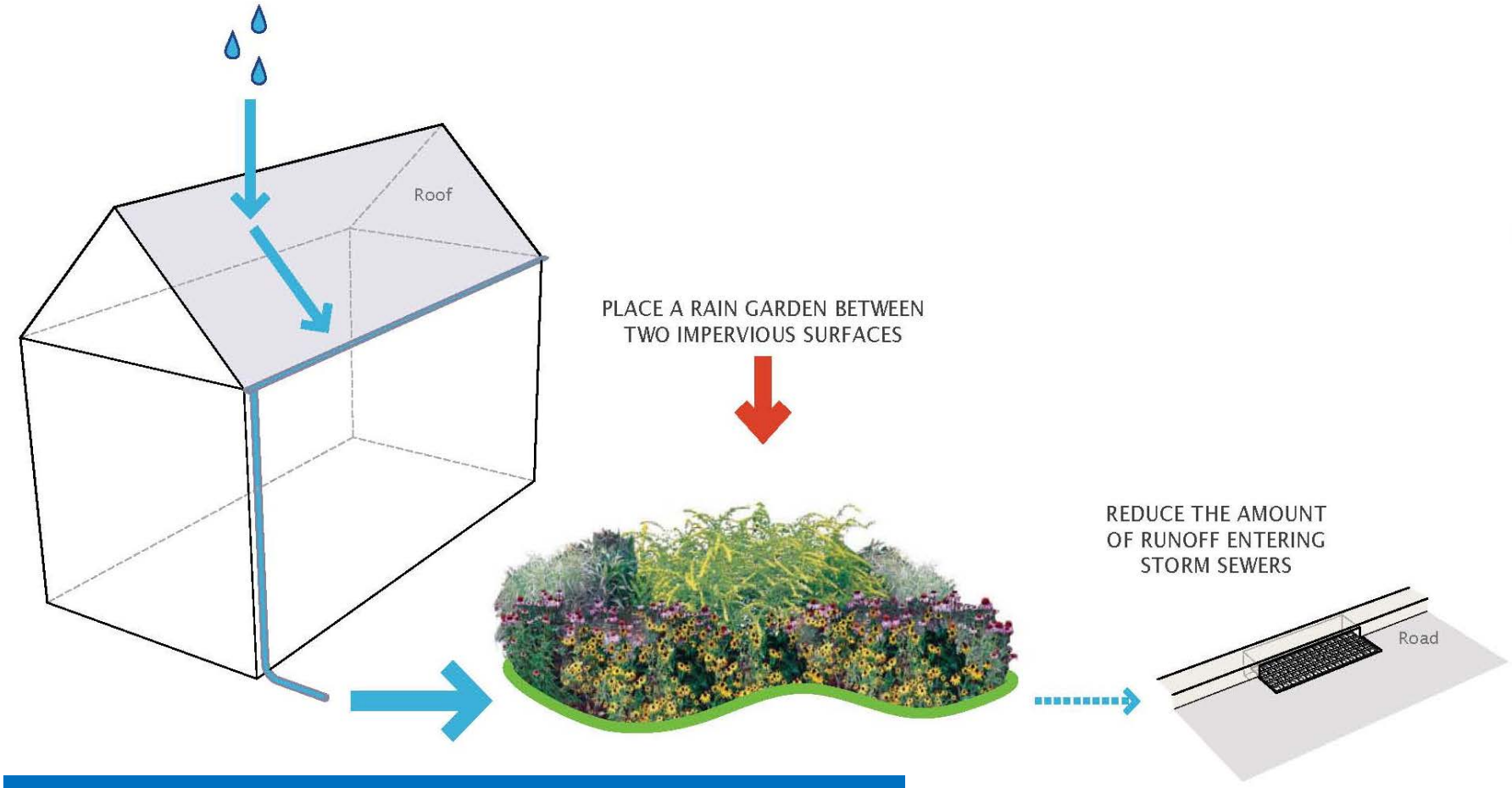
Impervious area is now ***"disconnected"*** from flowing directly into the storm sewer system

So Many Barrels to Choose From…

Or Larger Rainwater Harvesting Systems…



Disconnection with Rain Gardens



Rooftop runoff is now ***"disconnected"*** from flowing directly into the storm sewer system

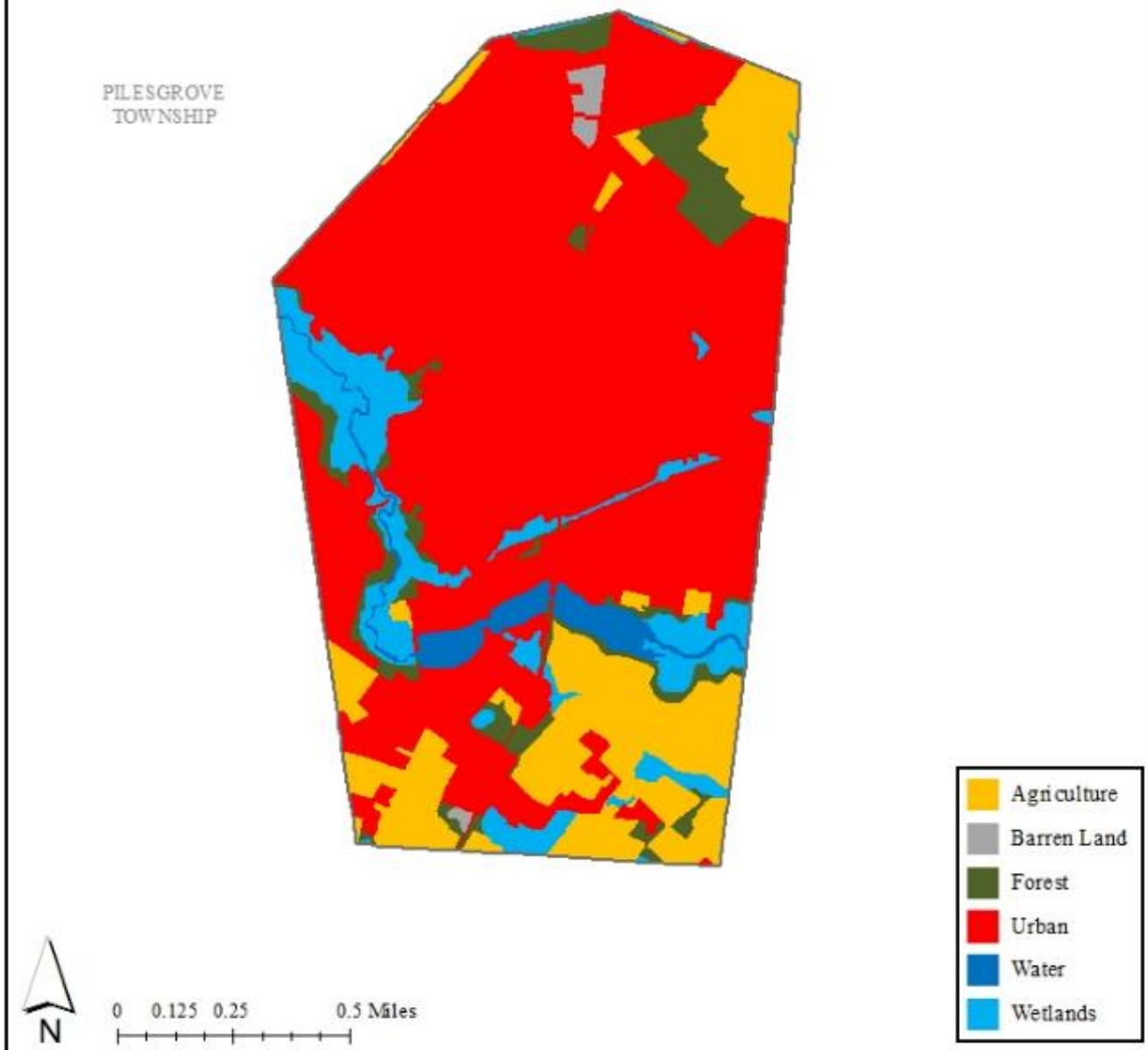
Lots of Rain Gardens

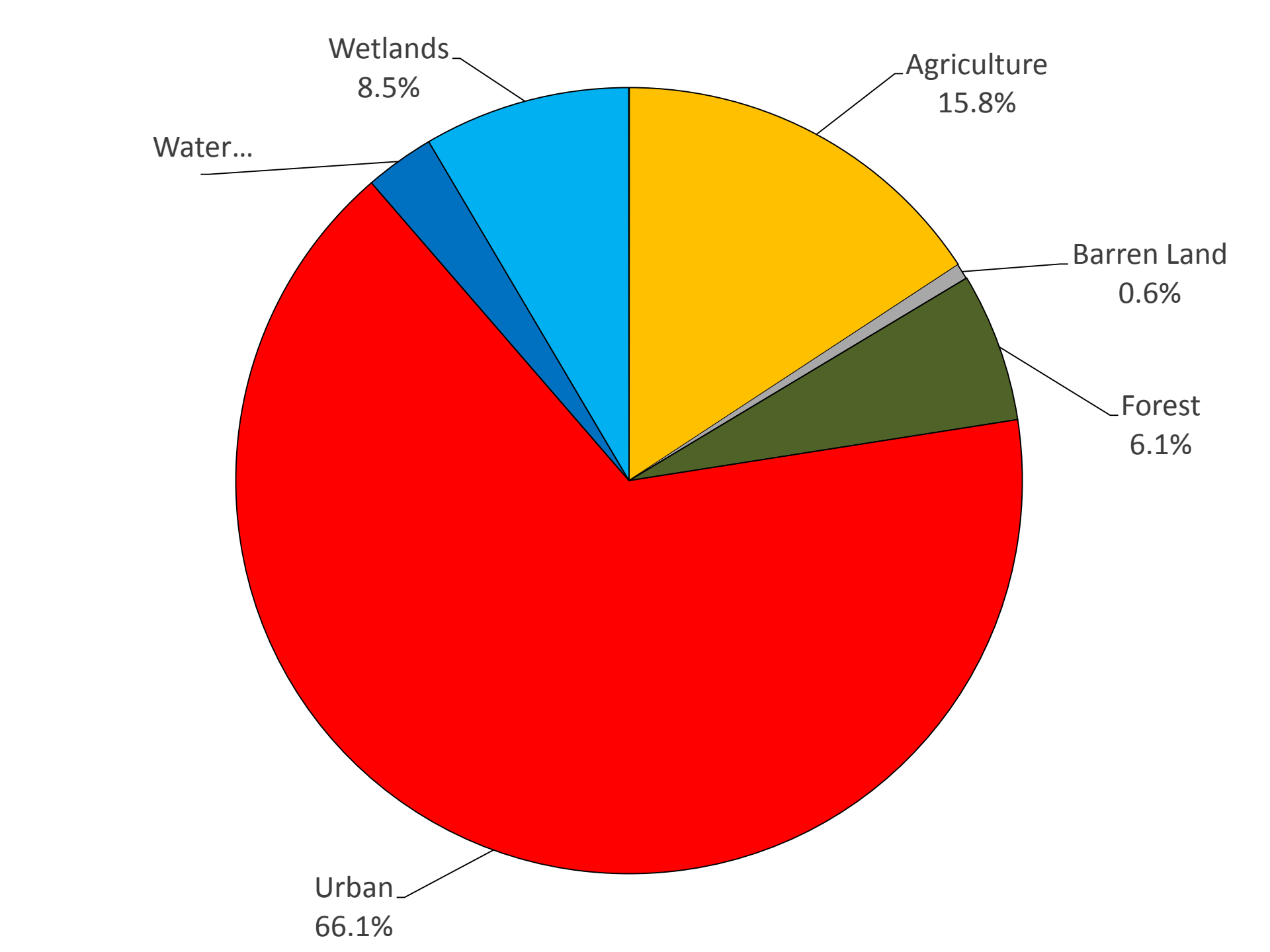
Impervious Cover Assessment

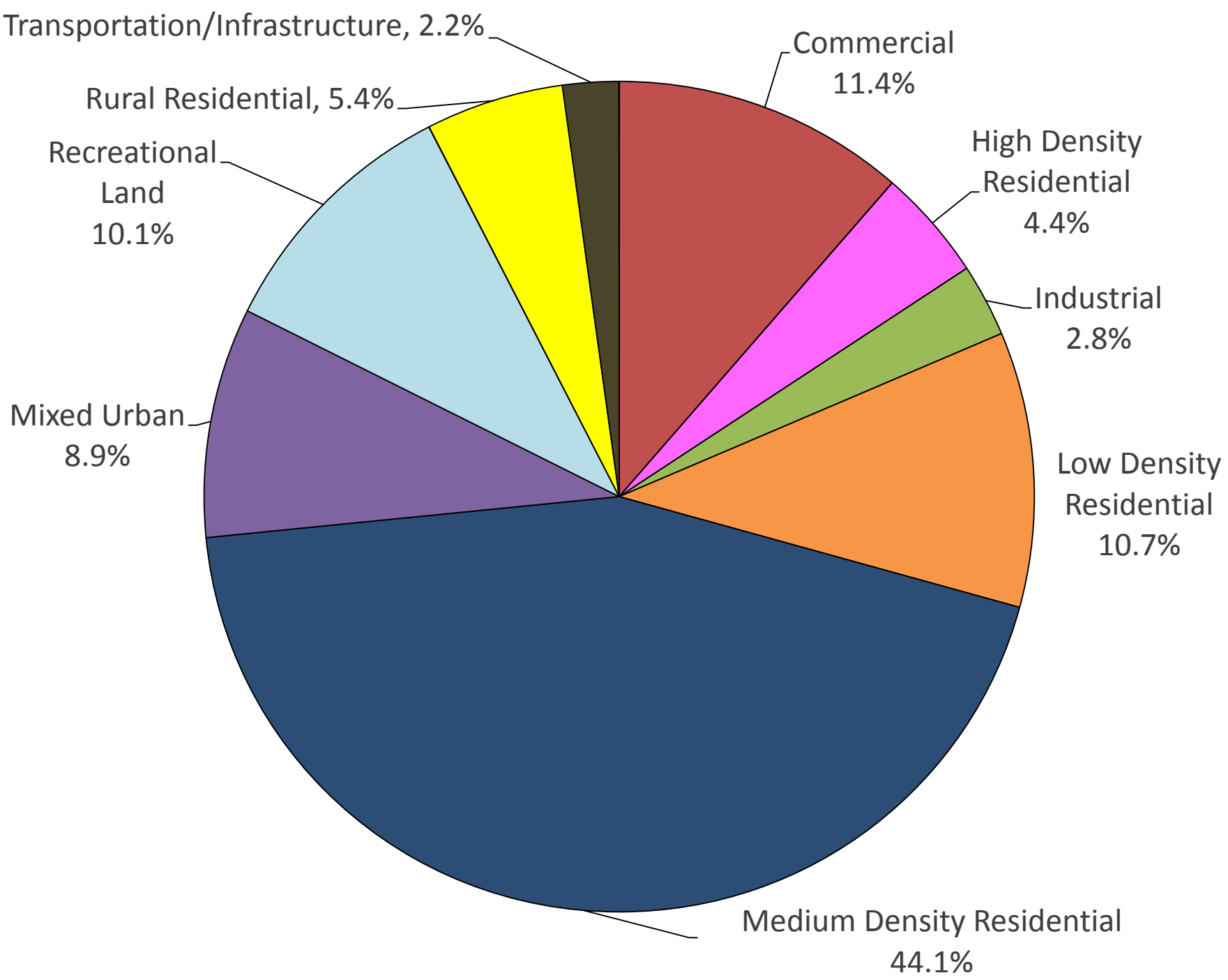
Impervious Cover Assessment

- Analysis completed by watershed and by municipality
- Use 2007 Land Use data to determine impervious cover
- Calculate runoff volumes for water quality, 2, 10 and 100 year design storm and annual rainfall
- Contain three concept designs

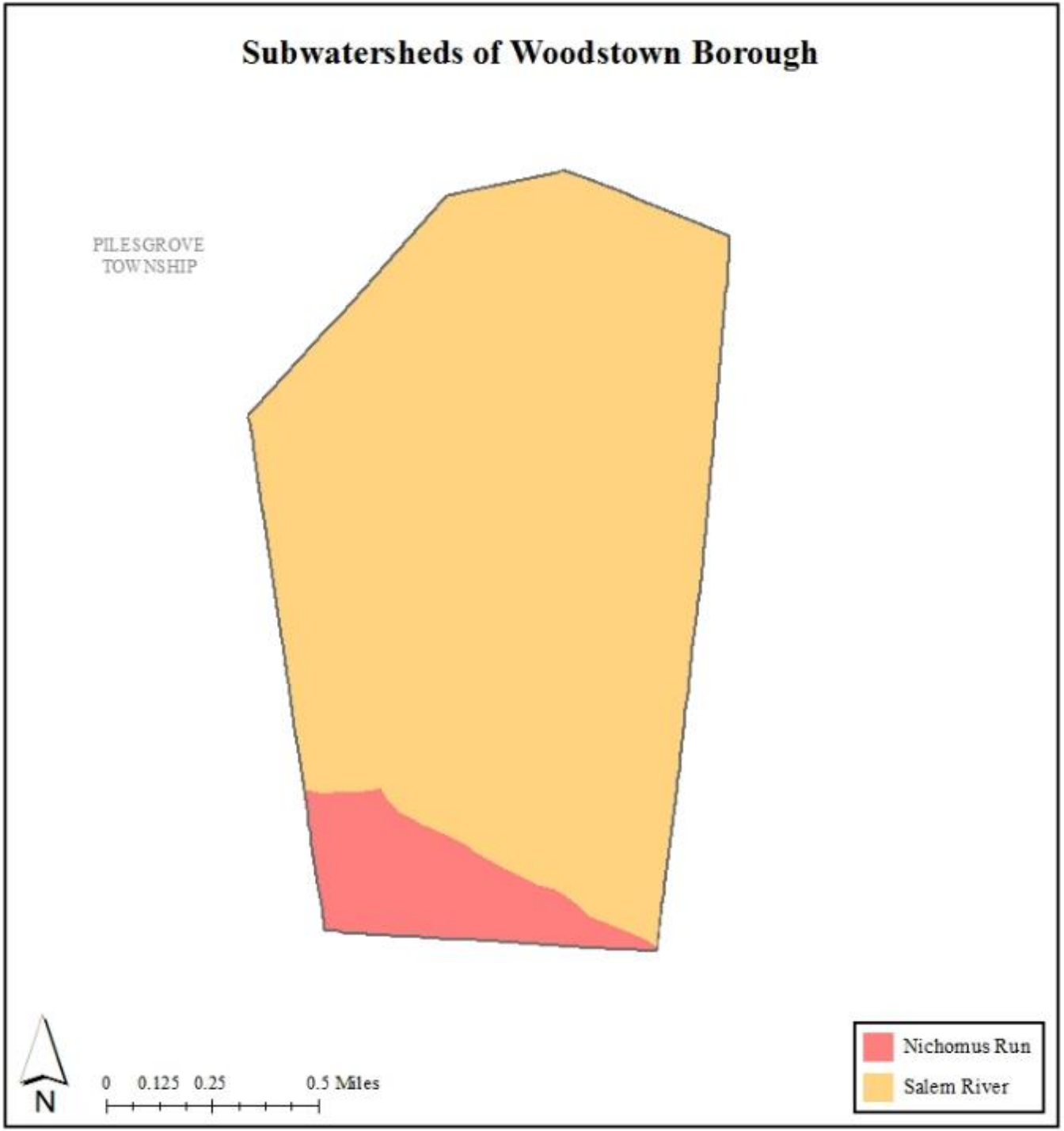
Land Use Types for Woodstown Borough




Wetlands
8.5%
Agriculture
15.8%
Water…
Barren Land
0.6%
Forest
6.1%
Urban
66.1%


Transportation/Infrastructure, 2.2%
Commercial
11.4%
Rural Residential, 5.4%
High Density
Residential
4.4%
Recreational
Land
10.1%
Industrial
2.8%
Mixed Urban
8.9%
Low Density
Residential
10.7%
Medium Density Residential
44.1%

Subwatersheds of Woodstown Borough



Watershed	Total Area (ac)	Impervious Cover (ac)	%
Nichomus Run	98.5	9.5	9.7%
Salem River	936.2	198.7	21.9%
TOTAL	1,034.7	208.2	20.7%

Subwatershed	NJ Water Quality Storm (MGal)	Annual Rainfall of 44" (MGal)	2-Year Design Storm (3.3”) (MGal)	10-Year Design Storm (5.0”) (MGal)	100-Year Design Storm (8.2”) (MGal)
Nichomus Run	0.32	11.35	0.85	1.29	2.19
Salem River	6.75	237.75	17.83	27.02	45.93
TOTAL	7.08	249.10	18.68	28.31	48.12

WE LOOK HERE FIRST:

- ✓Schools
- ✓Churches
- ✓Libraries
- ✓Municipal Building
- ✓Public Works
- ✓Firehouses
- ✓Post Offices
- ✓Elks or Moose Lodge
- ✓Parks/ Recreational Fields

- 20 to 40 sites are entered into a PowerPoint
- Site visits are conducted

Woodstown, New Jersey
Impervious Cover Assessment
Heritage's Dairy Stores, 199 Pole Tavern Woodstown Rd.

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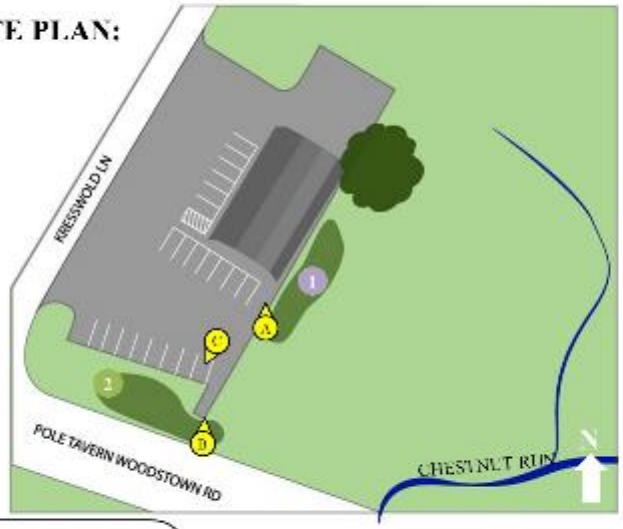
PROJECT LOCATION:

SITE PLAN:



A

B

C

1. **BIOSWALE:** A bioswale could be installed to treat runoff from the parking lot and rooftop. A bioswale is a vegetated system that will convey stormwater to the waterway on the north edge of the property while removing sediment and nutrients.

2. **BIORETENTION SYSTEM:** The bioretention system will reduce sediment and nutrient loading to the local waterway. Curb cuts will be used to allow stormwater runoff from the parking areas to enter into the bioretention system. The existing catch basins will be used to handle overflow from the system.

1 BIOSWALE

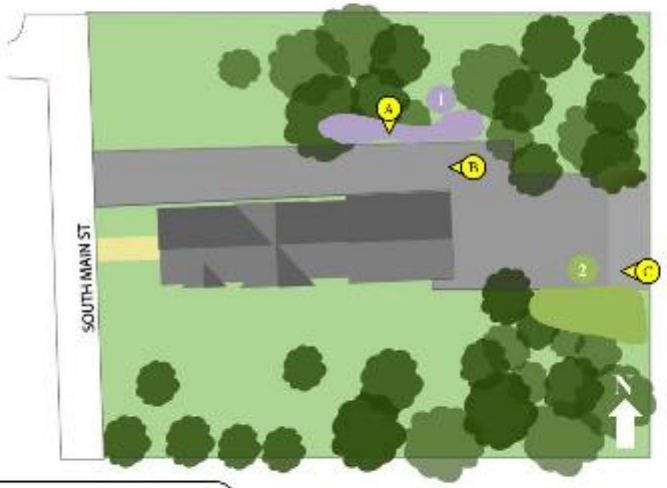
2 BIORETENTION SYSTEM

Woodstown, New Jersey
Impervious Cover Assessment
Ashury United Methodist Church, 149 South Main St.

RUTGERS

PROJECT LOCATION:

SITE PLAN:



A

B

C

1. **BIOSWALE:** A bioswale could be installed to treat runoff from the parking lot. A bioswale is a vegetated system that will convey stormwater while removing sediment and nutrients.
2. **BIORETENTION SYSTEM:** The bioretention system will reduce sediment and nutrient loading to the local waterway.

1 BIOSWALE

2 BIORETENTION SYSTEM

Woodstown, New Jersey
Impervious Cover Assessment
Reliance Fire Company, 35 Broad St.

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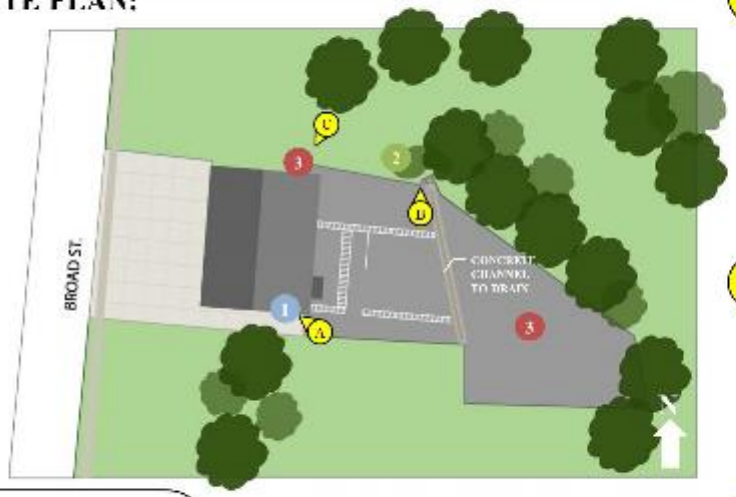
PROJECT LOCATION:

SITE PLAN:



A

B

C

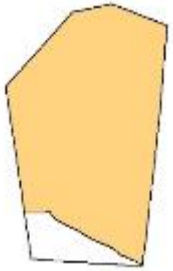
1. **RAINWATER HARVESTING SYSTEM:** Rainwater can be harvested from the roof of the building and stored in cisterns. The water can be used to wash the fire trucks.
2. **BIORETENTION SYSTEM:** A bioretention system could be installed to capture stormwater runoff from the parking lot. The bioretention system will reduce sediment and nutrient loading to the local waterway.
3. **GRASS PAVERS:** Grass pavers promote groundwater recharge and filters stormwater.

1 RAINWATER HARVESTING SYSTEM

2 BIORETENTION SYSTEM

3 GRASS PAVERS

Impervious Cover Reduction Action Plan



Salem River Watershed

1. Loyal Order of the Moose Lodge 932
2. Heritage's Dairy Stores
3. Catholic Community of the Holy Spirit
4. Woodstown Friends Meeting Church
5. Woodstown Public Works Lot
6. US Post Office
7. Adams Funeral Home
8. Woodstown Square / Woodstown Family Center
9. Reliance Fire Company
10. Woodstown-Pilesgrove Library
11. Woodstown High School
12. Friends Village at Woodstown
13. Mary S. Shoemaker Elementary School
14. First Baptist Church
15. Chestnut Run Pool Association
16. Asbury United Methodist Church
17. McDonald's
18. Railroad (along W. Wilson Ave)

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Loyal Order of the Moose Lodge 932

13 Bypass Rd. Woodstown, NJ 08098
Block 14.01, Lot 3
82,459 sq. ft.

The entire front roof and parking lot can be discharged to bioretention systems. The roof of the pavilion could be routed to a rainwater harvesting system. A preliminary soil assessment for this site suggested that the site's existing soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads (lbs/year)			Runoff Volume (Mgal)	
%	Square Feet	TP	TN	TSS	For the 1.25” Water Quality Storm	For an Annual Rainfall of 44”
64%	53,554	2.58	27.05	245.89	0.04	1.47

Recommended Green Infrastructure Practice	Recharge Potential (Mgal/yr)	Total Suspended Solids Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu.ft./second)
Bioretention systems	0.429	72	31,431	1.05
Rainwater harvesting systems	0.000	3	2,311	0.08

Estimated cost is $20,575 for 4,115 sq. ft. of bioretention systems. Estimated cost is $10,000 for rainwater harvesting systems.

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New Jersey Agricultural Experiment Station

Loyal Order of the Moose Lodge 932

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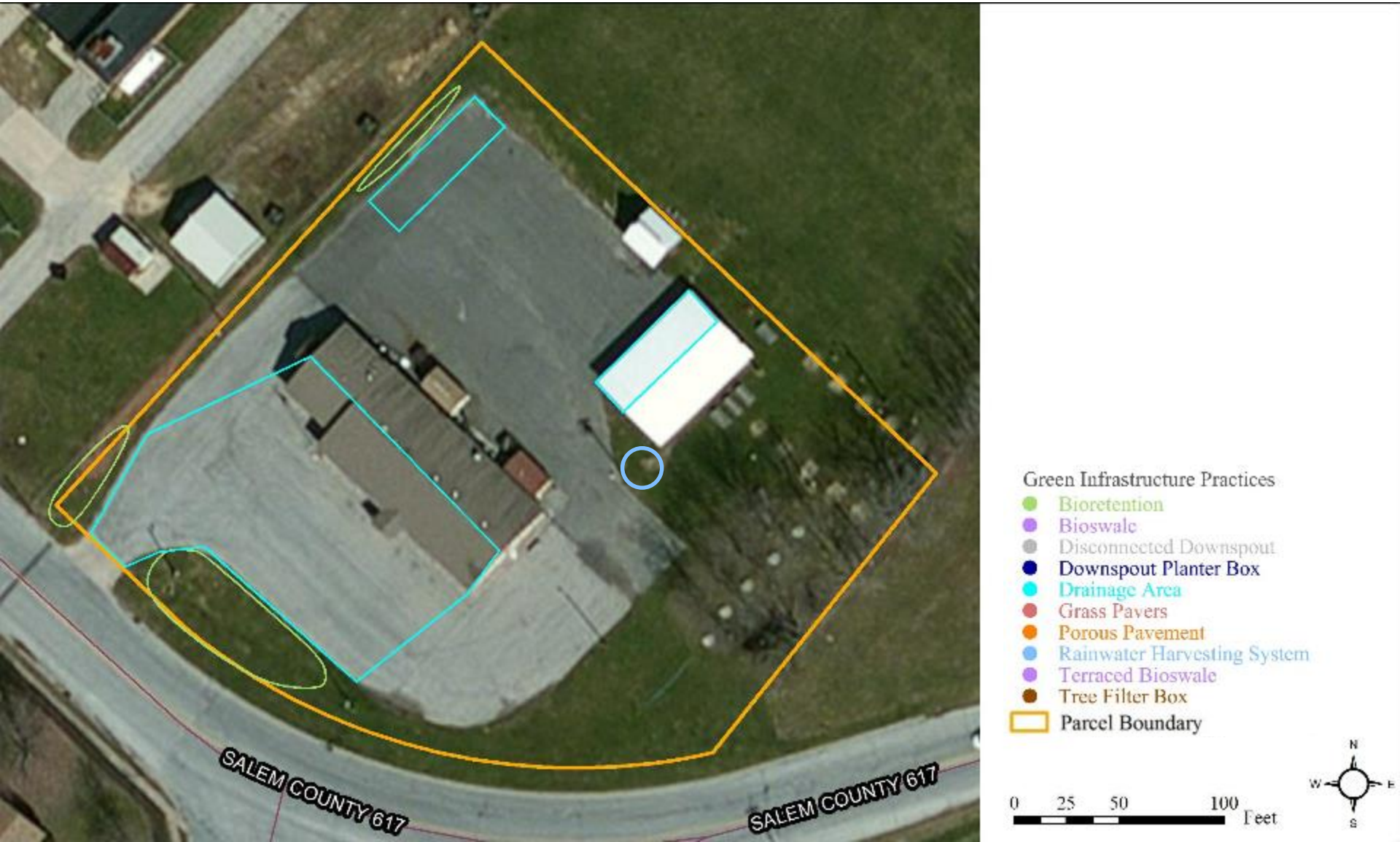
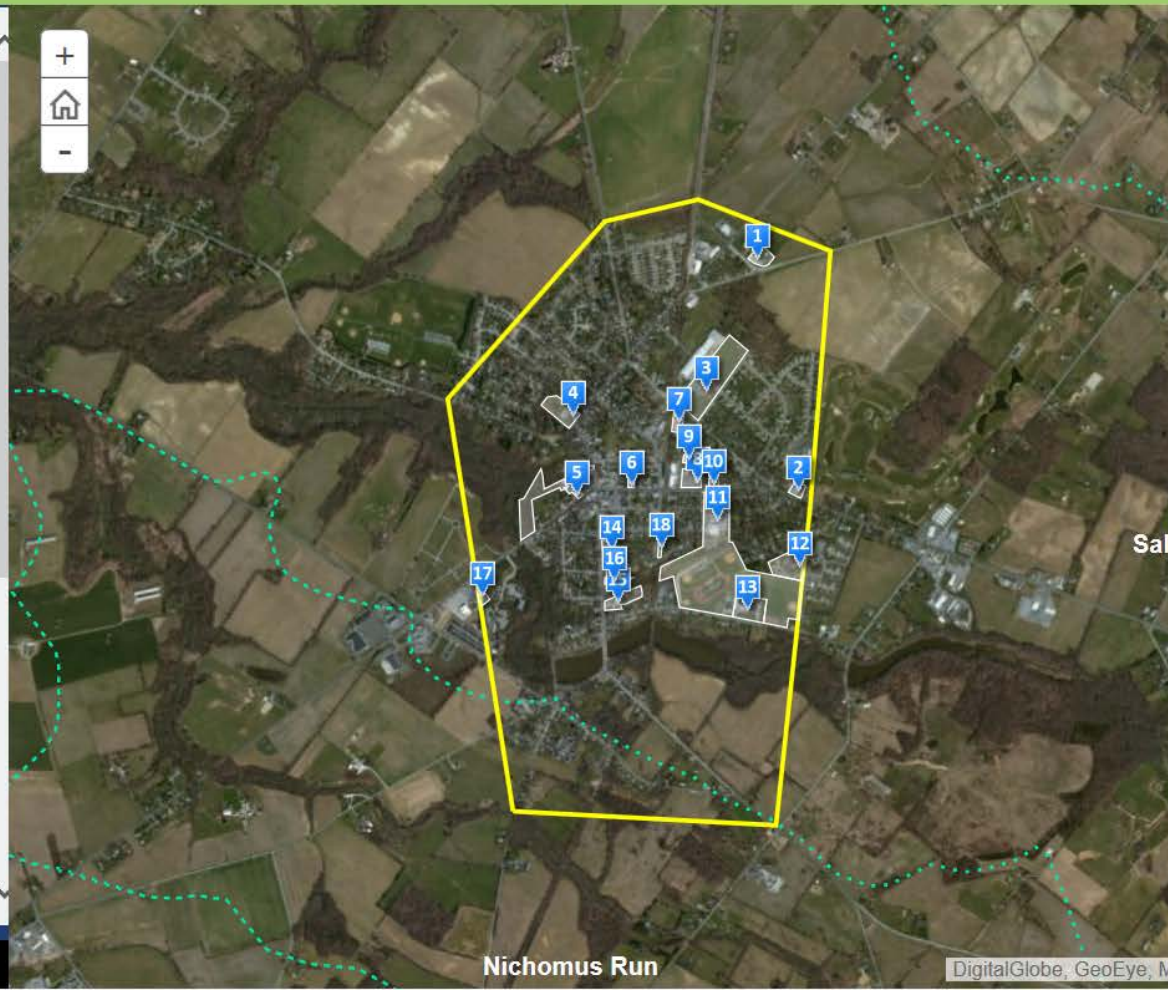


WOODSTOWN



/Woodstown/

Woodstown

Web Slice Gallery

Page Safety Tools

TOWN

RUTGERS
New Jersey Agricultural Experiment Station

3 Catholic Community of the Holy Spirit

6 US Post Office

9 Reliance Fire Company

Loyal Order of the Moose Lodge 932

For this site, we recommend bioretention systems and porous pavement. Click on the link below to view or download the Reducation Action Plan.

Download Report (PDF)

Salem River

POWERED BY esri

Final Thoughts

- Plans promote action
- Plans are a conduit for funding
- Impervious cover reduction action plan provide sites for developers to offset impacts
- Wide range in cost of projects (Eagle Scout projects to economic stimulus money projects)
- Foundation for stormwater utilities, watershed restoration plans, stormwater mitigation plan, and/or integrated water quality plans

Next Steps

- Funding may be available to implement some of the concept plans or other projects identifies in the action plan
- Decide who will take ownership of the assessment and action plan
  - Township Committee
  - Township Engineer and Business Administrator
  - Environmental Commission
  - Sustainable Jersey Green Team
  - Local Watershed Association
- Form a Municipal Action Team

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Questions?

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