Paraprofessional Watershed Restoration Training

March 19, 2014
Room 223, Environmental Sciences Building
New Brunswick, NJ

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RUTGERS
New Jersey Agricultural Experiment Station

Water Resources Program

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.

OVERVIEW

1. What is a watershed?
2. Where does precipitation go?
3. Land Use/Land Cover Changes
4. Nonpoint Source Pollution
5. How can we better manage stormwater?

WHAT IS A WATERSHED?

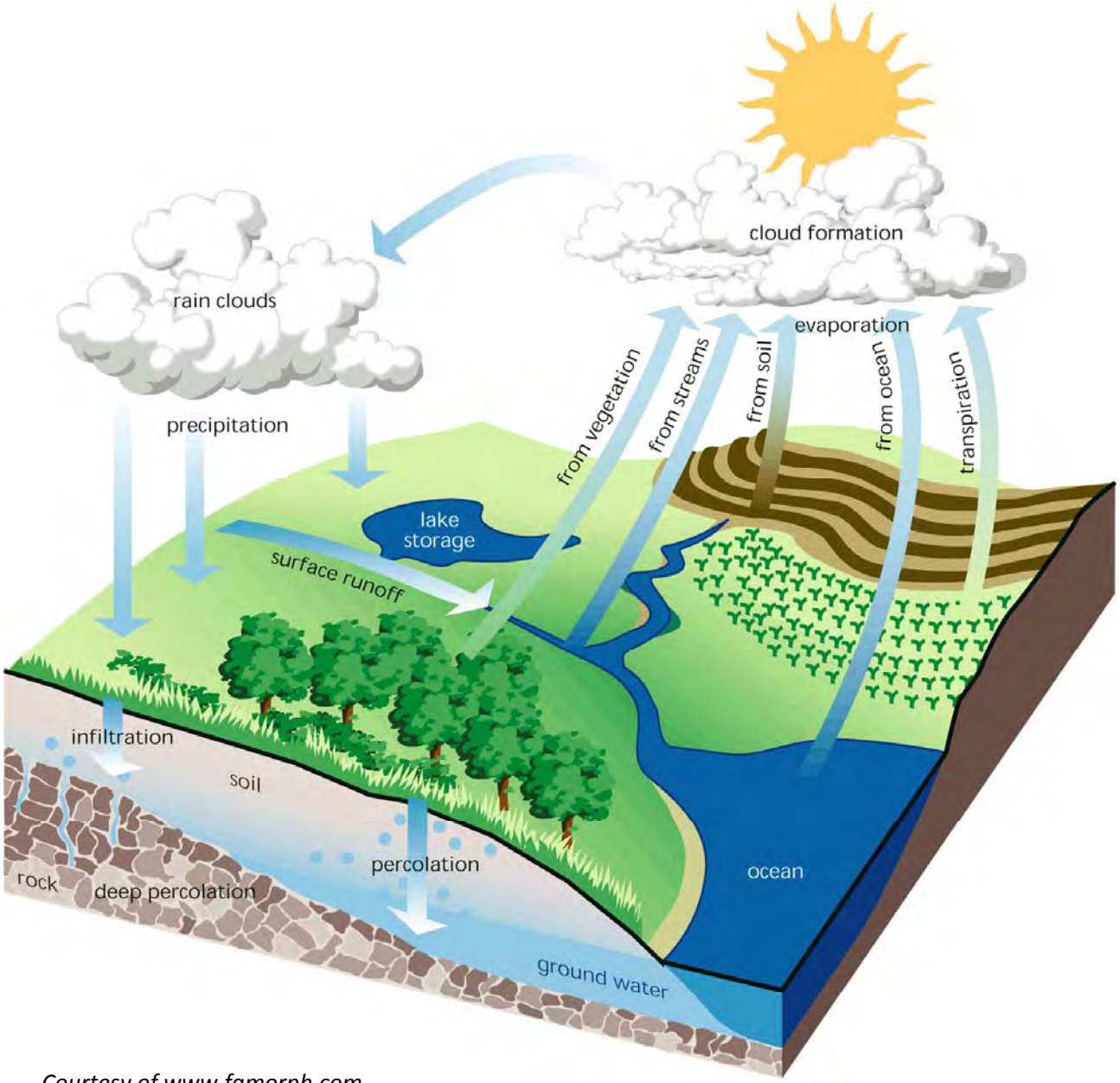
- An area of land that water flows across, through, or under on its way to a stream, river, lake, ocean or other body of water.

- A watershed is like one big bathtub...

Do you know what a watershed is?

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

HYDROLOGIC CYCLE



Courtesy of www.fgmorph.com

WHERE DOES PRECIPITATION GO?

1. It can *run off*

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

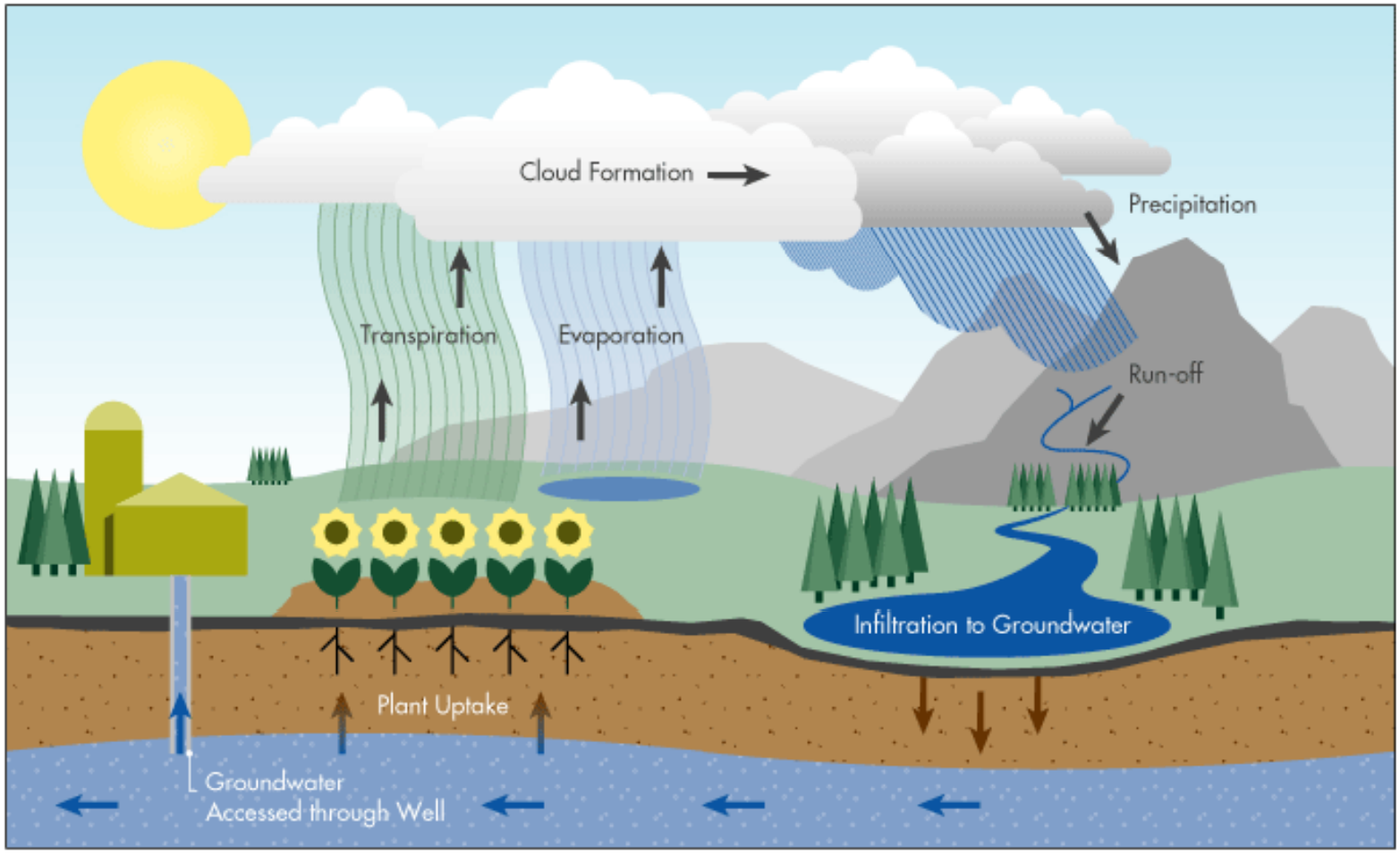
WHERE DOES PRECIPITATION GO?

2. It can be *absorbed* by plants and used for photosynthesis and other biological processes

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

WHERE DOES PRECIPITATION GO?

3. It can *infiltrate* through the soil surface and percolate downward to groundwater *aquifers*



Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

WHERE DOES PRECIPITATION GO?

4. It can *evaporate*

Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

The Impact of Development on Stormwater Runoff

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

LAND USE/LAND COVER CHANGES

LAND USE

HOW LAND IS USED BY HUMANS:

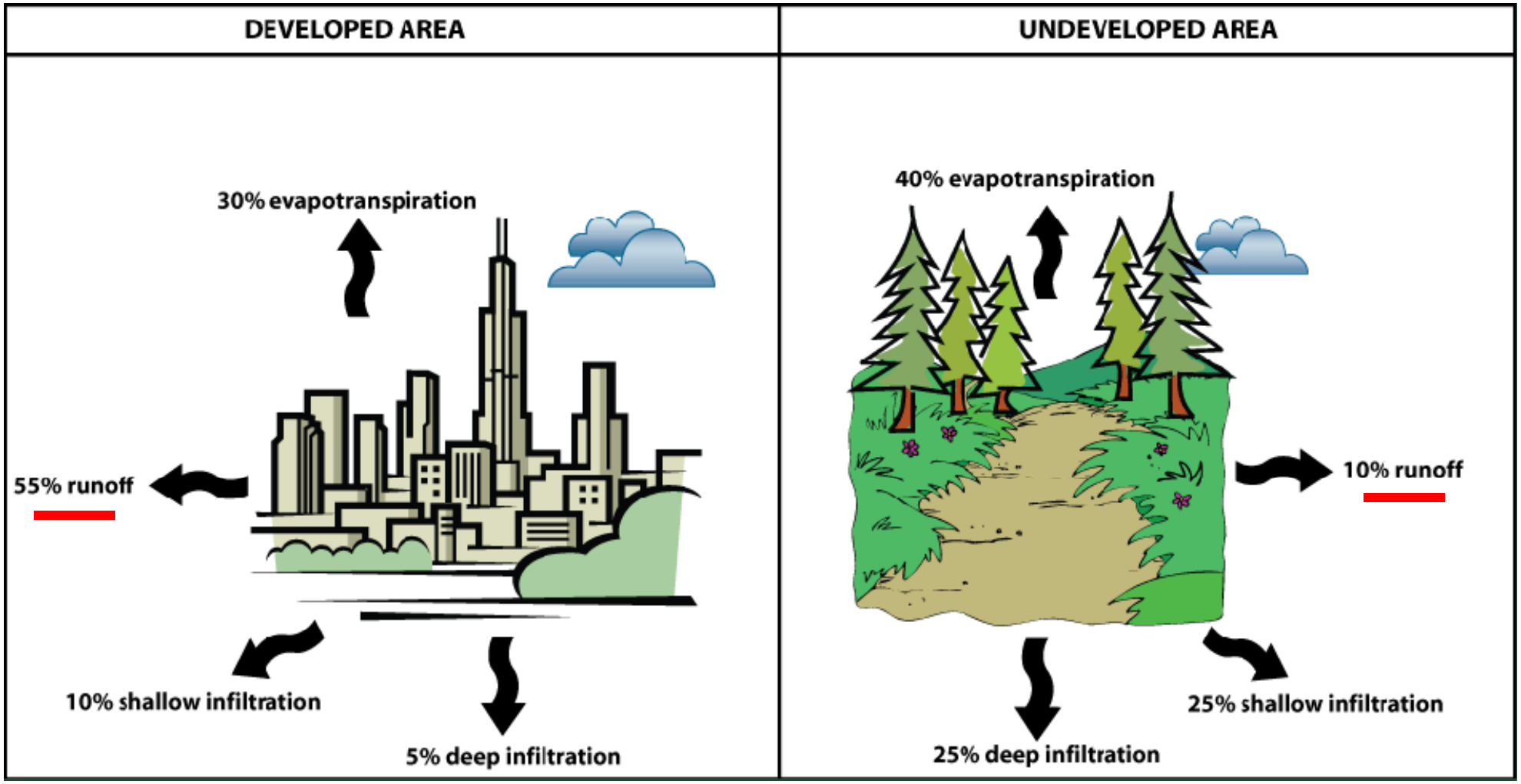
- AGRICULTURE
- INDUSTRY
- URBAN
- RESIDENTIAL
- RECREATION

LAND COVER

BIOLOGICAL AND PHYSICAL FEATURES OF THE LAND:

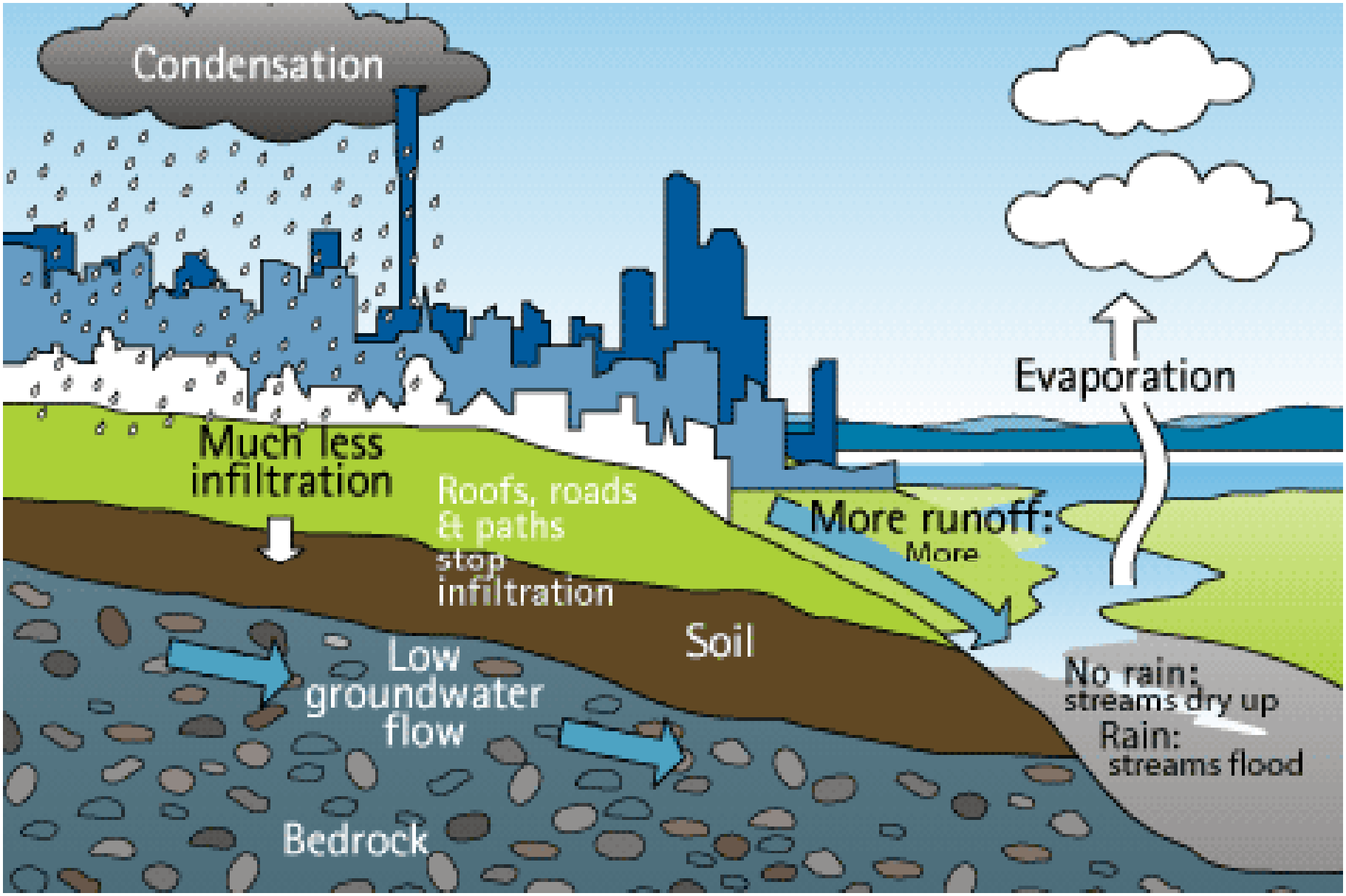
- FORESTS
- GRASSLANDS
- AGRICULTURAL FIELDS
- RIVERS, LAKES
- BUILDINGS, PARKING LOTS

LAND USE/LAND COVER CHANGES



Courtesy of Texas Watershed Stewards, Texas A&M AgriLife Extension

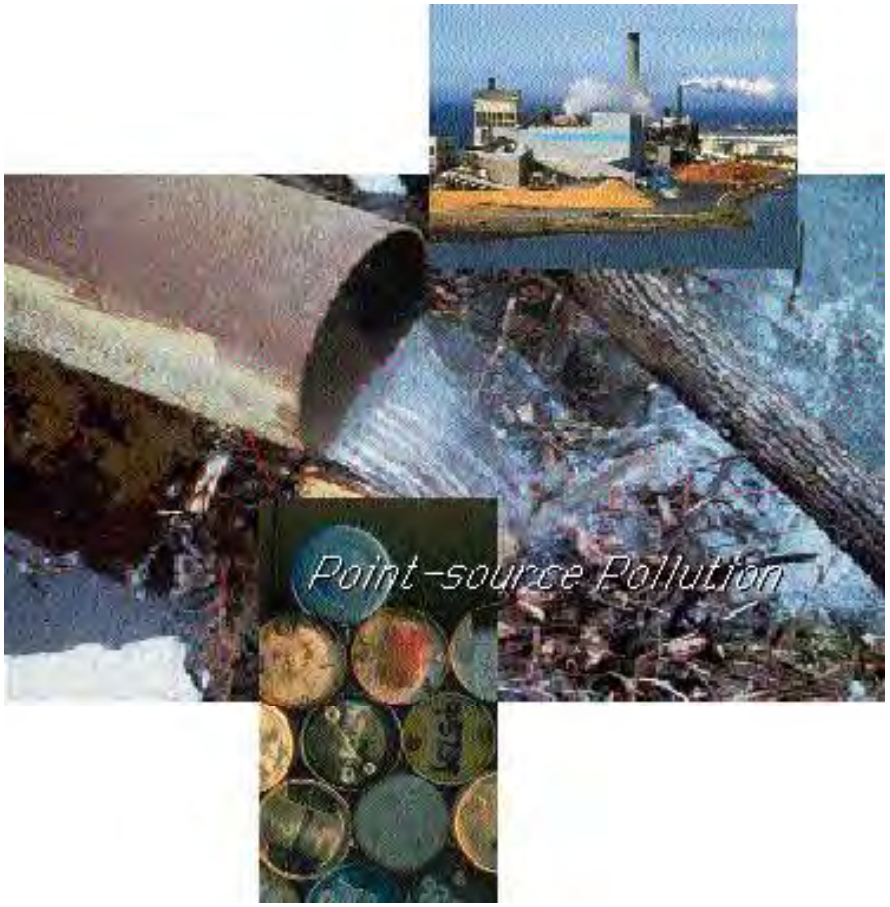
The *Urban* Hydrologic Cycle



Combined Sewer Systems (CSOs)

WATER POLLUTION SOURCES

POINT SOURCE POLLUTION



NONPOINT SOURCE POLLUTION

Environmental Health Perspective, National Institute of Health

POINT SOURCE POLLUTION

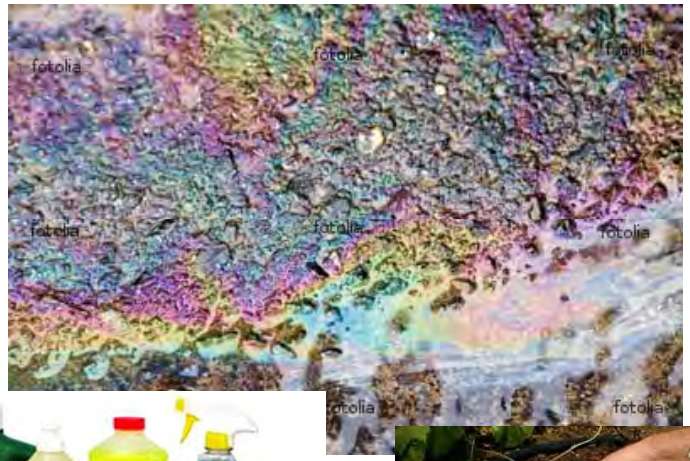
- Comes from a specific source, like a pipe
- Factories, industry, municipal treatment plants
- Can be monitored and controlled by a permit system (NPDES)

NONPOINT SOURCE POLLUTION (NPS)

- Associated with stormwater runoff
- Runoff collects pollutants on its way to a sewer system or water body
- It cannot be traced to a direct discharge point such as a wastewater treatment facility

EXAMPLES OF NPS

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



Impacts from Changing the Landscape

Hydrologic Effects:

- Disruption of natural water balance
- Increased flood peaks
- Increased stormwater runoff
- More frequent flooding
- Increased bankfull flows
- Lower dry weather flows

History of Stormwater Management

1st Attempt at Stormwater Management

Capture all runoff, pipe it, and send it directly to the river . . .prior to mid 1970's

2nd Iteration of Stormwater Management

Capture runoff, detain it, release it slowly to the river…mid 1970's to 2004

- Detain peak flow during large storm events for 18 hours (residential) or 36 hours (commercial)
- Reduce downstream flooding during major storms
- Use concrete low flow channels to minimize erosion, reduce standing water, quickly discharge low flows
- Does not manage runoff from smaller storms allowing stormwater to pass through the system
- Directly discharges stormwater runoff to nearby stream, waterway, or municipal storm sewer system (at a controlled/managed rate)

3rd Generation of Stormwater Management

- Reduce stormwater runoff volume
- Reduce peak flows and flooding

…and….

- Maintain infiltration and groundwater recharge
- Reduce pollution discharged to local waterways

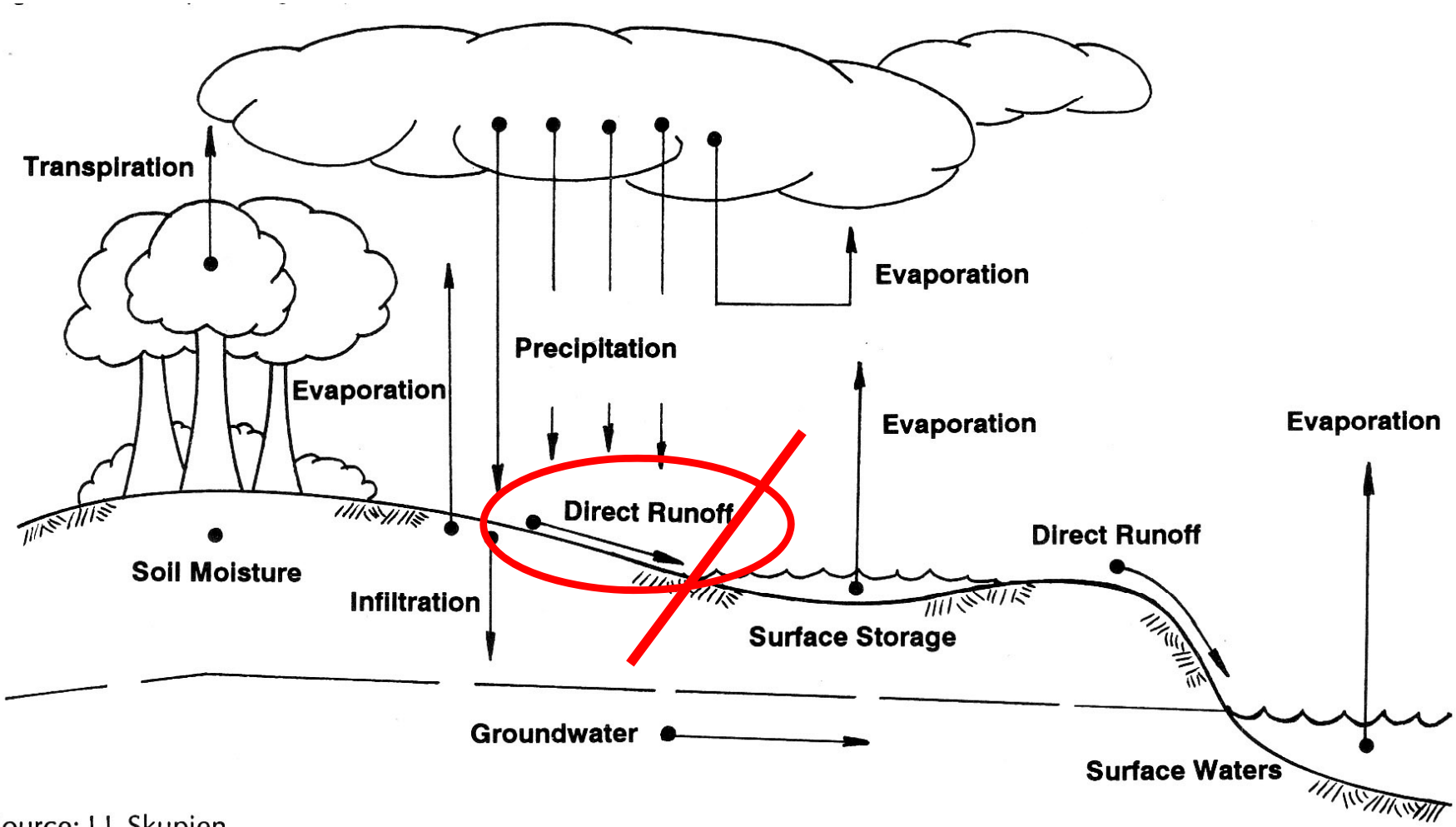
abc Action News, August 27, 2012

How NJ's regulations change the way we manage stormwater

Stormwater Management

It is all about controlling runoff from impervious surfaces

The Hydrologic Cycle



Source: J.J. Skupien.

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?

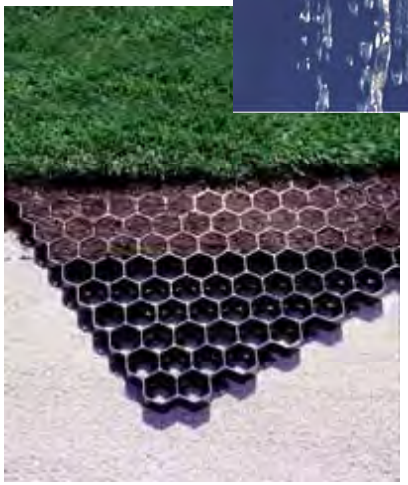
If we can't eliminate or reduce it, can we disconnect it?

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

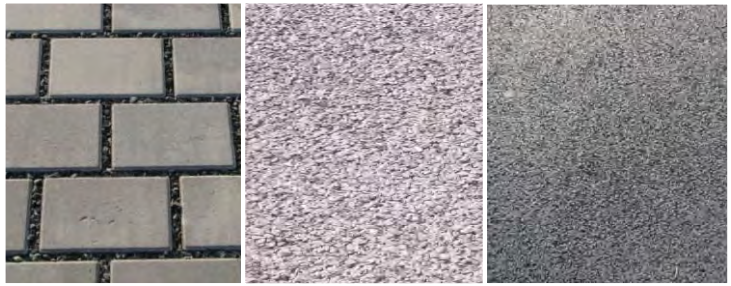
Are there conveyance systems that can be converted to bioswales?

Eliminate it!

Reduce It!
Pervious 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

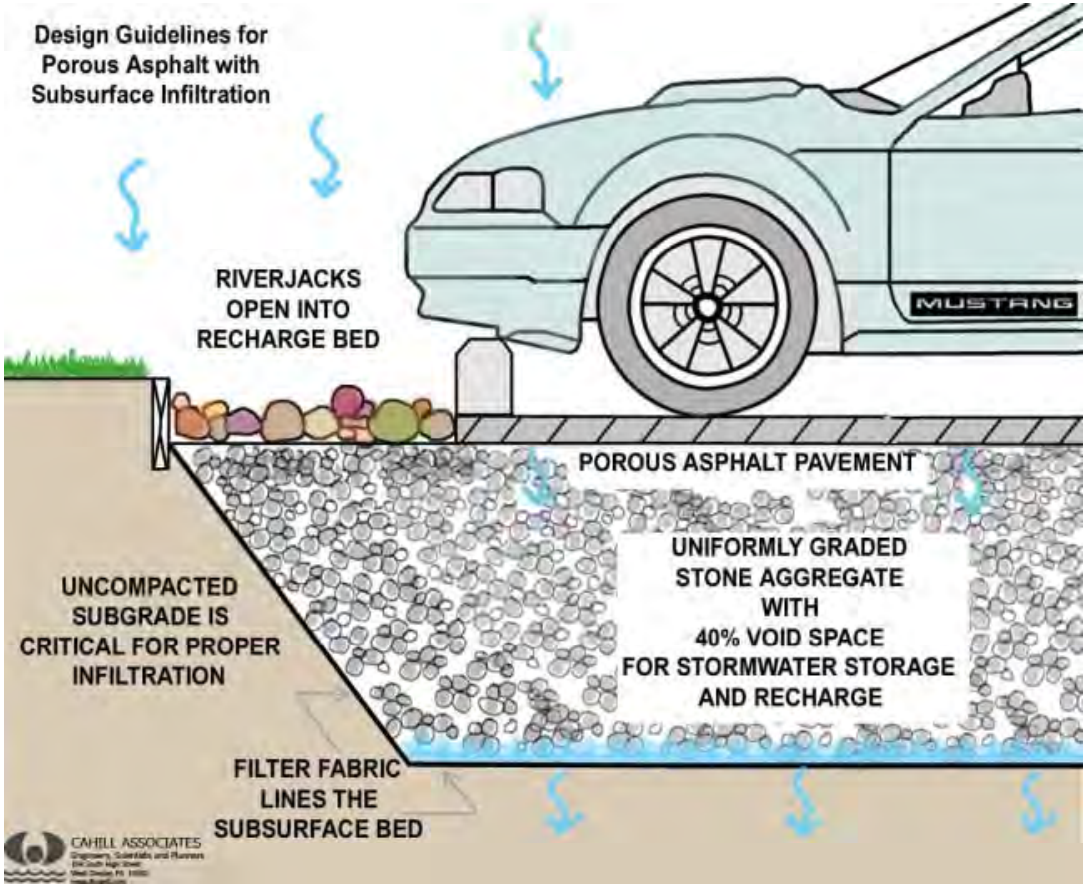


Pervious Pavements

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



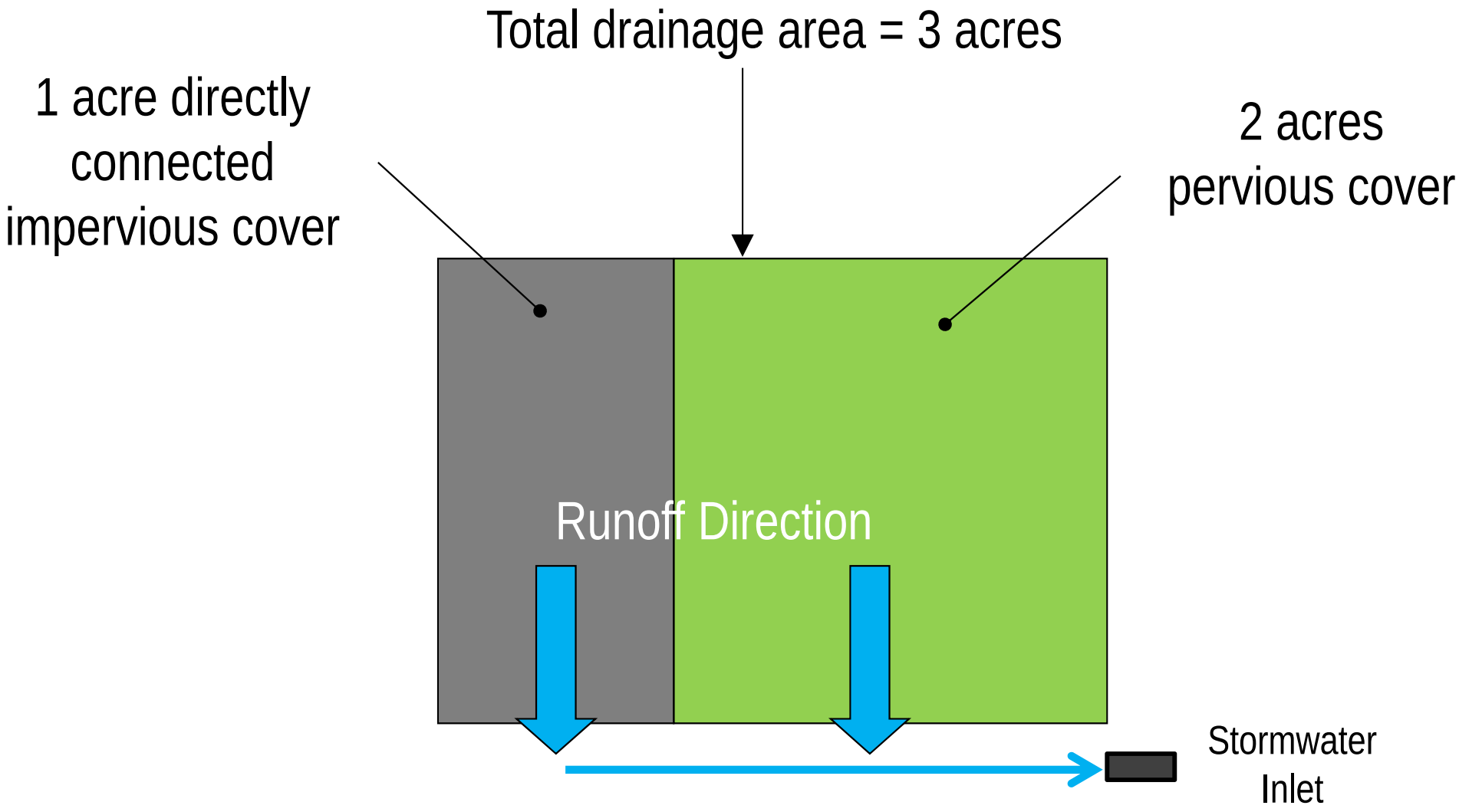
Pervious Pavement

Pervious Pavements

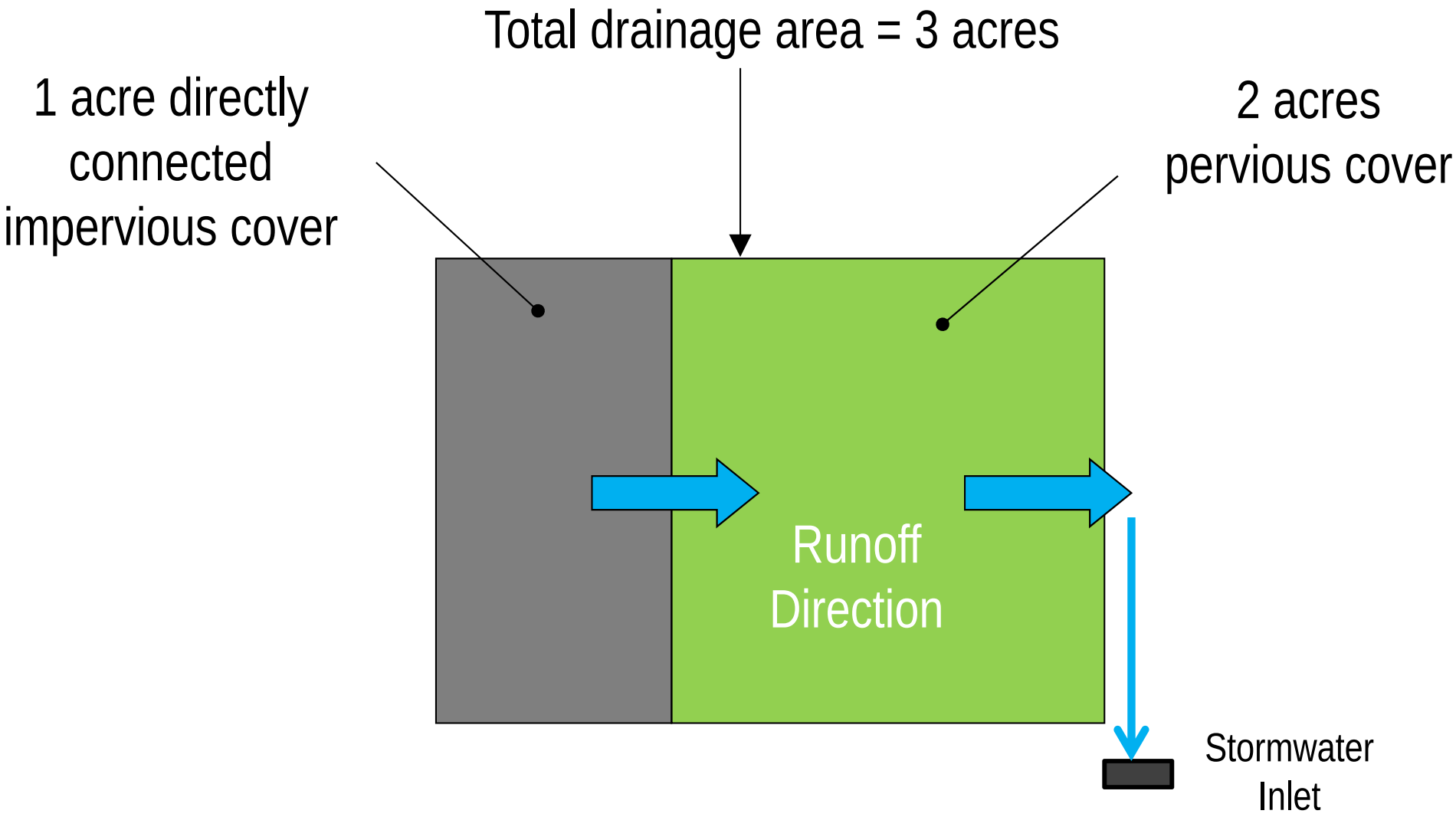
Disconnect It!

RUTGERS

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

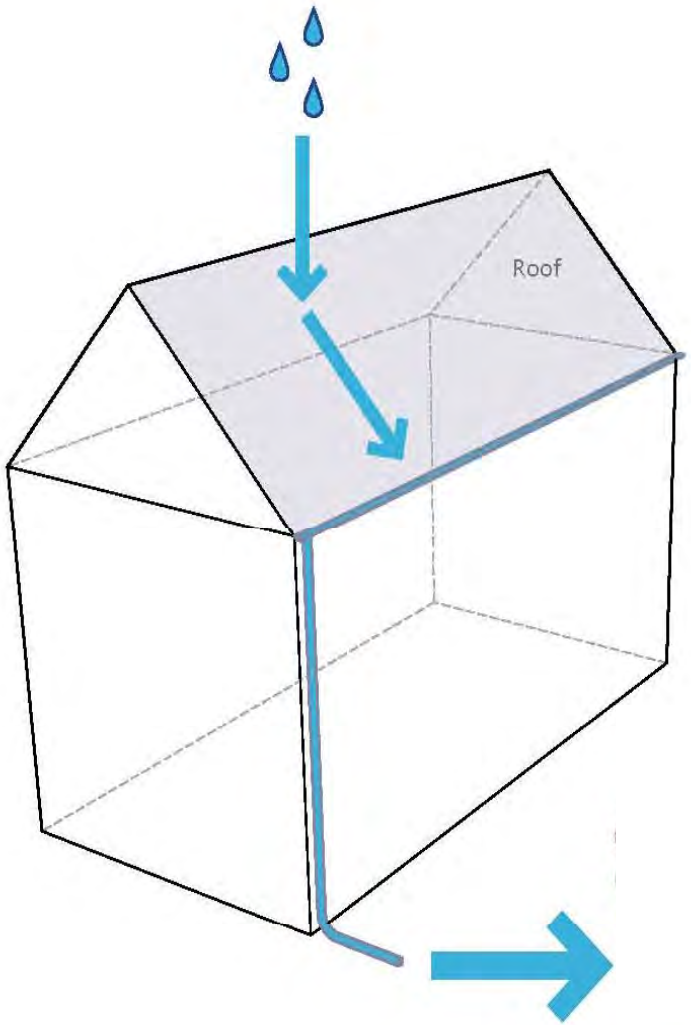


For 1.25 inch storm, 581 cubic feet of runoff = **4,360 gallons**



	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

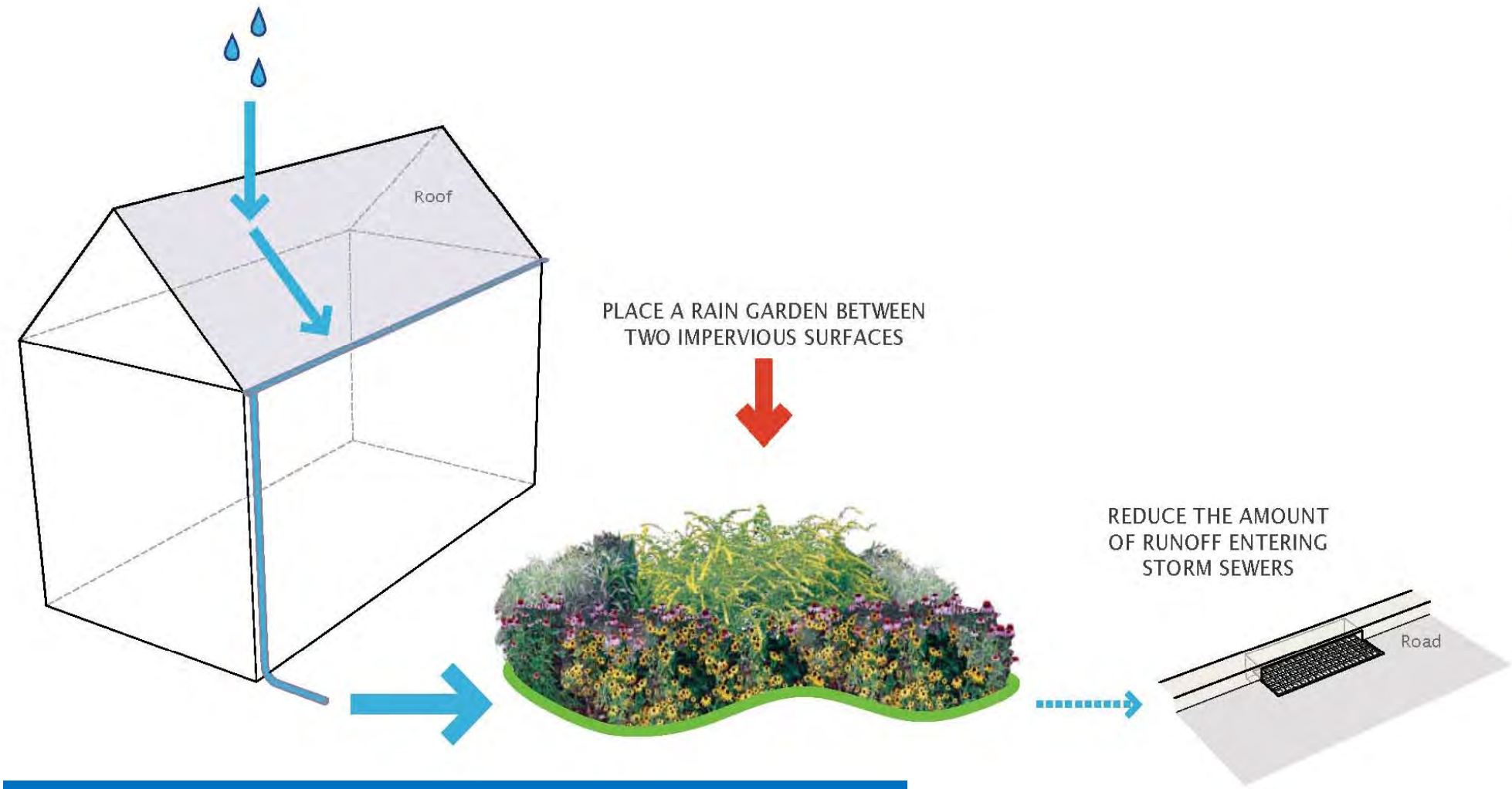
REDUCE THE AMOUNT OF RUNOFF ENTERING STORM SEWERS

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

Green Infrastructure is ...

…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 includes:

Green Roofs

Rainwater Harvesting

Planter Boxes

Rain Gardens

Permeable Pavements

Vegetated Swales

Natural Retention Basins

Trees & Urban Forestry

Brownfield Redevelopment


Natural Retention Basins


Rain Gardens


Green Roofs


Permeable Pavements


Rainwater Harvesting

Rainwater Harvesting

FUNCTIONS

- Collecting, filtering and storing water from roof tops, paved and unpaved areas for multiple uses.
- Harvested water can be used for nonpotable or potable purposes after testing and treatment.
- Surplus water after usage can be used for recharging ground water.
- Systems can range in size from a simple PVC tank or cistern to a contractor designed and built tank/sump with water treatment facilities.


overflow pipe
roof
washer
system

Rainwater Harvesting

Samuel Mickle School Rainwater Harvesting System

Green Roofs

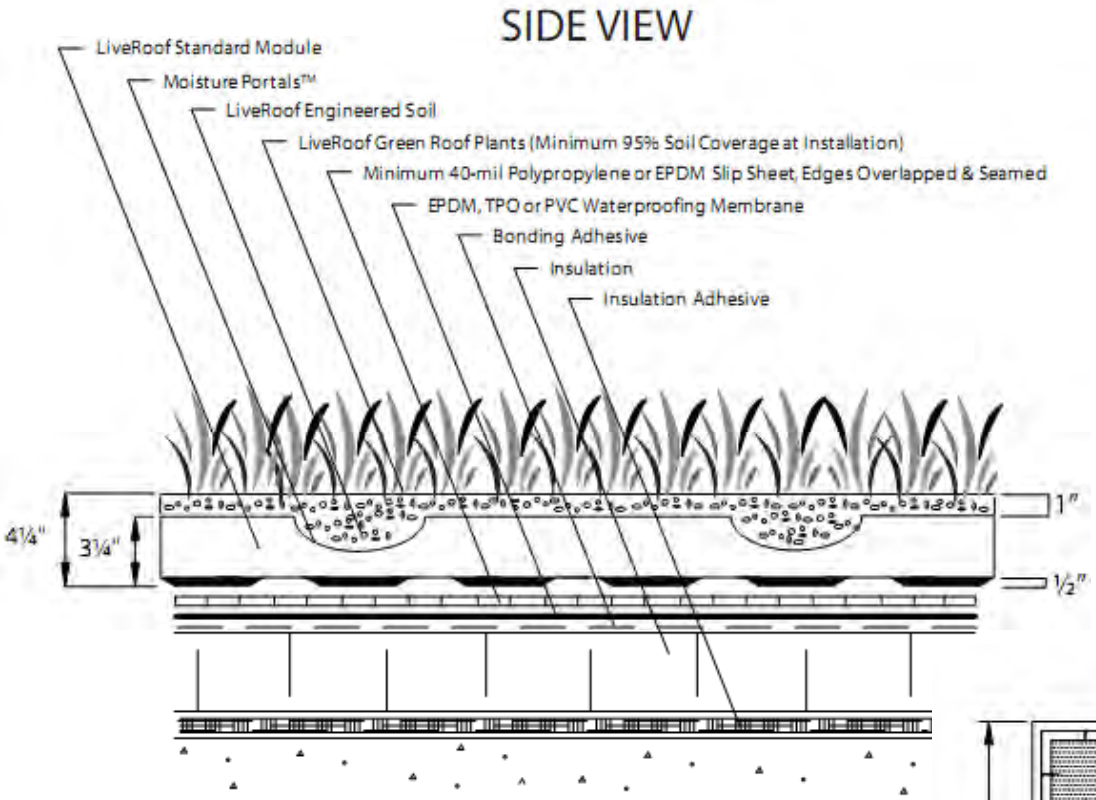
FUNCTIONS

- Improves stormwater management
- Improves air quality
- Temperature regulation (moderation of Urban Heat Island Effect)
- Carbon dioxide/oxygen exchange
- Increased urban wildlife habitat

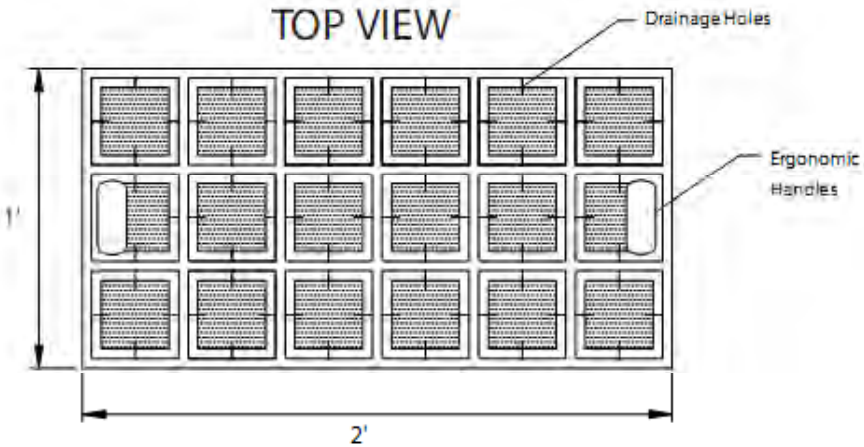
COMPONENTS

Green Roof Design

Modular System Specifications:

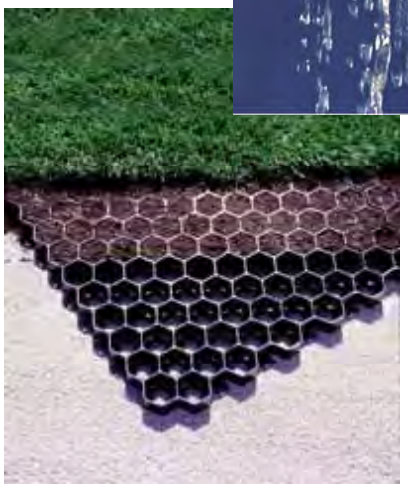


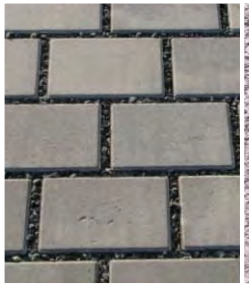

Parker Urban Greenscapes.



Pervious Pavements

- Underlying stone reservoir that temporarily stores surface runoff before infiltrating into the subsoil
- Porous asphalt and pervious concrete are manufactured without "fine" materials, and incorporate void spaces to allow infiltration
- Grass pavers are concrete interlocking blocks or synthetic fibrous grid systems with open areas designed to allow grass to grow within the void areas
- Ideal application for porous pavement is to treat a low traffic or overflow parking area



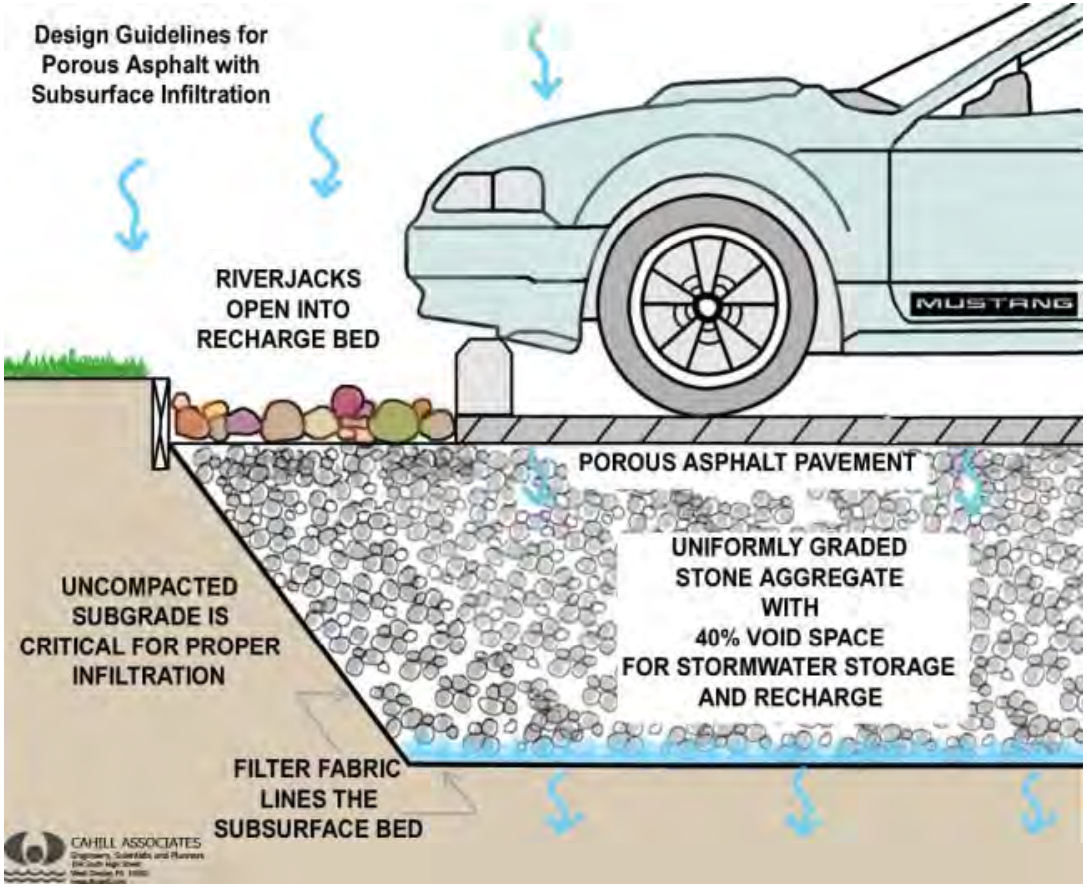


Pervious Pavements

FUNCTIONS

- Manage stormwater runoff
- Minimize site disturbance
- Possibility of 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



Pervious Pavement

Pervious Pavements

Bioretention Systems & Rain Gardens

Traditional Approach

Design Dry Detention Basin:

- Treat Water Quality Storm (1.25” rain over 24 hours)
- Detain for 18 hours (residential) or 36 hours (commercial)
- Minimum outflow orifice = three inches
- Use Concrete Low Flow Channels to Minimize Erosion

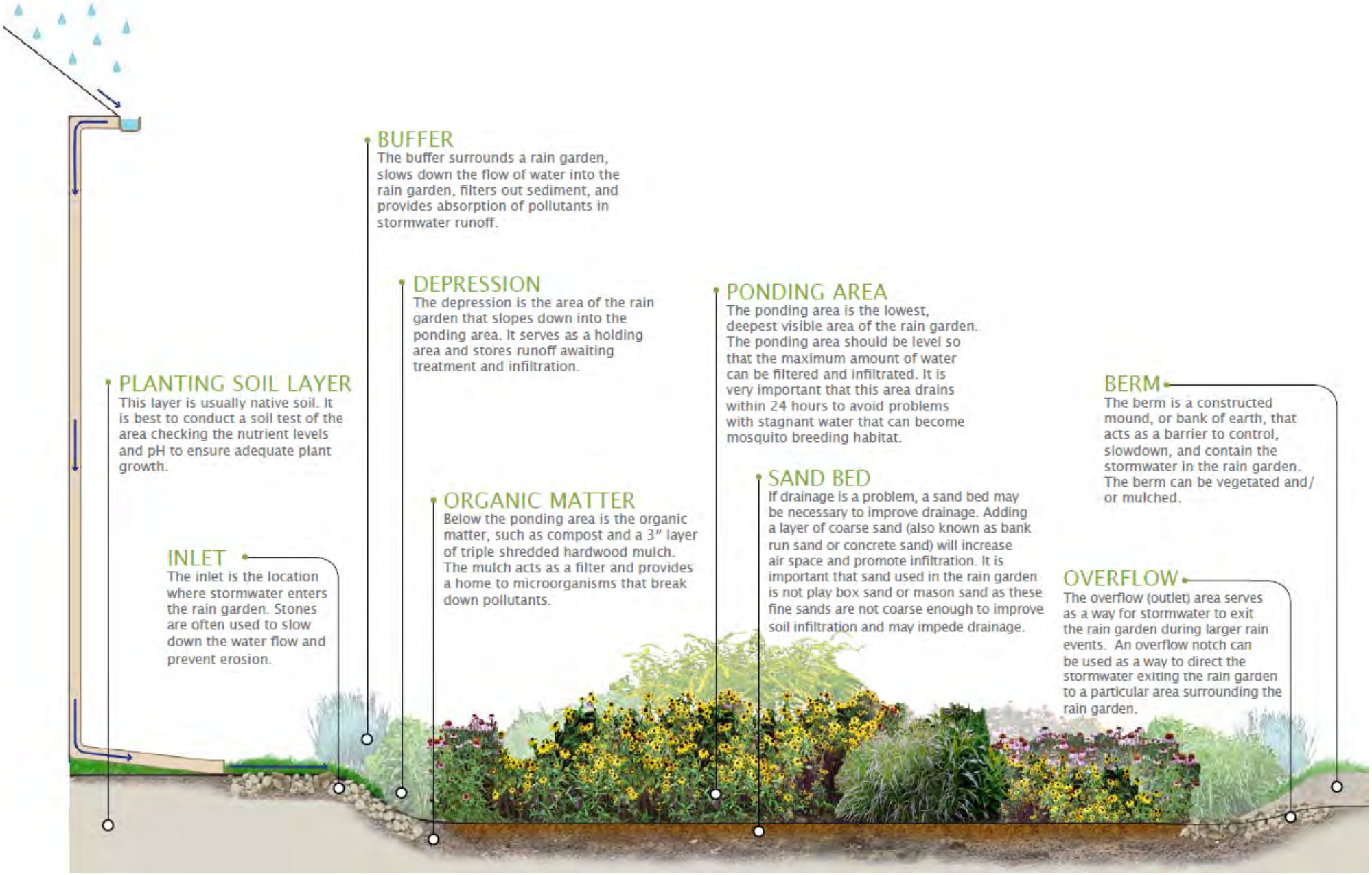
New Approach

- Combines settling of detention basin with physical filtering and absorption processes
- Provides very high pollutant removal efficiencies
- More aesthetically pleasing than conventional detention basins
- Can be incorporated into the landscapes of individual homes

Bioretention Systems & Rain Gardens

NJDEP. 2004. NJ Stormwater BMP Manual.

Bioretention Systems & Rain Gardens



Curb Extensions/Green Streets

Curb extension with a planted swale that captures stormwater from the gutter: Portland, OR (Credit: Abby Hall)

BREAK

Let’s go outside!

It is all about controlling runoff from impervious surfaces

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?

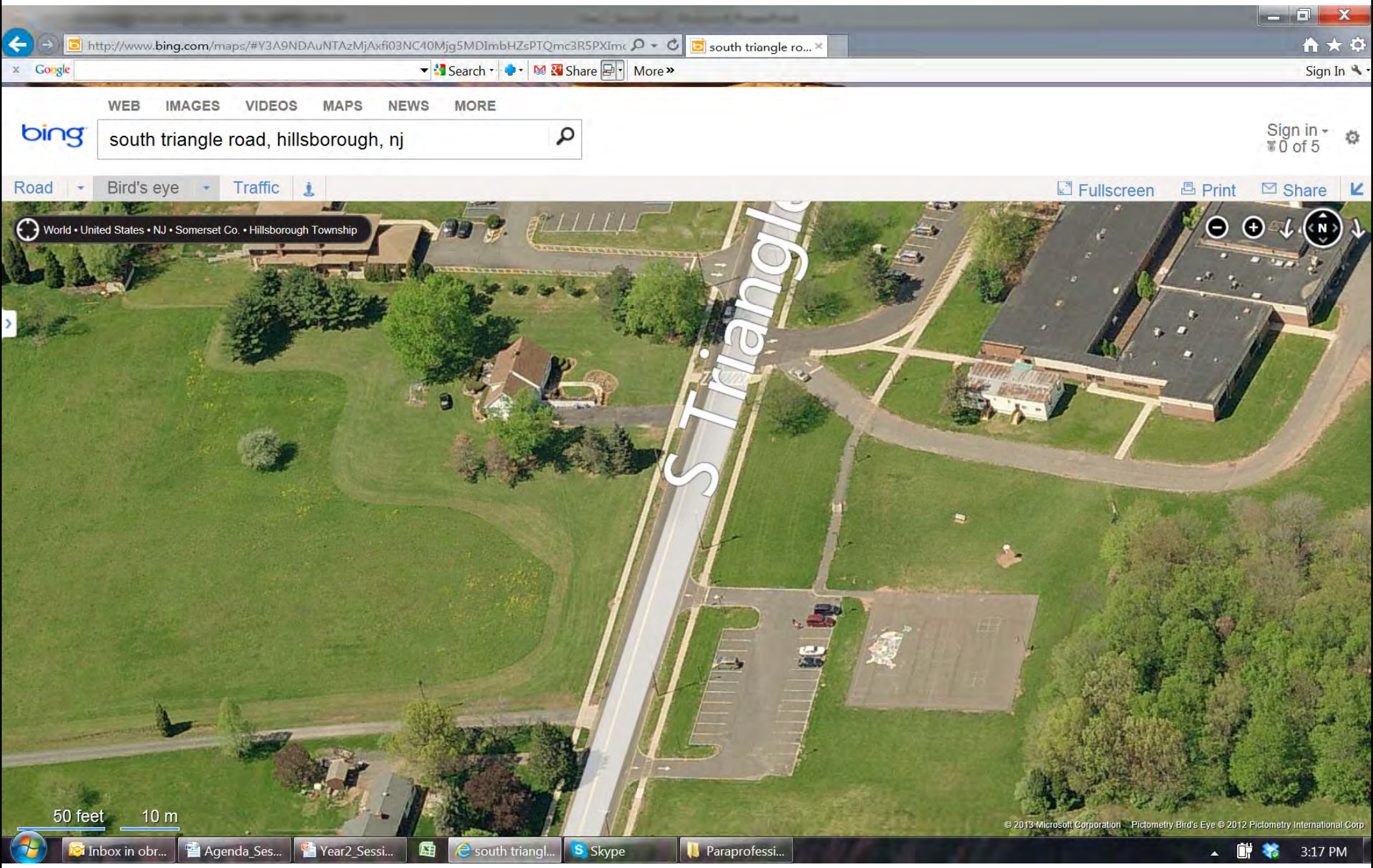
Are there conveyance systems that can be converted to bioswales?

Paraprofessionals

Here is what you’re gonna do!

Desktop Analysis


Triangle Rd
Simonson Ln
Everett Close
Hill Rd
Triangle Rd
Baker Close
Yates Dr
Cardinal Ln
Farm Rd
R1
R2
R3
R4
R5
Cardinal Ln
Triangle Rd
Cooper Pl
Aspen Dr
Coronet Rd
Crestwood Ave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south triangle ro...
Google
Search
Share
More
Sign In
WEB
IMAGES
VIDEOS
MAPS
NEWS
MORE
bing
south triangle road, hillsborough, nj
Sign in
0 of 5
Road
Bird's eye
Traffic
Fullscreen
Print
Share
World • United States • NJ • Somerset Co. • Hillsborough Township
S Triangle
50 feet
10 m
© 2013 Microsoft Corporation
Pictometry Bird's Eye © 2012 Pictometry International Corp
Inbox in obr...
Agenda_Ses...
Year2_Sessi...
south triangl...
Skype
Paraprofessi...
3:17 PM

Site Visits

Site Visit Checklist

- ❑ Organized route with directions
- ❑ Camera!
- ❑ Measurement tools – tape measure comes in handy!
- ❑ Aerials
- ❑ Notes pages
- ❑ Contact information for Site Owner
- ❑ List of constraints to refer to
- ❑ A friend to go with

Site Photos:

Stormwater Best Management Practice Opportunities

Royce Brook Watershed - Hillsborough Township

Project Identifier	Geographic Coordinates	
R5 - Parking Lot Next to Triangle School	N40° 58' 46.26"	W074° 2' 38.76"

Site Description and BMP Implementation Opportunities: This site is the overflow parking lot and paved playground lot for Triangle Elementary School on South Triangle Road. The site is adjacent to Royce Brook. The parking lot flows to a single catch basin at the south end of the parking lot, which dumps directly into the Royce Brook. The parking lot is in fair condition. The paved playground lot does not have any catch basins but rather flows onto the grassed area adjacent to the lot and ultimately into the stream. The paved playground lot is in fair condition. The flow from the parking lot can be diverted to a bioretention system bypassing the existing catch basin. There is ample area for the bioretention system. The design and construction of this bioretention basin or rain garden can be incorporated into the fourth grade science curriculum at the elementary school. The paved playground lot could be converted to pervious asphalt and serve as an outstanding demonstration project for the watershed.

Document Recommendations

Royce Brook Watershed Restoration and Protection Plan
BMP Information Sheet

Project ID: R5 - Parking Lot Next to Triangle School	
Location: South Triangle Road at Triangle Elementary School	Municipality: Hillsborough Subwatershed: Royce Brook
BMP Description: Bioretention System/Rain Garden and Educational Program	Targeted Pollutants: Total nitrogen (TN), total phosphorus (TP), and total suspended solids (TSS) in surface runoff

Existing Conditions and Issues:

This site is the overflow parking lot for Triangle Elementary School on South Triangle Road. The site is adjacent to Royce Brook. The parking lot flows to a single catch basin at the south end of the parking lot, which dumps directly into the Royce Brook. The parking lot surface is in fair condition. The pollutants that accumulate in the parking lot are directly discharged to Royce Brook during storm events with no level of treatment. Additionally, the stormwater runoff is quickly discharged to the stream, contributing to the stream's flashy hydrology, which cause bank erosion, downcutting, and localized flooding.

Proposed Solution(s):

The flow from the parking lot (12,000 square feet in size) can be diverted to a bioretention system or rain garden bypassing the existing catch basin. There is ample area for the rain garden, which would be approximately 2,400 square feet in size with a depth of six to eight inches. The design and construction of this bioretention basin or rain garden can be incorporated into the fourth grade science curriculum at the elementary school. The RCE Water Resources Program has a Stormwater Management in Your School Yard program that could be incorporated into the 4th grade curriculum. The students could gain knowledge and increase their awareness of issues associated with stormwater runoff while building a BMP on the school grounds that actually helps address some of the problems.

Anticipated Benefits:

The rain garden would be designed to capture, treat and infiltrate the water quality design storm (1.25 inches of rain over two hours). Since 90% of the annual rainfall in New Jersey comes in storms events less than water quality design storm, the rain garden would remove 90% of the TN, TP, and TSS on an annual basis. Pathogens and Bacteria such as E. coli and Fecal Coliform will be reduced by up to 90% as well. A rain garden would also provide ancillary benefits, such as enhanced wildlife habitat and aesthetic appeal to surrounding property owners. The Triangle Elementary School is located at the proposed site. Rutgers Cooperative Extension Water Resources Program could present the *Stormwater Management in Your School Yard* curriculum to students and then include them in the rain garden design and planting efforts as an augmentation to the in-class lessons. It can also be used as a demo project to launch educational programming for Hillsborough Department of Public Works staff.

Possible Funding Sources:

319(h) grants from the New Jersey Department of Environmental Protection
Soil Conservation District of Somerset-Union Counties
Hillsborough Township
Sustainable Jersey
Triangle School Home and School Association

Partners/Stakeholders:

Rutgers Cooperative Extension
Stony Brook-Millstone Watershed Association

Royce Brook Watershed Restoration and Protection Plan
BMP Information Sheet

Estimated Cost:

Task	Task Description			Estimated Cost
1	Complete topographic survey and soils test			$500
2	Prepare final design			$1,000
3	Activities for BMP installation	Unit Cost	Quantity	
	Plant materials	$0.50/sq.ft.	2,400	$1,200
	Soil amendments (course sand)	$35/cu.yd.	10	$350
	Mulch	$25/cu.yd.	20	$500
	Installation (assume volunteer-based effort)	$25.22/hr*	30 people 4 hr/person	$3,027 (no charge)
	Supervision of volunteers	$1,000	1	$1,000
	Educational Programs (Schools and DPW)	$2,000		$2,000
	Contingency (10%)	-	-	$655
		Total Estimated Project Cost		**$7,205**

*Based on New Jersey State Value for Volunteer Time as reported by the Corporation for National and Community Service

Quantify Load Reductions of Proposed BMPs?

- Based upon land use of your site, determine pollutant loads from site and amount of runoff.
- Based upon ability of recommended BMP to reduce pollutants, determine amount of pollutant load to be reduced by recommended BMPs.
- Put it in an easy to read table – DEP likes that.

Table 3-1: Pollutant Loads by Land Cover

Land Cover	TP load (lbs/acre/yr)	TN load (lbs/acre/yr)	TSS load (lbs/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/Transitional Area	0.5	5	60

Table 4-1: TSS Removal Rates for BMPs

Best Management Practice (BMP)	Adopted TSS Removal Rate (%)
Bioretention System	90
Constructed Stormwater Wetland	90
Dry Well	Volume Reduction Only[1]
Extended Detention Basin	40 to 60[2]
Infiltration Structure	80
Manufactured Treatment Device	See N.J.A.C. 7:8-5.7(d)[3]
Pervious Paving System	Volume Reduction Or 80[4]
Sand Filter	80
Vegetative Filter	60-80
Wet Pond	50-90[5]

[1] See text below.
[2] Final rate based upon detention time. See Chapter 9.
[3] To be determined through testing on a case-by-case basis. See text below.
[4] If system includes a runoff storage bed that functions as an infiltration basin. See Chapt
[5] Final rate based upon pool volume and detention time. See Chapter 9.

Table 4.2 – Typical Phosphorous and Nitrogen Removal Rates for BMPs

Best Management Practice (BMP)	Total Phosphorous Removal Rate (%)	Total Nitrogen Removal Rate (%)
Bioretention Basin	60	30
Constructed Stormwater Wetland	50	30
Extended Detention Basin	20	20
Infiltration Basin	60	50
Manufactured Treatment Devices	See N.J.A.C. 7:8-5.7(d)	See N.J.A.C. 7:8-5.7(d)
Pervious Paving[2]	60	50
Sand Filter	50	35
Vegetative Filter	30	30
Wet Pond	50	30

Pollutant Load Reductions for Royce Brook Project

Site	Area (acres)	Aerial Loads			Loads			Reductions in Loads		
		TP (lbs/ac/yr)	TN (lbs/ac/yr)	TSS (lbs/ac/yr)	TP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)	TP (lbs/yr)	TN (lbs/yr)	TSS (lbs/yr)
R5	**0.28**	**2.1**	**22**	**200**	**0.59**	**6.21**	**56.4**	**0.53**	**5.59**	**50.8**

Stormwater Treated and Infiltrated by BMP:

12,300 square feet * 44 inches * ft/12in * 0.90 = 40,590 cu.ft.

40,590 cu.ft. * 7.48 gallons per cubic foot = 303,613 gallons

Picture is worth 1,000 words

Triangle Elementary School Parking lot Stormwater Management Practice

Bioenvironmental Engineering Design

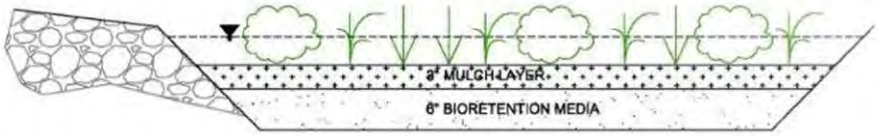
Luxin Li

Project location

A rain garden can be built on the green space, and we can cut the curb near the drainage inlet to lead rain water to the rain garden. One overflow stone weir can be built near the river side Therefore, overflows from rain garden can flows to river.

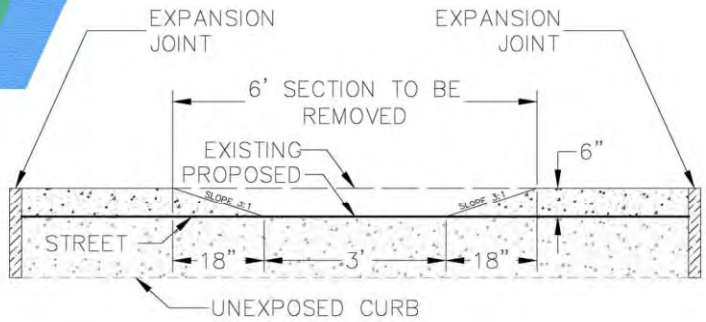
SITE PHOTO

1



RAIN GARDEN (TYP.)
NTS

2



4
DET

CURB CUT DETAIL
1:1

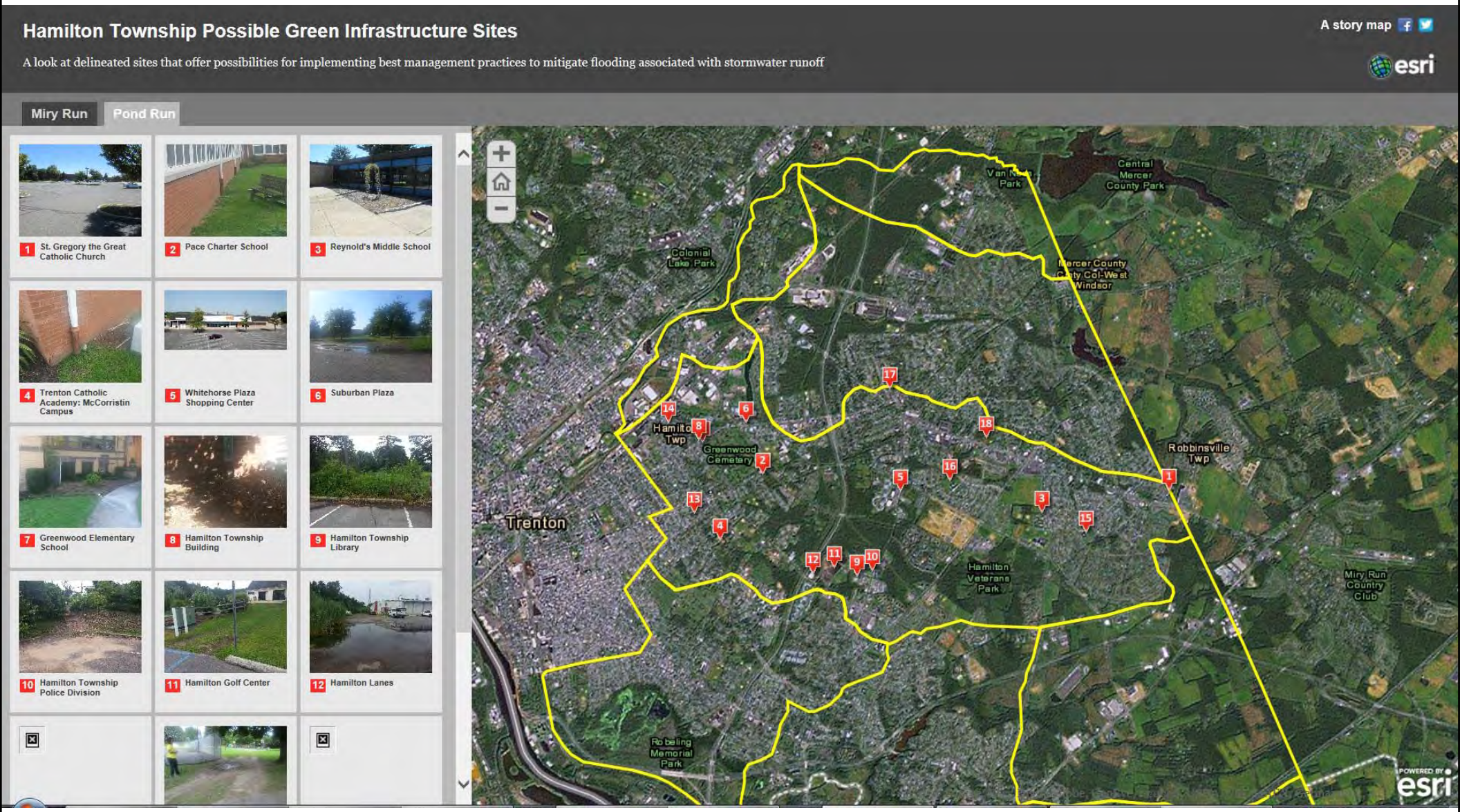
How this can be used to develop plans?

- Develop an Impervious Cover Reduction Action Plan
- Develop a Watershed Restoration Plan

How the plans can be used to implement projects?

- Implementing community projects
- Developing local ordinances
- Identification of mitigation for new development and redevelopment

Stormwater Mitigation Plan Online Tool



Greenwood Elementary School

2069 Greenwood Avenue

Area (sq. ft.): 83,374 ; Block: 1884; Lot: 1

Impervious Cover (sq. ft.): 75, 121 ; Percent Impervious: 90%; Total Runoff from Impervious Surfaces for the 1.25" Quality Storm (gal): 58,536

Total Phosphorus Loads (lbs/yr): 4; Total Nitrogen Loads (lbs/yr): 42; Total Suspended Solids Loads (lbs/yr): 383

Recharge Potential:____; Total Suspended Solids Removal Potential:_____; Stormwater Peak Reduction Potential: _____

Suitable for: Bioretention (with underdrain system), Bioretention (infiltration), Dry Pond, Grass Swale, Infiltration Trench, Porous Pavement, Vegetated Filter Strips

An Example

What would you design for this site?

Observations

- Lots of impervious cover
- No stormwater management
- Lots of open space for potential BMPs

Questions

- Are there downspouts?
- Are they connected?
- Is there curb along the parking lot?
- Which way is the parking lot graded?
- What is the condition of the parking lot?

Other Questions

- Do the soils around the Ag Museum infiltrate?
- Who own the property? Will they be open to installing stormwater management measures?
- Are there potential partners to help with the project?
- Do we need permits for altering this site with stormwater best management practices?
- Does the building have a basement?
- Can we lose parking spaces?
- Who will maintain the BMPs?
- Is the project a high priority?


College Farm Rd
MbuA
FavAr
NkrB
MbrA
0
123ft

	Map Unit Name	Acres in AOI	Percent of AOI
FarAr	Fallsington bedrock substratum variant loam, 0 to 2 percent slopes, rarely flooded	2.3	59.3%
MbrA	Matapeake silt loam, 0 to 2 percent slopes	0.5	13.0%
MbuA	Mattapex silt loam, 0 to 2 percent slopes	1.0	24.7%
NkrB	Nixon moderately well drained variant loam, 2 to 5 percent slopes	0.1	3.0%
	Totals for Area of Interest	3.8	100%

FavAr—Fallsington bedrock substratum variant loam, 0 to 2 percent slopes, rarely flooded

Map Unit Composition

- *Fallsington variant, bedrock substratum, rarely flooded, and similar soils:* 85 percent

Properties and qualities

- *Slope:* 0 to 2 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Poorly drained
- *Capacity of the most limiting layer to transmit water (Ksat):* Moderately low to moderately high (0.06 to 0.20 in/hr)
- *Depth to water table:* About 0 to 12 inches

Interpretive groups

- *Hydrologic Soil Group:* D

Sewage Disposal (NJ)

Map unit symbol	Rating	Rating reasons (numeric values)
FavAr	Very limited	Depth to perched zone of saturation (1.00)
		Restrictive substratum (1.00)
		Restrictive horizon (1.00)
		Not Permitted - Flooding (1.00)
		Not Permitted - Hydric Soil (1.00)
MbrA	Not limited	
MbuA	Somewhat limited	Depth to apparent zone of saturation (0.83)
NkrB	Somewhat limited	Depth to apparent zone of saturation (0.83)


Cook College Dept of
Ecology

Presenting the information

Presenting Data

1. Consider the audience
2. Make sure you have something to present!
3. Organize data in Watershed Management Plan format – even if pieces are missing
4. Create a “standard” PowerPoint.
5. Provide handout/samples
6. Take a friend/Call RCE

Consider the Audience

- Host Agency
- School kids
- NJDEP
- Environmental Commissions, Planning Boards
- Watershed Planning Advisory Committee

- What are your goals of presenting the data?
  - Assistance?
  - Marketing support?
  - Awareness?

Make sure you have something to present

Make sure you have something to present

Triangle Elementary School Parking lot
Stormwater Management Practice

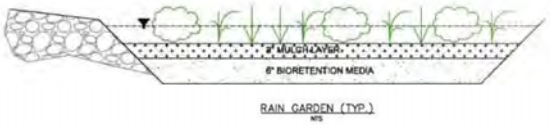
Bioenvironmental Engineering Design

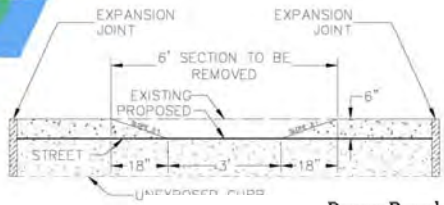
Luxin Li

Project location

A rain garden can be built on the green space, and we can cut the curb near the drainage inlet to lead rain water to the rain garden. One overflow stone weir can be built near the river side Therefore, overflows from rain garden can flows to river.

SITE PHOTO





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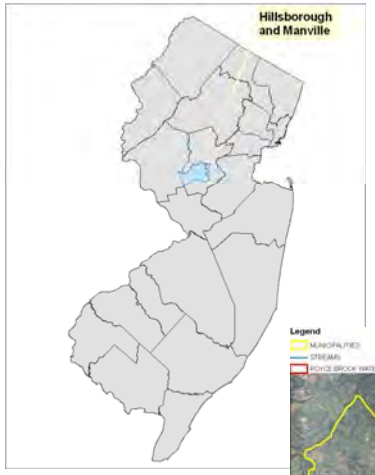
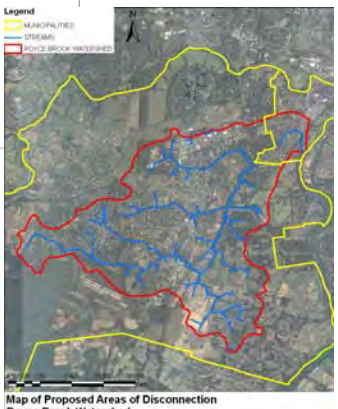




Map of Proposed Areas of Disconnection
Royce Brook Watershed
Restoration and Protection Plan

Royce Brook Watershed Restoration and Protection Plan
BMP Information Sheet

Estimated Cost:

Task	Task Description			Estimated Cost
1	Complete topographic survey and soils test			$500
2	Prepare final design			$1,000
3	Activities for BMP installation	Unit Cost	Quantity	
	Plant materials	$0.50/sq.ft.	2,400	$1,200
	Soil amendments (course sand)	$35/cu.yd.	10	$350
	Mulch	$25/cu.yd.	20	$500
	Installation (assume volunteer-based effort)	$25.22/hr*	30 people 4 hr/person	$3,027 (no charge)
	Supervision of volunteers	$1,000	1	$1,000
	Educational Programs (Schools and DPW)	$2,000		$2,000
	Contingency (10%)	-	-	$655
			Total Estimated Project Cost	**$7,205**

*Based on New Jersey State Value for Volunteer Time as reported by the Corporation for National and Community Service

RUTGERS

Organization of data

RUTGERS

Outline for Watershed Restoration and Protection Plans
January 2013

Water Resources Program

- Executive Summary/Abstract
- Introduction
  - Project Description/Background
  - TMDLs in Watershed
- Watershed Description/Characterization[1]
  - Watershed Boundary; Municipalities
  - Topography
  - Subwatersheds/HUCs
  - Hydrology (Streams; Rivers; Lakes; Ponds)
  - Land Use
  - Soils
  - Impairment Status of HUCs (from Integrated List)
- Assessment of Water Quality[1,2]

In this section be sure to provide an identification of any causes of impairment and definite/possible pollutant sources; Identify sources at subcategory level along with estimates of the extent present.

  - Historical Water Quality
  - Visual Assessment Findings & Assessment
  - Chemical Monitoring Findings
  - Biological Assessments
  - Assessment of Bacterial Findings
    - Fecal coliform; *E. coli*
- Management Measures; Targeted BMPs

A description of possible nonpoint source management measures to implement and a description of the critical areas where these will be needed/implemented. This is the section that includes the short descriptions of potential BMPs for problems identified (Paraprofessional Training Program). This section also includes the detailed information sheets and concept plans for several BMPs that are representative of the BMPs identified with the short descriptions.

- Pollutant Load Reductions[1,2]
  - Estimated Pollutant Loads Before & After Management Measures/BMPs
    - Models
    - Areal Loading Coefficients
- Plan Implementation

Provide estimates of technical and financial assistance/costs/sources and authorities needed to implement planned measures.

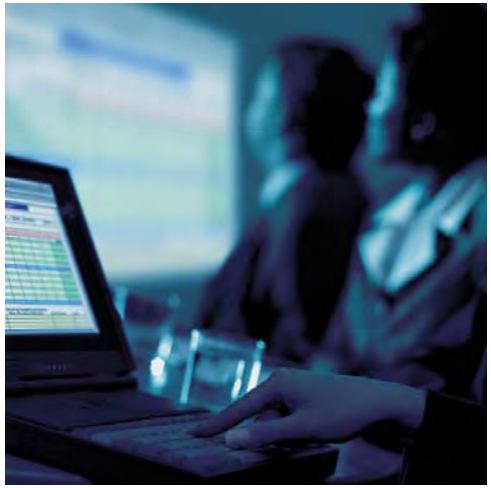
  - Implementation Schedule for Planned Management Measures
  - Interim Measurable Milestones Determining Whether Measures are Being Implemented
  - Criteria to Determine that Loading Reductions are Being Achieved
  - Education Component
  - Monitoring Component

Here is the link to the Tenakill Brook Restoration Plan: http://water.rutgers.edu/Projects/Tenakill/Tenakill_Restoration_Plan.pdf
Appendices for the Tenakill Plan:

- http://water.rutgers.edu/Projects/Tenakill/Tenakill_Restoration_Plan_AppendixA.pdf
- http://water.rutgers.edu/Projects/Tenakill/Tenakill_Restoration_Plan_AppendixB.pdf
- http://water.rutgers.edu/Projects/Tenakill/Tenakill_Restoration_Plan_AppendixC.pdf
- http://water.rutgers.edu/Projects/Tenakill/Tenakill_Restoration_Plan_AppendixD.pdf

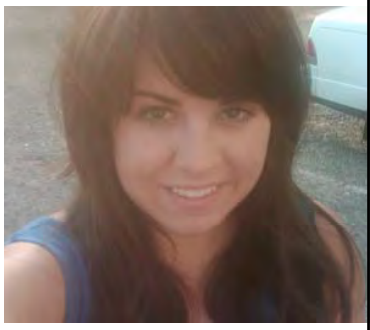
[1] Maps/tables/charts of these are to accompany text; note that maps may include more than one of these items at a time
[2] Depending on what data is available, not all sections of this outline may be included

Create a "standard" PowerPoint and handouts



Resources Available to You

Resources Available to You



- Jessica Brown (jess@envsci.rutgers.edu)

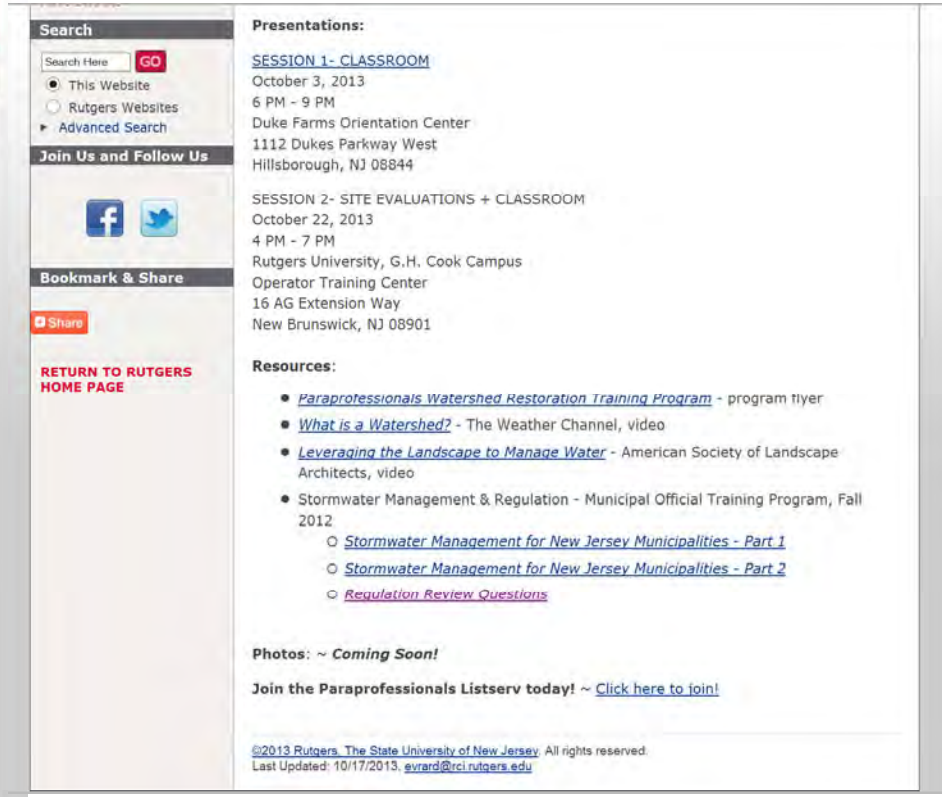
- Lisa Galloway Evrard (Evrard@rci.rutgers.edu)

- Steve Yergeau (syergeau@envsci.rutgers.edu)
- Kyle Gourley (kgourley@envsci.rutgers.edu)

http://www.water.rutgers.edu/Program_Staff/Default.htm

Resources Available to You

- http://www.water.rutgers.edu/Projects/Paraprofessionals/Paraprofessionals.html



PICK A WATERSHED OR A MUNICIPALITY


QUESTIONS?