Engaging Youth in Climate Resilience with Rain Gardens

Christopher C. Obropta, Erik Lin, Alena Brayshaw, Gillian Mulvoy, and Benny Roe

RUTGERS
New Jersey Agricultural Experiment Station

Rutgers, The State University of New Jersey
School of Environmental and Biological Sciences

Rutgers was established in 1766 and became New Jersey's Land-Grant College in 1862. In 1880 the New Jersey Agricultural Experiment Station was set up to conduct applied agricultural research for the public interest.

Rutgers Cooperative Extension

In 1917, Rutgers Cooperative Extension (RCE) was created to disseminate information for the public good with an agricultural emphasis. Over time, RCE was re-dedicated to help 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.

RCE 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.

Interesting New Jersey Facts

- New Jersey is 8,723 mi^2 (22,591 km^2)
- Population is 9.5+ million (394/km^2)
- 1,055 mi^2 (2,732 km^2) of impervious cover = 12.1%
- 25 mm of rain = 18.2 billion gallons (68 million m^3)
- 95% of NJ's rivers are impaired
- Localized flooding is problem in most communities
- Erosion and scouring of our streams

Compare NJ to Taiwan

	New Jersey	Taiwan
Size	8,723 mi^2 (22,591 km^2)	13,976 mi^2 (36,197 km^2)
Population	9.5+ million (488/km^2)	23.7+ million (657/km^2)
Impervious Cover	1,055 mi^2 (2,732 km^2) = 12.1%	a whole lot of impervious cover too
Annual Avg Rainfall	~46 inches (1,168 mm)	~102 inches (2,590 mm)
Impairment	95% of rivers are impaired	~23% of rivers are moderately/severely polluted

Problem: Stormwater Runoff

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

Main Cause of Water Resources Problems in New Jersey

Urban/Suburban Land Use
Existing Development

Rutgers Role

- Engage communities in stormwater mgt planning
- Design demonstration projects
- Implement demonstration projects
- Empower community to do more
- Conduct research on green infrastructure

- **PROMOTING BEHAVIOR CHANGE STARTING WITH THE YOUTH**

Green Stormwater Infrastructure (GSI) or Green Infrastructure (GI)

…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

Bioretention Systems

- Rain Gardens
- Bioswales
- Stormwater Planters
- Curb Extensions
- Tree Filter Boxes

Permeable Pavements

Rainwater Harvesting

- Rain Barrels
- Cisterns

Dry Wells

Rooftop Systems

- Green Roofs
- Blue Roofs








What makes a good site?

- Sites with impervious surfaces that are directly connected
- Sites with a lawn area that can be converted to accept stormwater runoff
- Sites with highly visibility – good educational opportunities
- Sites in impaired watersheds
- Sites on municipal owned land/public land
- Sites that provide partnership opportunities

Let’s Focus on the Schools

How do we identify the most appropriate green infrastructure practices for a school?

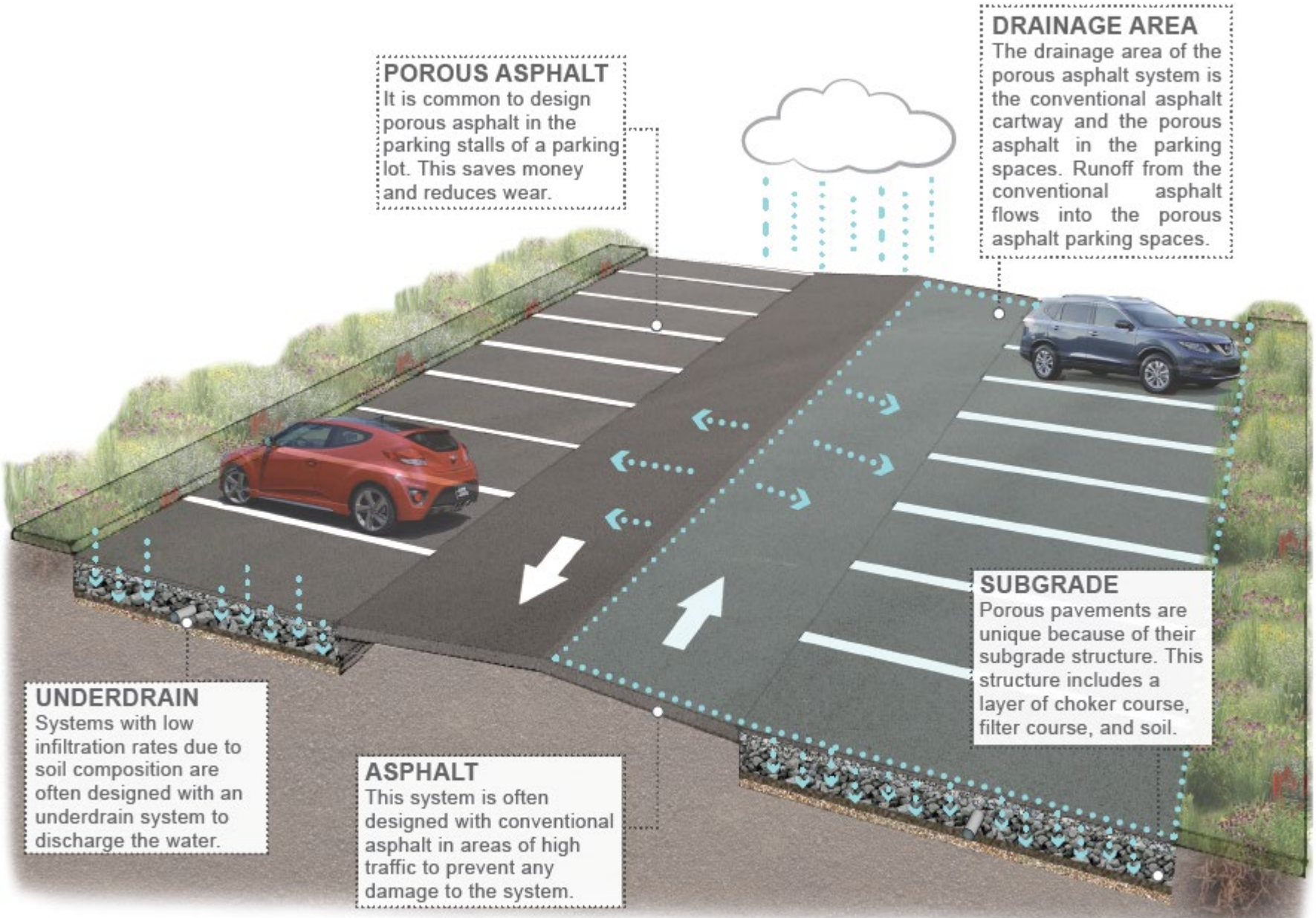
It is all about controlling runoff from impervious surfaces

Option 1: Depave

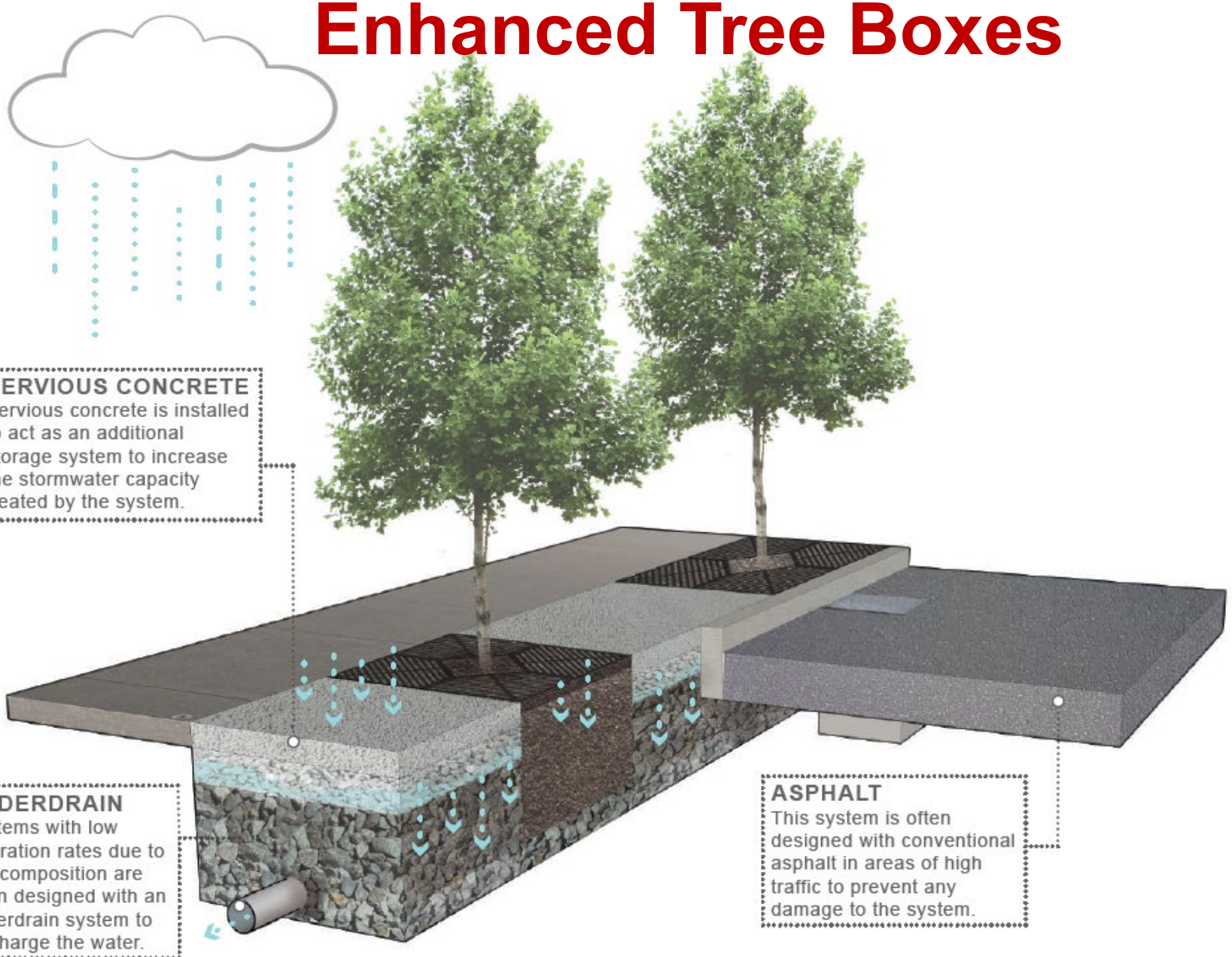





Permeable Pavement



Enhanced Tree Boxes



PERVIOUS CONCRETE
Pervious concrete is installed to act as an additional storage system to increase the stormwater capacity treated by the system.

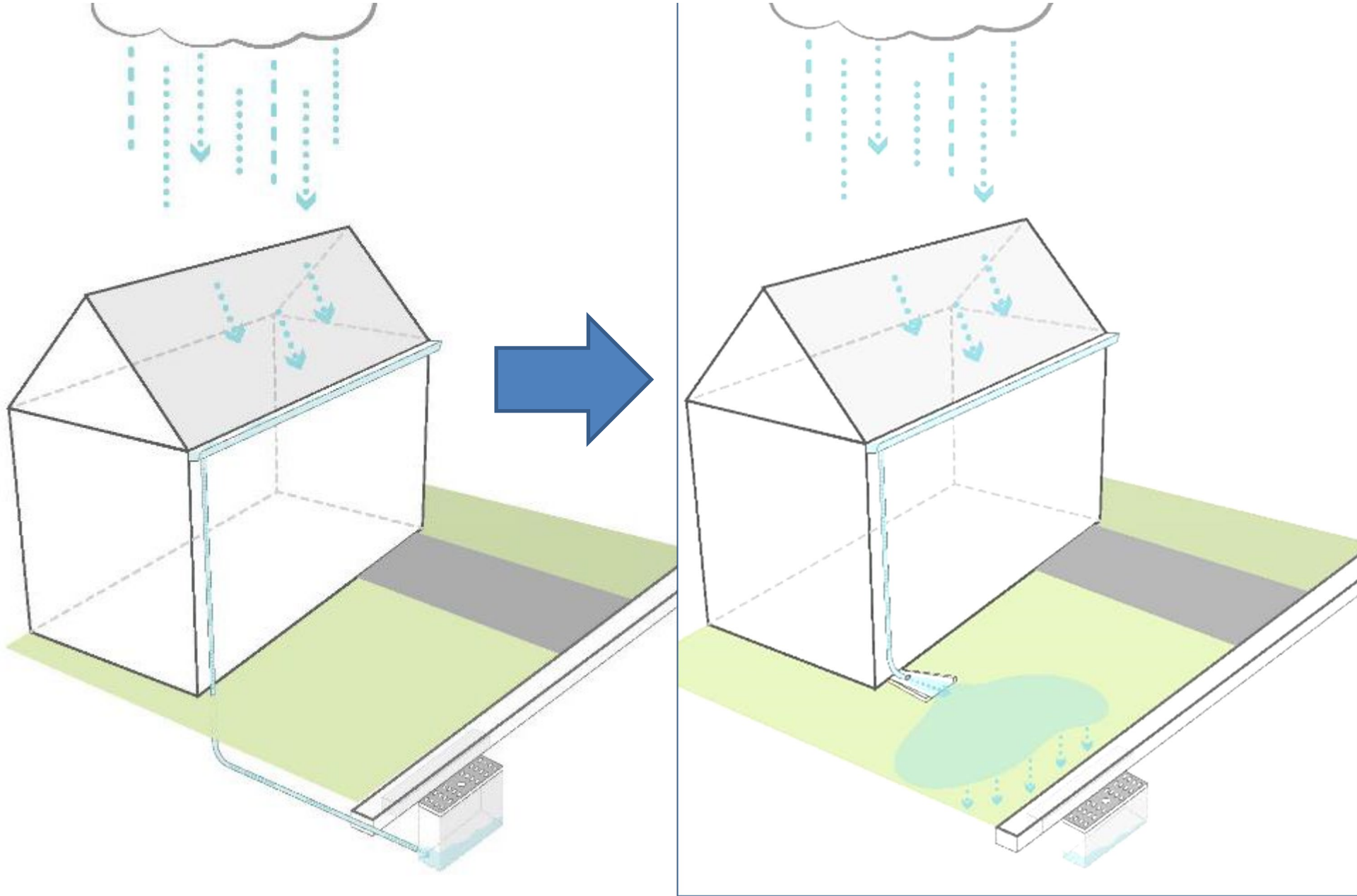
UNDERDRAIN
Systems with low infiltration rates due to soil composition are often designed with an underdrain system to discharge the water.

ASPHALT
This system is often designed with conventional asphalt in areas of high traffic to prevent any damage to the system.

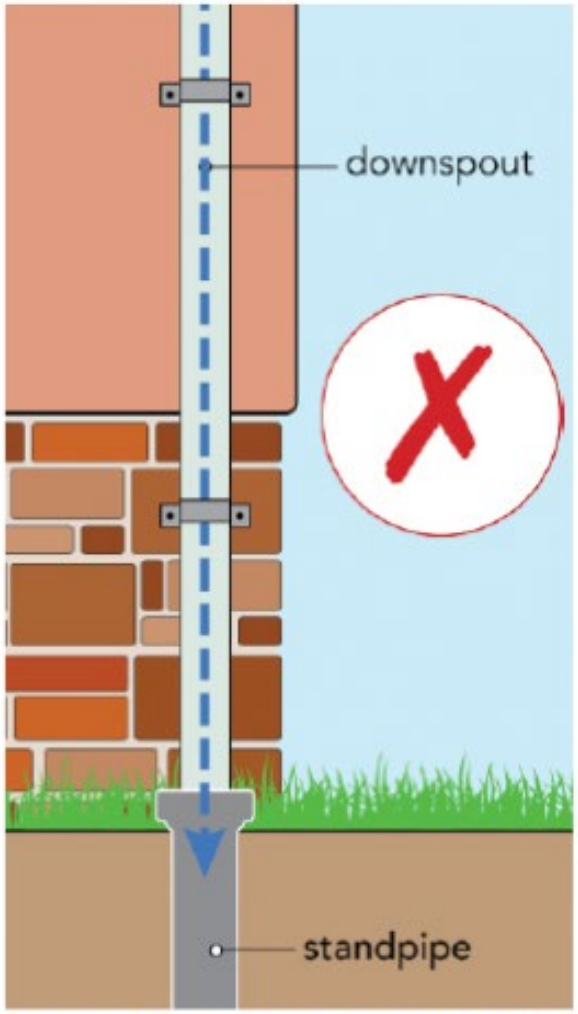

Pervious Concrete


Grass Pavers

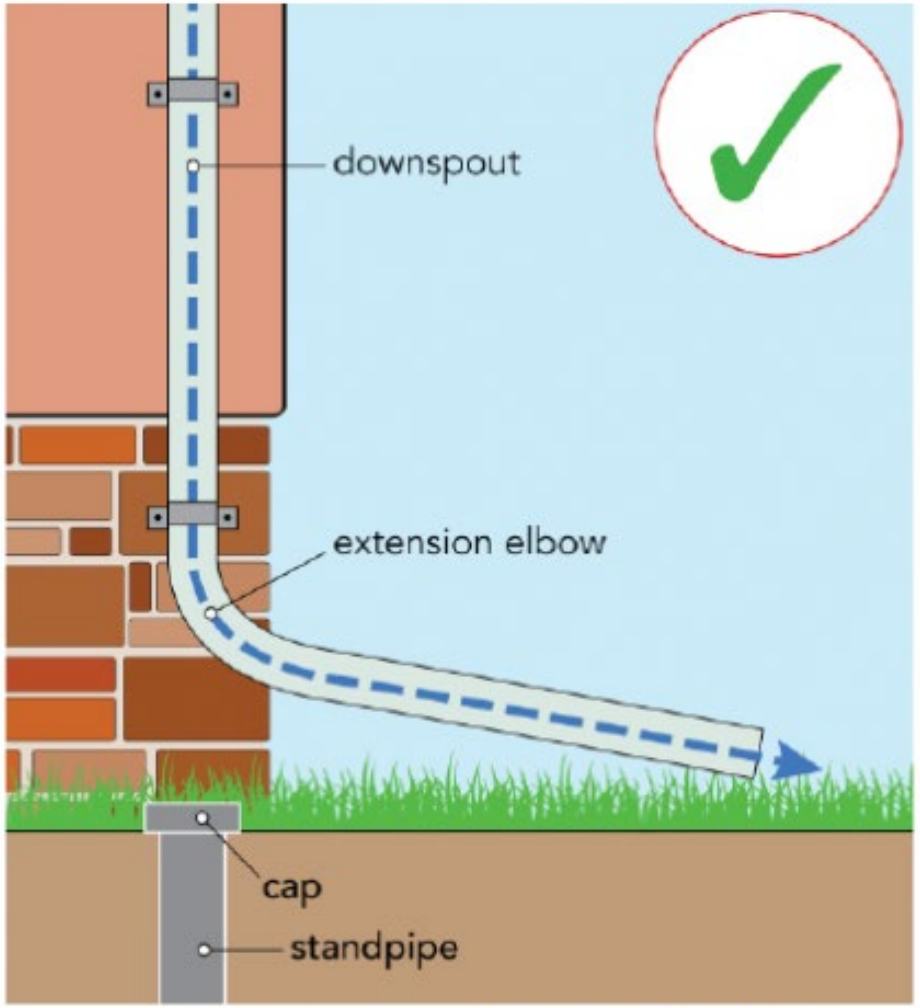
Option 2: Disconnection



Downspout Disconnection

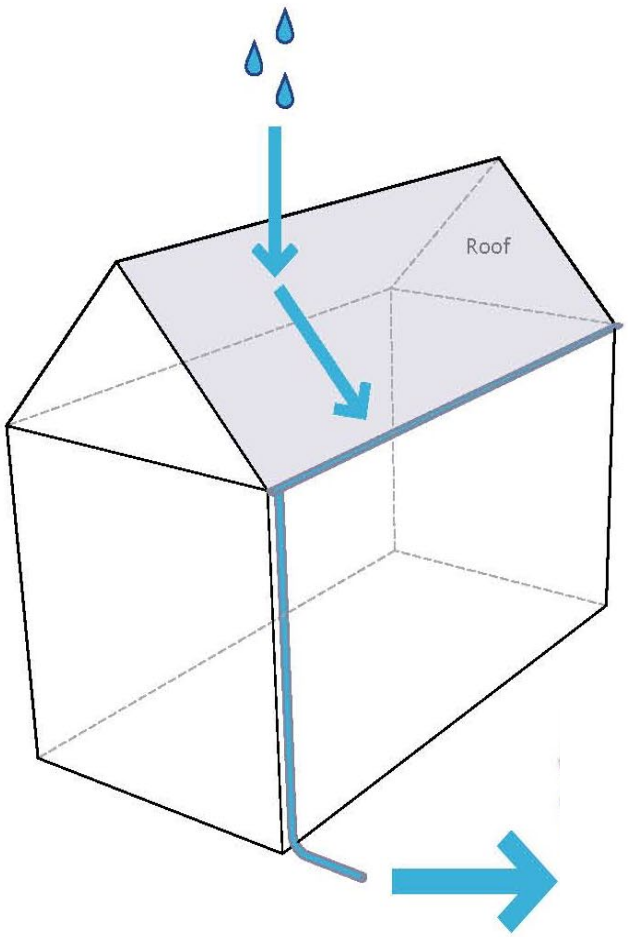


DOWNSPOUT CONNECTED TO SEWER SYSTEM



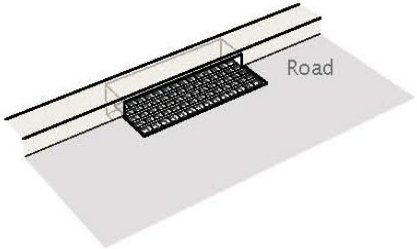
DOWNSPOUT DISCONNECTED FROM SEWER SYSTEM

Disconnect to a Rain Barrel



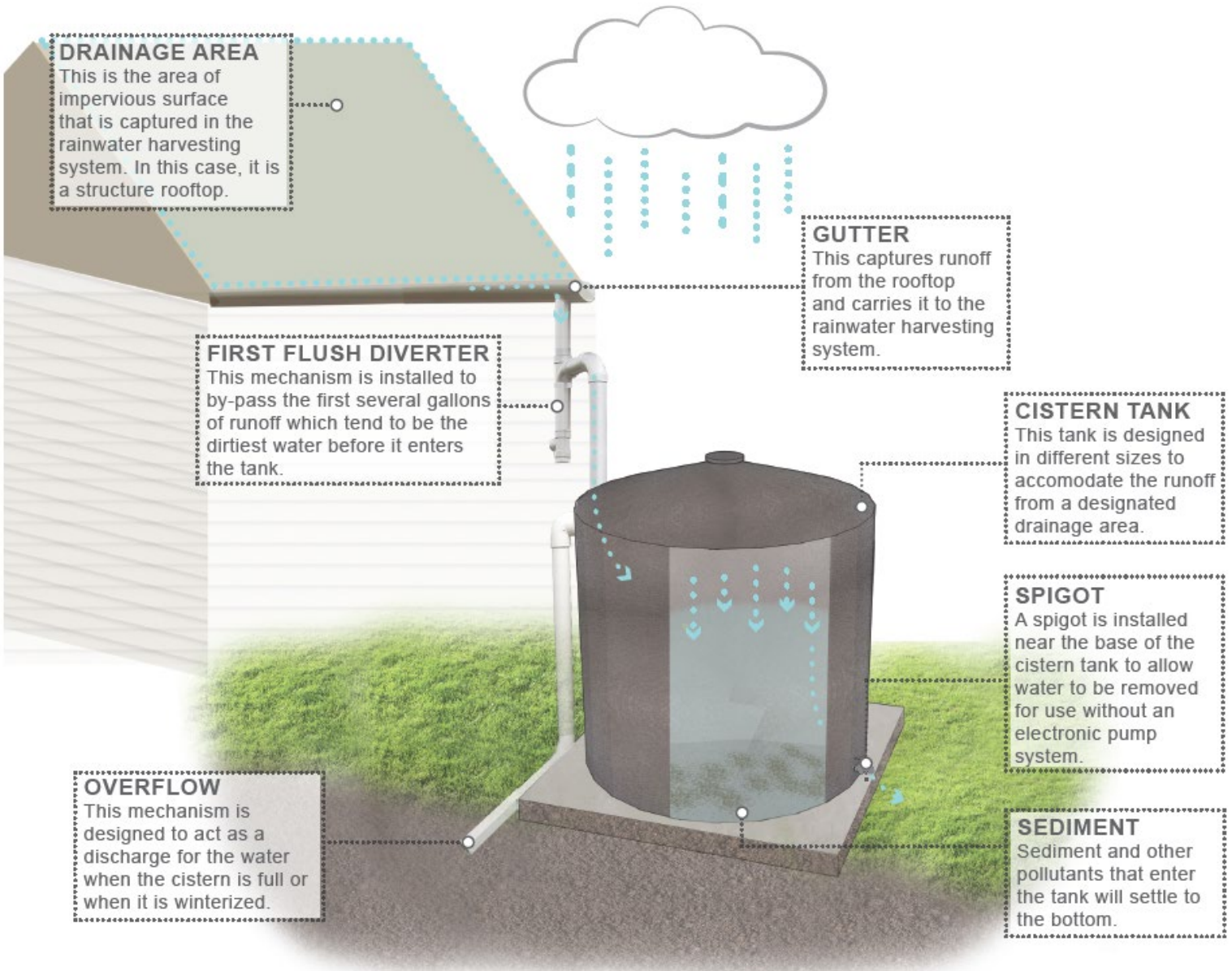
Disconnect your downspout by installing a rain barrel

REDUCE THE AMOUNT OF RUNOFF ENTERING STORM SEWERS



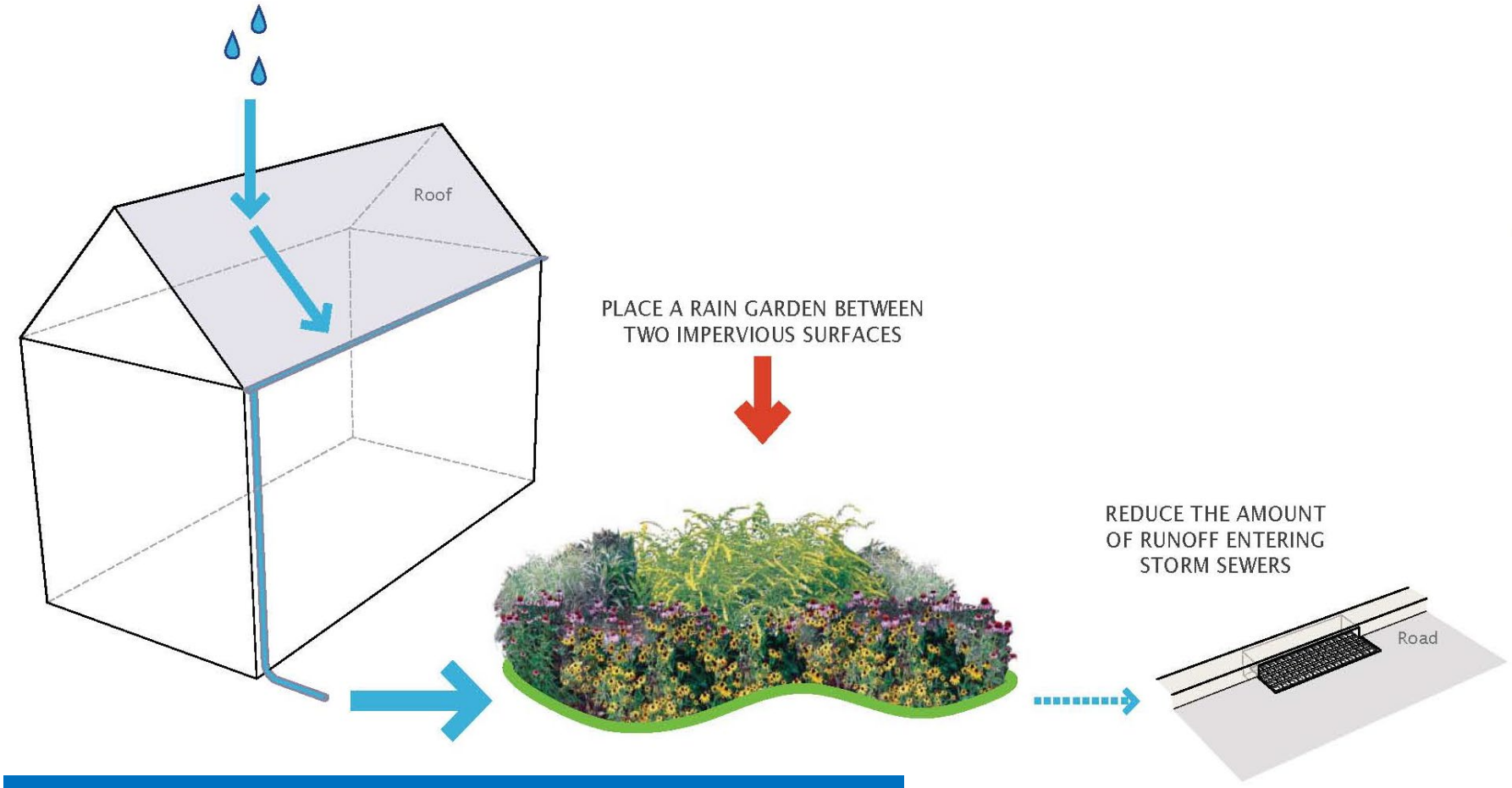
Impervious area is now ***"disconnected"*** from flowing directly into the storm sewer system

Disconnect to a Cistern



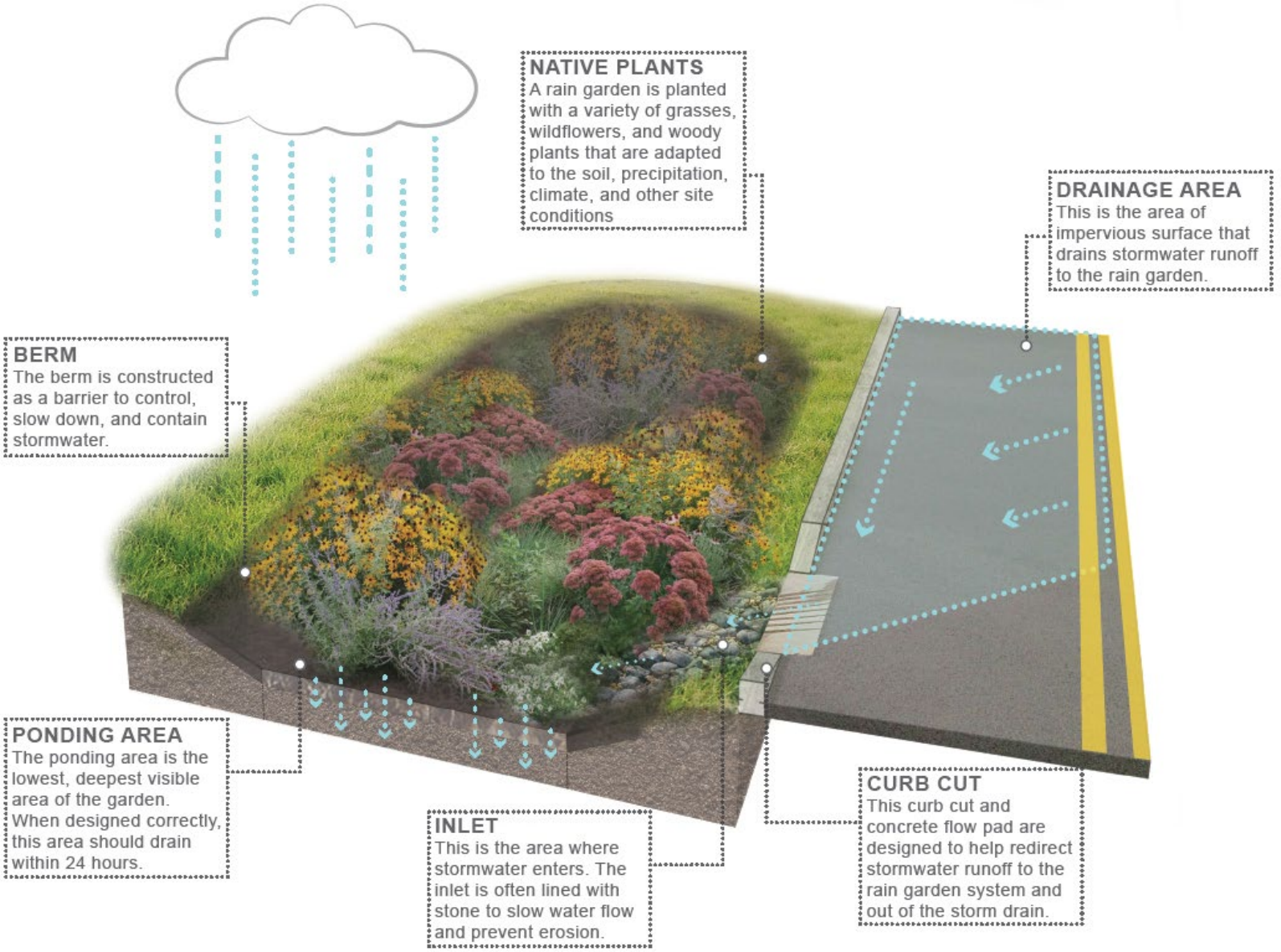
Larger Rainwater Harvesting Systems…

Disconnect to a Rain Garden



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

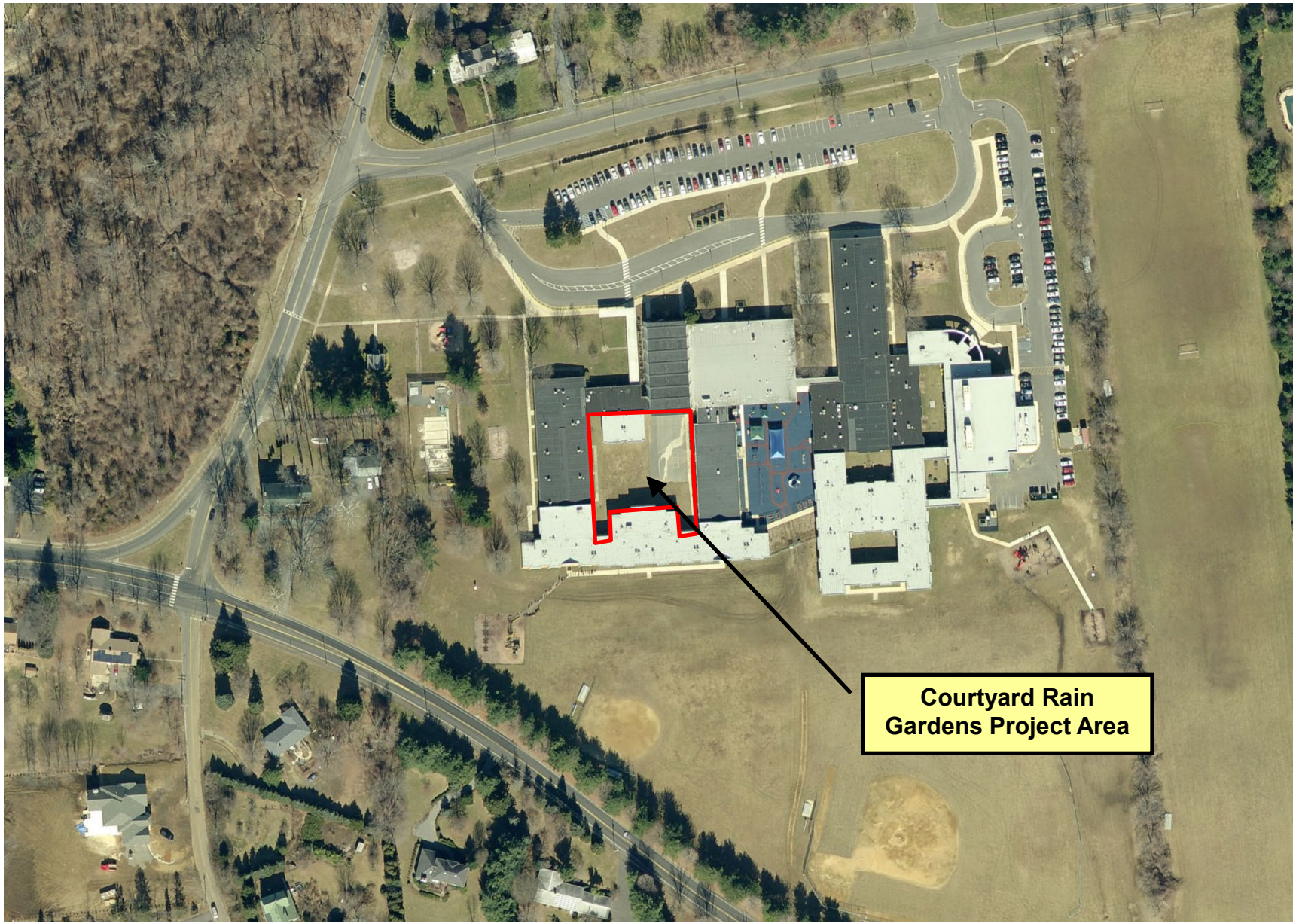
Bioretention Systems or Rain Gardens



Lots of Rain Gardens

Examples of School Projects

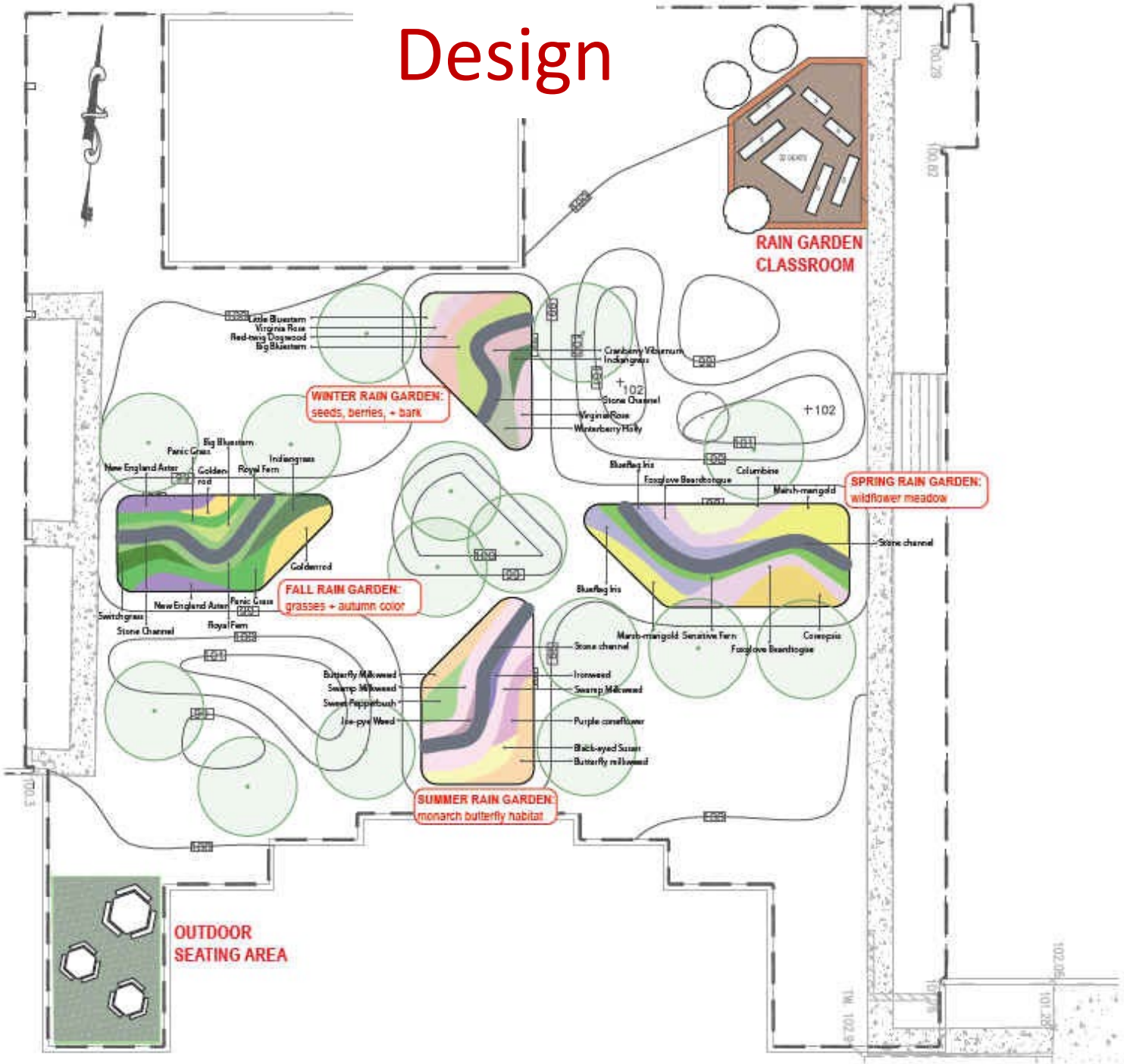
Village Elementary School - Aerial



Existing Courtyard

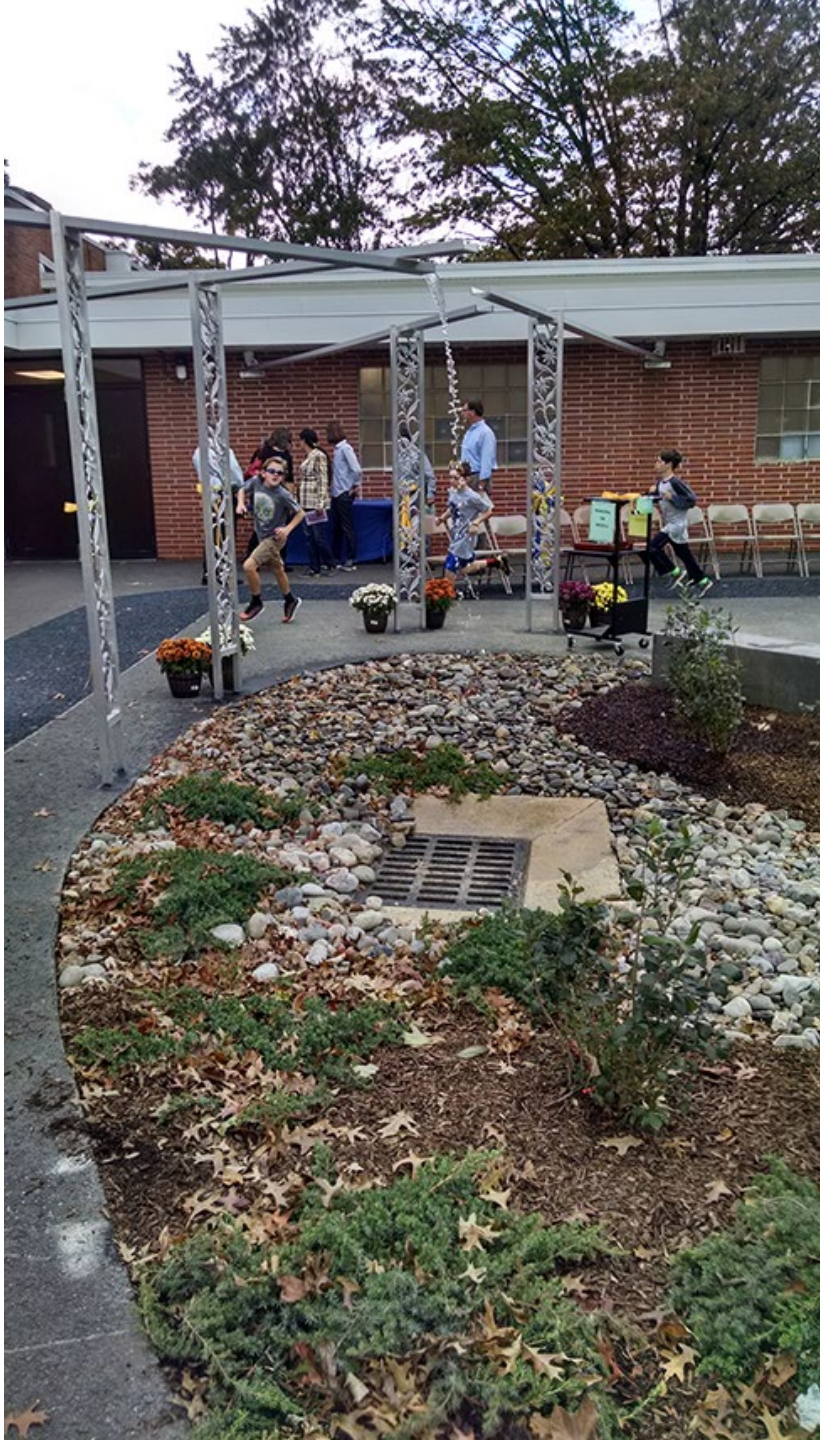
Existing Courtyard

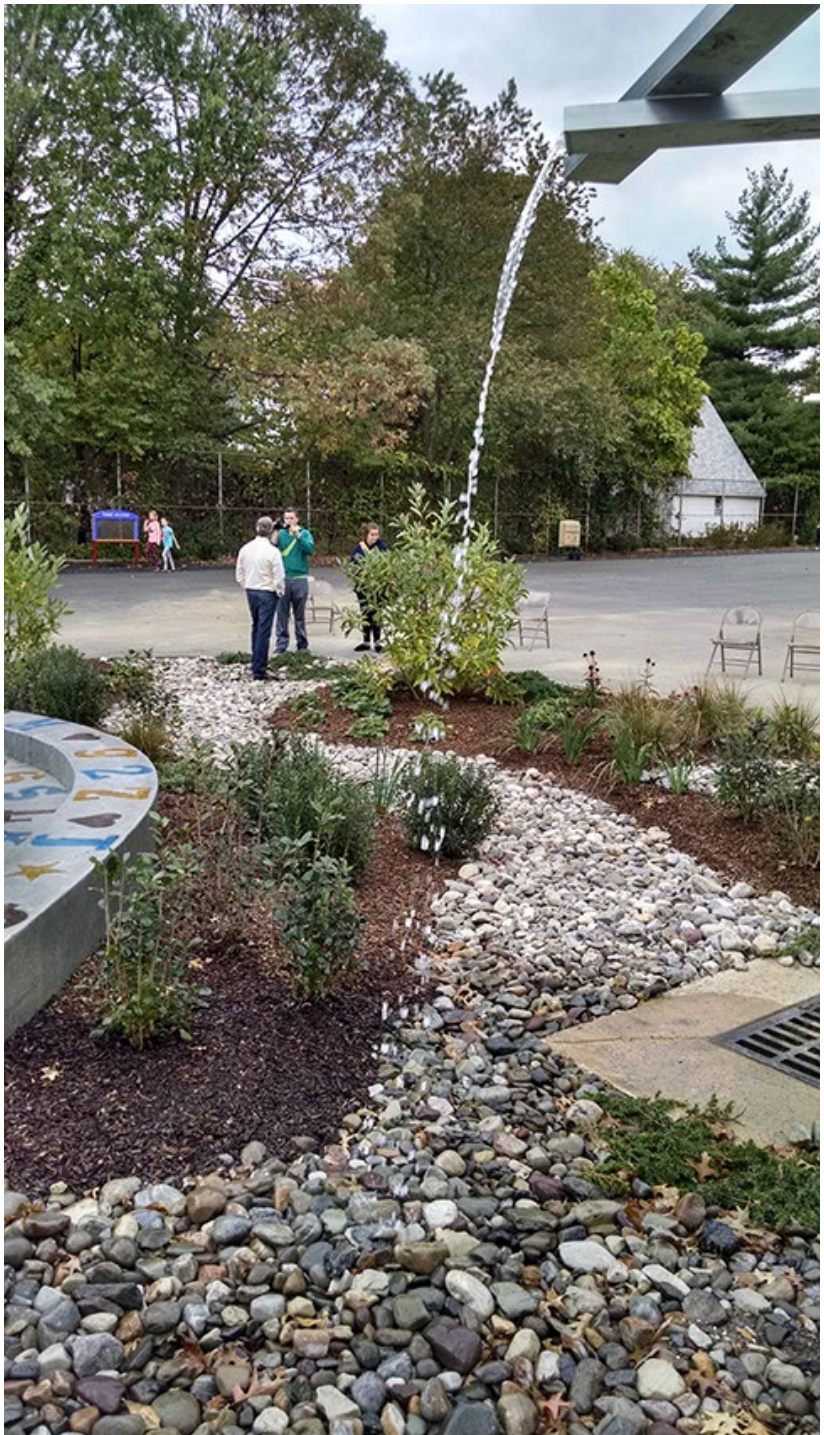
Design


RAIN GARDEN CLASSROOM
WINTER RAIN GARDEN: seeds, berries, + bark
Little Bluestem
Virginia Rose
Red-twig Dogwood
Big Bluestem
Cranberry Viburnum
Indiangrass
Stone Channel
Virginia Rose
Winterberry Holly
+102
SPRING RAIN GARDEN: wildflower meadow
Blueflag Iris
Foxglove Beardtongue
Columbine
Marsh-marigold
Stone channel
FALL RAIN GARDEN: grasses + autumn color
Big Bluestem
Panic Grass
New England Aster
Golden-rod
Royal Fern
Indiangrass
Goldenrod
Switchgrass
Stone Channel
SUMMER RAIN GARDEN: monarch butterfly habitat
Butterfly Milkweed
Swamp Milkweed
Sweet Pepperbush
Joe-pye Weed
Ironweed
Swamp Milkweed
Purple coneflower
Black-eyed Susan
Butterfly milkweed
Marsh-marigold
Sensitive Fern
Coreopsis
OUTDOOR SEATING AREA


BRAVO, Livingstone Mouse!
It's Pumpkin Time!
Very Scary
BUS
Move!
BIG RED TUB
LIBRARY MOUSE
A Place Called KINDERGARTEN

Zane North Elementary






Rain Garden
Water Quality and Wildlife Habitat
Enhancement Project
This garden is designed to capture, treat, and infiltrate stormwater at the source before it becomes runoff. It helps prevent nonpoint source pollutants from entering nearby waterways. The plants are native to the region and attract wildlife.
Rain gardens are beautiful, low-maintenance, and inexpensive gardens that you can install at home.
www.water.rutgers.edu
RUTGERS

Next Steps

- Install monitoring equipment at three schools
- Link real-time monitoring to website dashboard
- Engage the students to interact with each other
- Symposium to share results


QUESTIONS?