



Applying knowledge to improve water quality

**New York - New Jersey
Puerto Rico - Virgin Islands**

Regional Water Coordination Program

A Partnership of USDA CSREES
& Land Grant Colleges and Universities

“Rain Gardens: Stormwater Management in your Backyard”

*A Regional Project that
Integrates Research, Education and Extension*

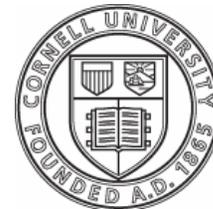


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An Extension/Education Program

- Started as an advanced Master Gardener's course for New Jersey
- Kicked off an Environmental Steward Program in NJ
- The foundation for Community-Project-Based Learning
- Provided a new home for watershed volunteers
- A tool to address nonpoint source pollution
 - In-class Lectures
 - In-kind Service (Hands On Experience)

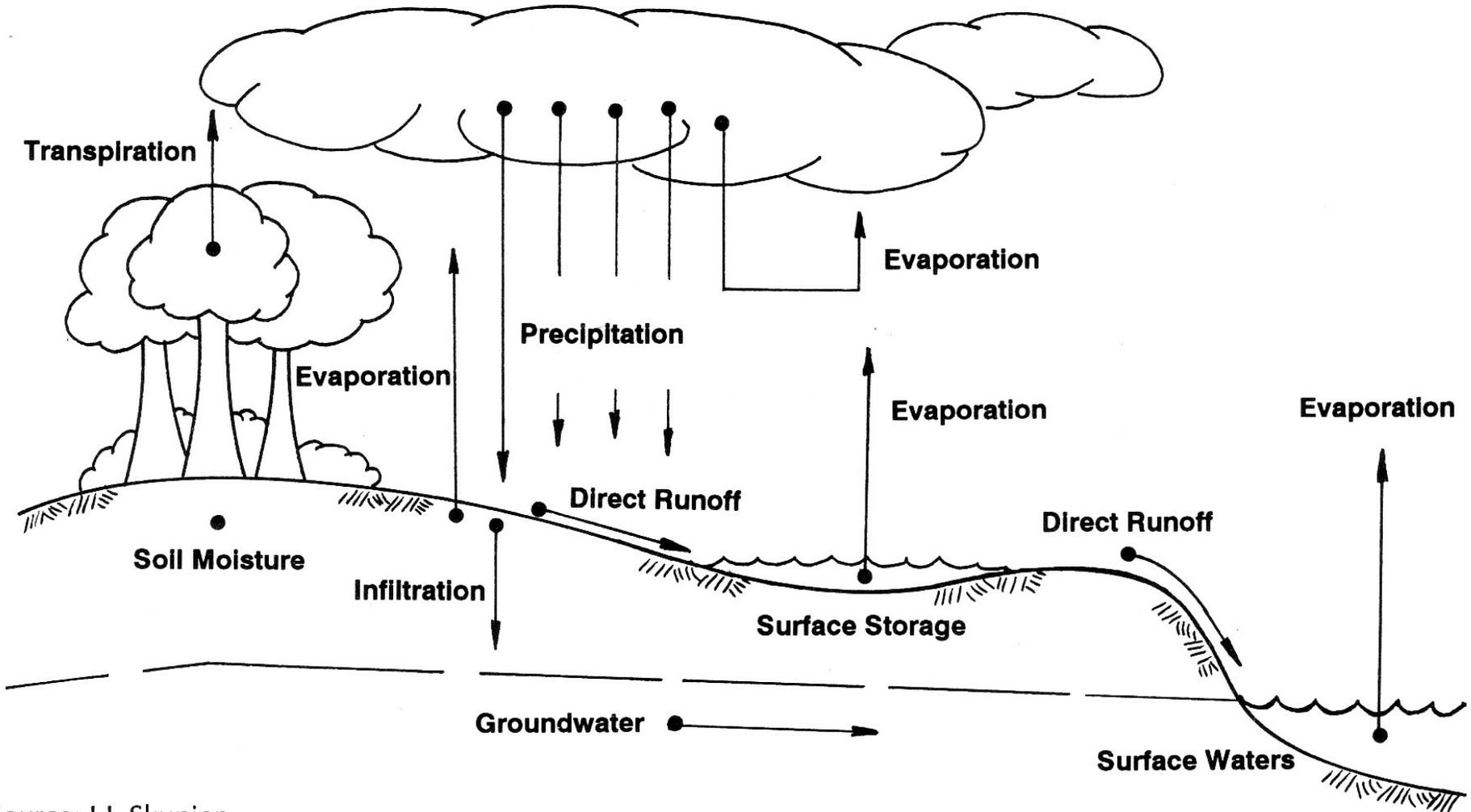
Four In-Class Lectures

1. Stormwater Runoff – Processes and Impacts,
2. The Basics of Stormwater Best Management Practices (BMPs),
3. Design and Construction of BMPs, and
4. Monitoring and Maintenance of BMPs.

These lectures are available on EPA Region 2's Regional Water Quality Web Site – see the last slide of this presentation for details.



Lecture 1: Stormwater 101



What is Storm Water?

Storm water is the water from rain or melting snows that can become “runoff”, flowing over the ground surface and returning to lakes and streams. Storm water runoff includes the water and everything it picks up along the way.





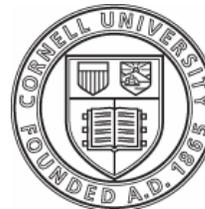
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What is Nonpoint Source Pollution?

- Nonpoint Source (NPS) Pollution is pollution associated with storm water
- NPS pollution cannot be traced to a direct discharge point such as a wastewater treatment facility



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NPS: Common Sources



Residential



Construction

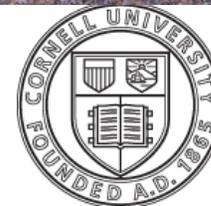


Wildlife

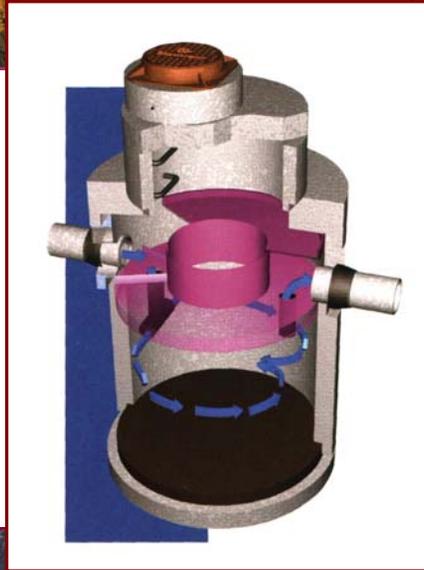


Forest

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Lecture 2: Basics of BMPs



Your Rain Garden is composed of woody plants (trees and shrubs) and herbaceous species (flowers, grasses, and ground covers) planted in three wetness zones.

The lowest zone supports plant species that can tolerate standing water and fluctuating water levels.

The outer edge or highest zone generally contains plant species that prefer drier conditions.

The middle zone is slightly drier, but also supports plant species that can tolerate fluctuating water levels.





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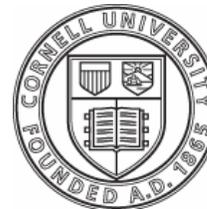
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Structural BMPs

- Dry/wet detention basin,
- Manufactured treatment devices,
- Dry wells,
- Cisterns/rain barrels,
- Grassed swale,
- Stormwater Treatment Wetlands,
- Vegetated filter strips, and
- Bioretention basins (or rain gardens)





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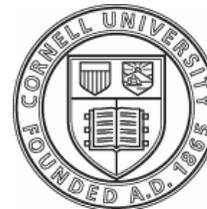
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Nonstructural BMPs

- Minimize impervious cover
- Minimize disturbance
- Maximize vegetation, minimize lawns
- Pollutant Reduction
 - Minimize vegetation that needs fertilizers
 - Trash racks and receptacles
- Fertilizer and Pesticide Management

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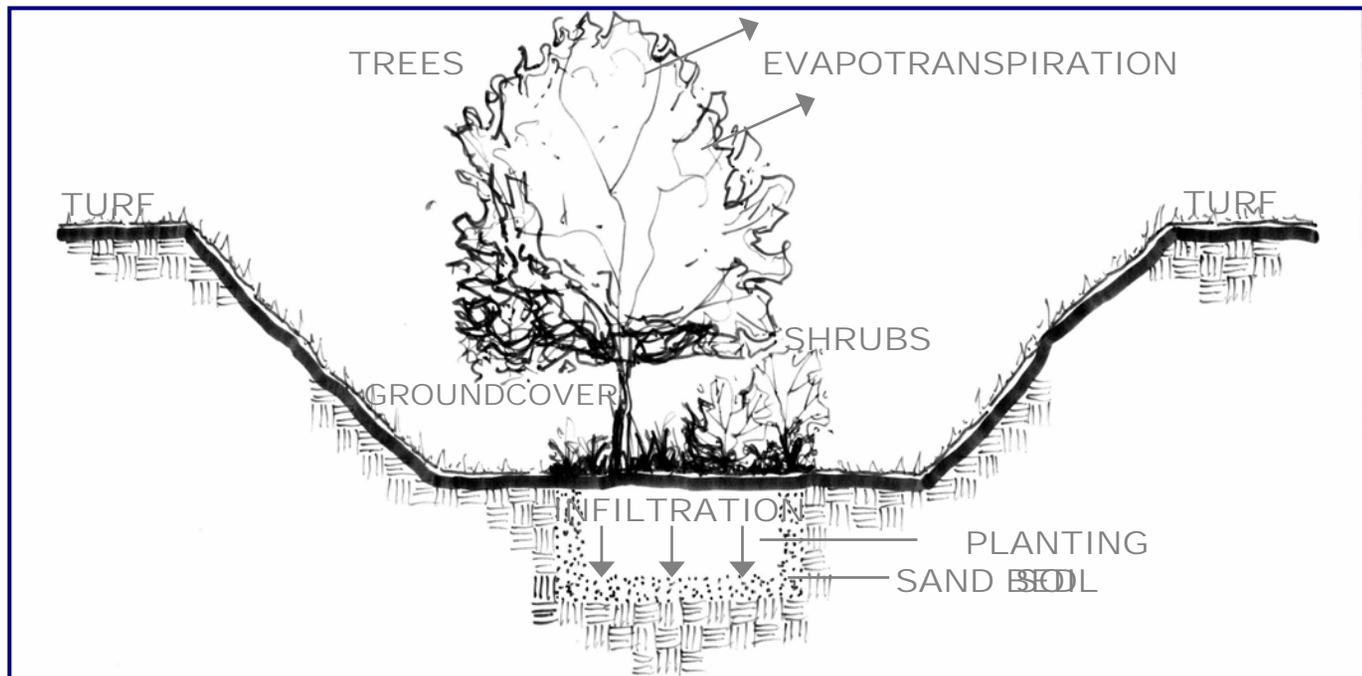


Lecture 3: BMP Design and Construction

- ◆ Site Characteristics
 - Soil Types
 - Depth to Groundwater
 - Permeability
 - Depth to Bedrock
 - Slope
- ◆ Stormwater Flows and Volumes
 - Drainage Areas
 - Time of Concentration
 - Curve Numbers
- ◆ Vegetation
- ◆ Construction Requirements

Bioretention Basin/Rain Gardens

- ◆ Combines settling of detention basin with physical filtering and adsorption processes
- ◆ Provides very high pollutant removal efficiencies
- ◆ More aesthetically pleasing than conventional detention basins
- ◆ The adopted removal rate is 90 percent





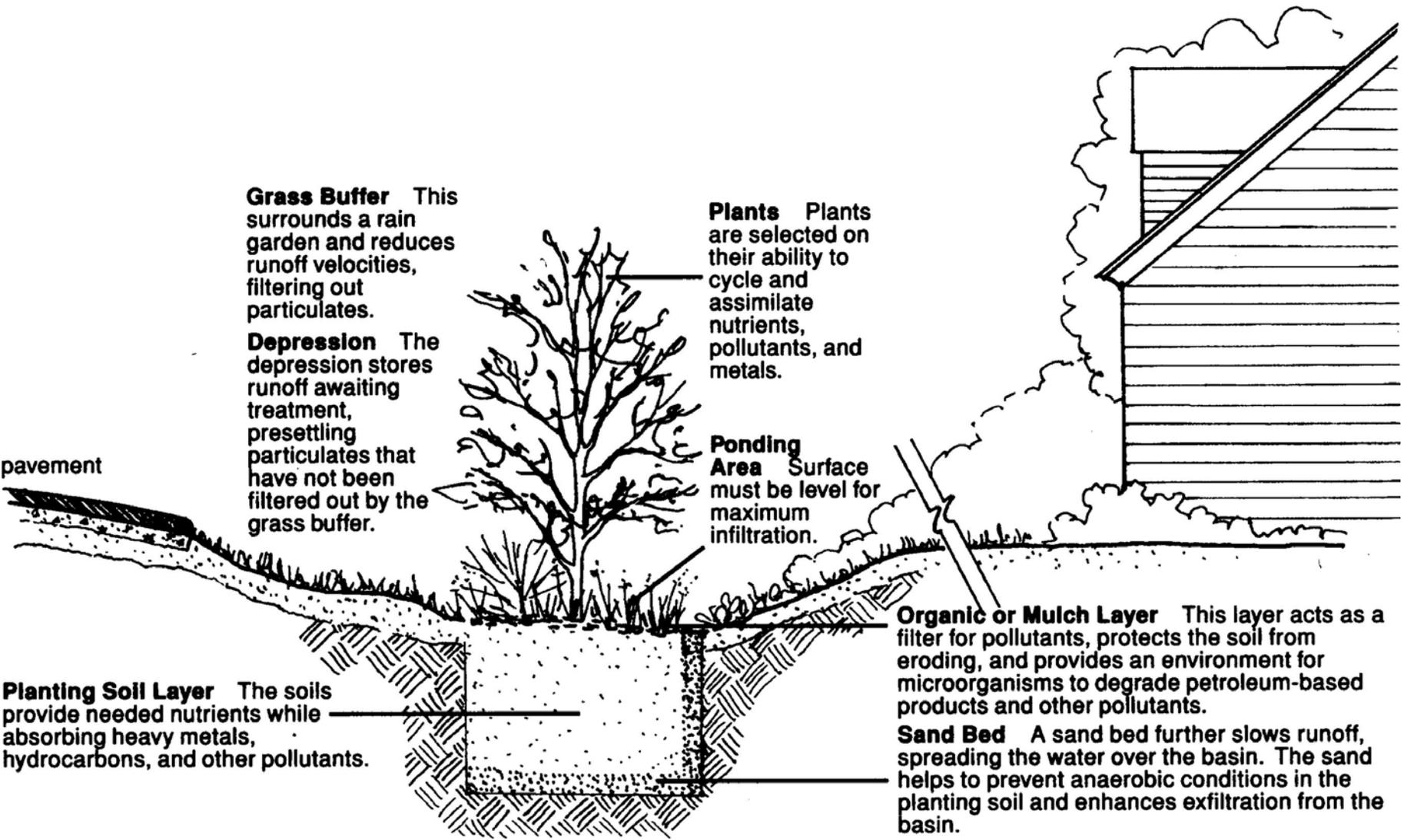
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The Rain Garden



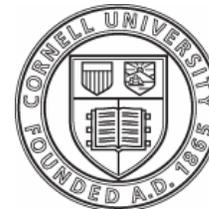


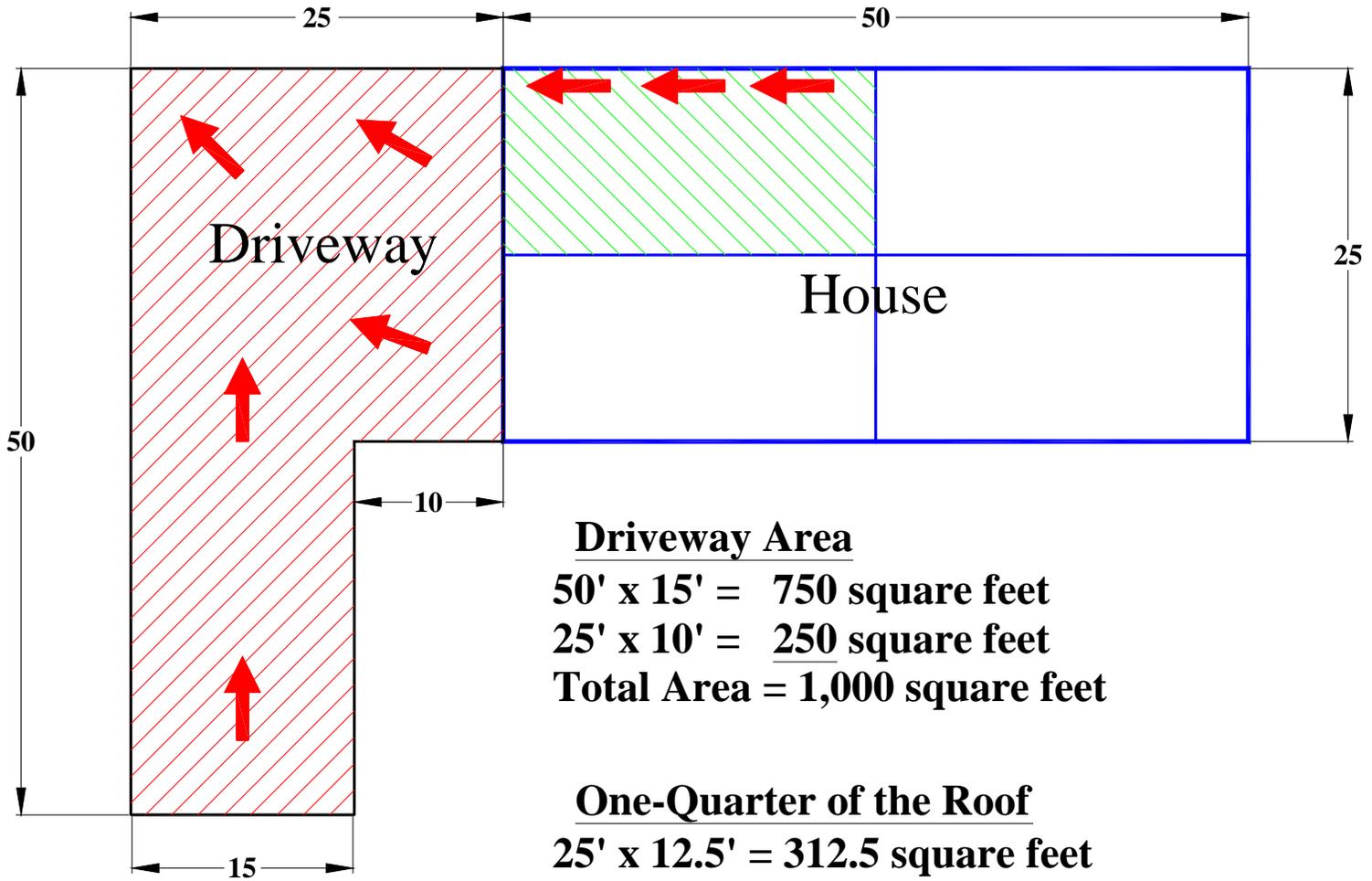
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Example in Sizing

Problem:

How big does a rain garden need to be to treat the stormwater runoff from my driveway?





Example in Sizing

- Drainage Area = 1,000 square feet
- 1.25 inches of rain = 0.1 feet of rain
- 1,000 sq. ft. x 0.1 ft. = 100 cubic feet of water for the design storm
- Let's design a rain garden that is 6 inches deep

Answer:

10 ft wide x 20 ft long x 0.5 feet deep
= 100 cubic feet



How much water does this treat?

- 90% of rainfall events are less than 1.25"
- New Jersey has approx. 44" of rain per year
- The rain garden will treat and recharge:
 $0.9 \times 44" = 40"/\text{year} = 3.3 \text{ ft}/\text{year}$
- The rain garden receives runoff from 1,000 sq.ft.
- Total volume treated and recharged by the rain garden is 1,000 sq. ft. x 3.3 ft. = 3,300 cubic feet, which is 25,000 gallons per year
- **Build 40 of these and we have treated and recharged 1,000,000 gallons of water per year!**



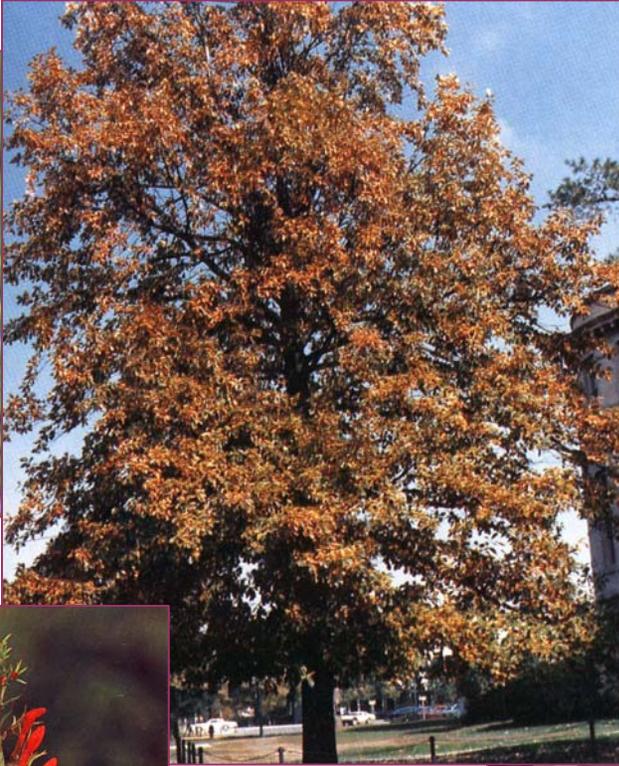
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Vegetation





Lecture 4: Monitoring and Maintenance

- Regular inspections of inlet and outlet structure
- Removal of sediment
- Replacement of vegetation
- Maintenance of vegetation
- O&M Manual for each BMP
- Monitoring Pollutant Removal Efficiency













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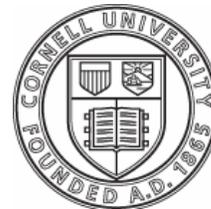
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Research Components

- Cornell's – variable source hydrology modeling
- Rutgers' – laboratory experiments on pathogen removal and various soil amendments to enhance phosphorus removal
- Rutgers' application to treat small farm runoff

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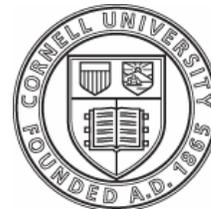
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Measuring Outcomes

- Piggyback on Master Gardeners Program potentially yields 35 to 70 trained volunteers per year per county (up to \$1.5 million/year of in-kind)
- Acres of impervious surfaces disconnected
- Gallons of stormwater treated and recharged
- Acres of urban landscape retrofitted with BMPs
- Pounds of pollutants removed



Expanding in NJ

- Began in 2005 in Union County
- Since then the program has expanded into nine other counties at various stages
- 19 demonstration rain gardens installed in New Jersey
- Community-Project-Based Learning as a mechanism to deliver this program to middle school students
- New developments
 - Small animal farm demonstrations
 - Incentive programs/small grants for homeowners
 - Landscaper training

Expanding inter- and intra-regionally

- USDA CSREES NIWQP Ext. Edu. Grant
 - Co-PI with Cornell Cooperative Extension of Ulster County (result of last year's conf.)
 - Co-PI with Virginia Tech
 - Repeating New Jersey successes into other states
- Working in New York
 - Working group with Extension and Research faculty and staff
 - Design manual collaboration
 - Research collaboration in Rockland County initiated

Expanding inter- and intra-regionally

- Working in the Virgin Islands
 - Provided tech, support to Virgin Islands RC&D
 - Demonstration rain garden completed in November 2007
 - Extension education component initiated
- Conference planned for May 2008
 - Agenda will cover research, case studies, and training for professionals



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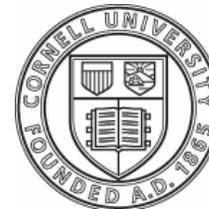
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Funding

- USDA CSREES 406 Program (Regional Project and Extension Education Project)
- 319h funds from NY and NJ
- NRCS funds in the Virgin Islands (St. Croix)
- New Jersey Sea Grant Funds

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For More Information

Go to CSREES's Regional Water Quality
Web Site for EPA Region 2 at
<http://rwqp.rutgers.edu>

Various powerpoint presentations are
available under the “Hot Topics” section
of the web page.

