



Green Infrastructure Overview

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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.

New Jersey

- Most densely populated state
- 21 counties, 565 municipalities
- 95% of our waterways are impaired
- Harmful Algal Blooms (HABS) in many of our lakes
- Hammered by Ida, Henri, Sandy, and a bunch of nor'easters
- Climate change is real – more severe storms and sea level rise



Main Cause of Water Resources Problems in New Jersey

Urban/Suburban Land Use
Existing Development



Stormwater Basics

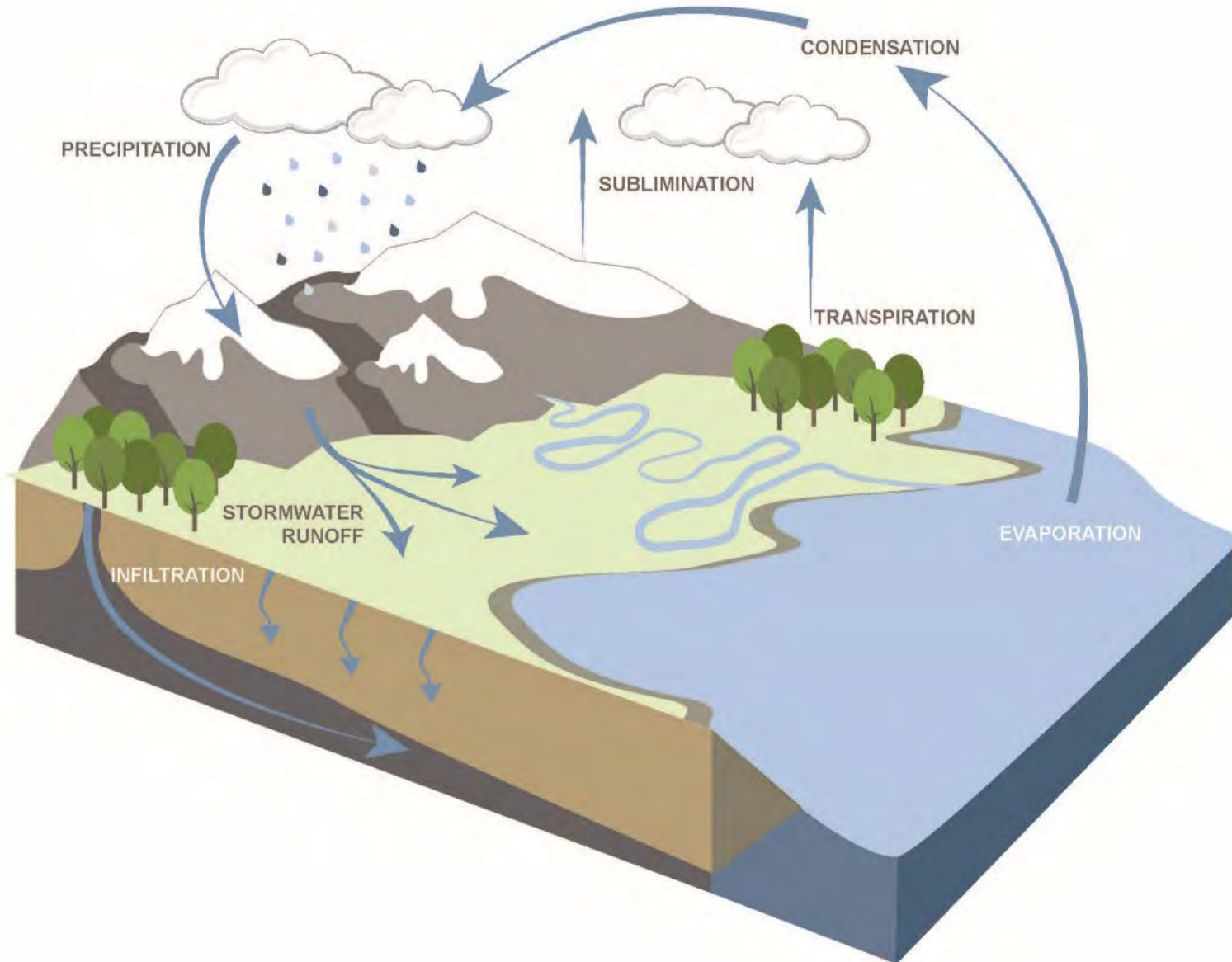


What is stormwater?

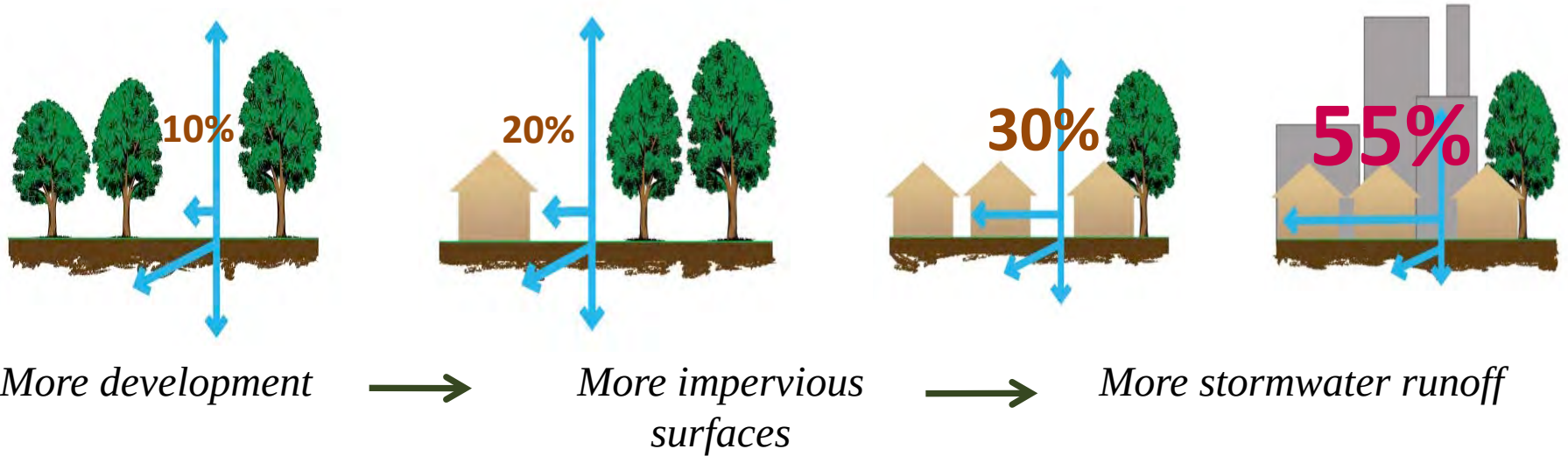


Stormwater is the water from rain or melting snow that can become “runoff,” flowing over the ground surface and returning to lakes and streams.

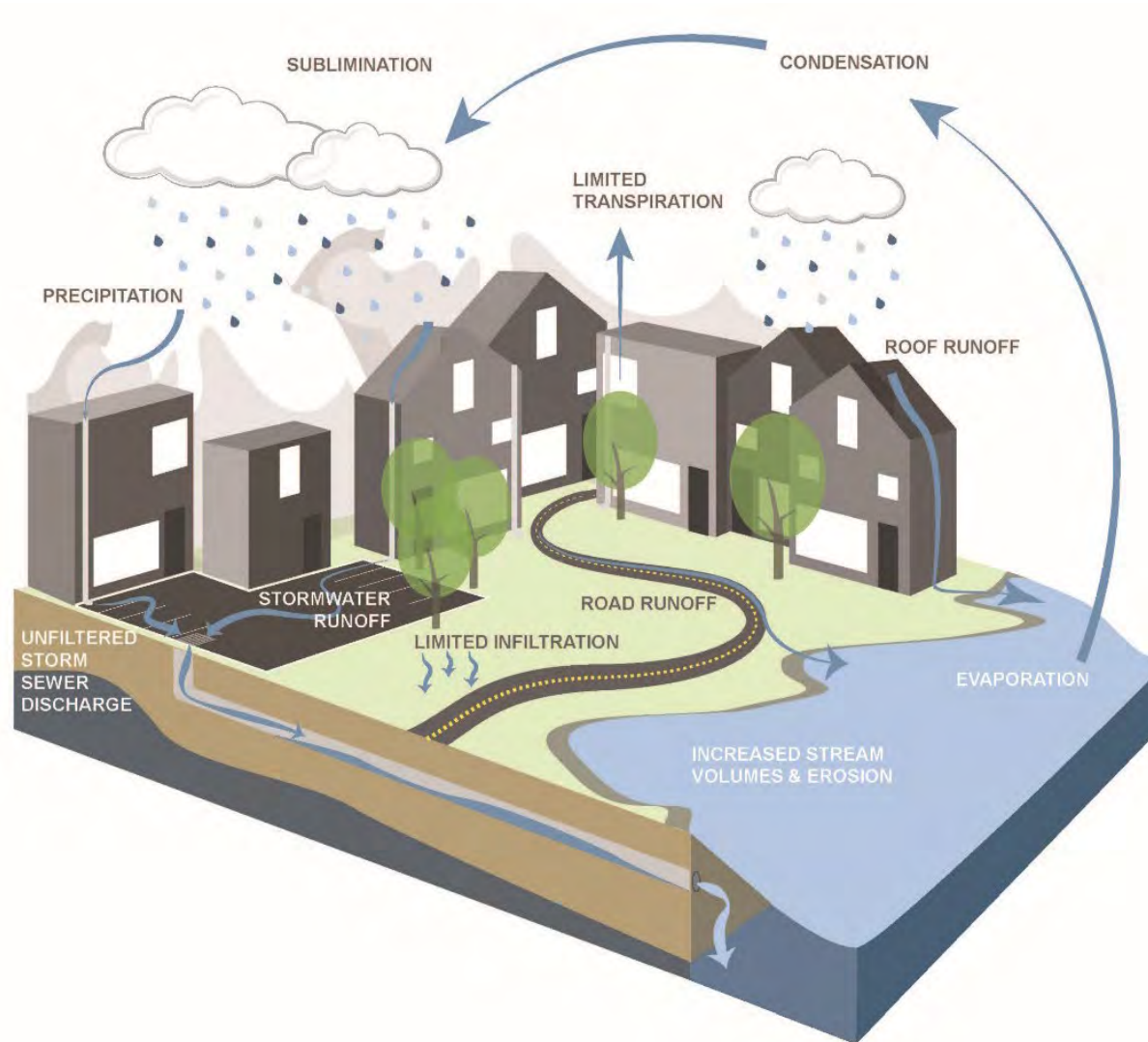
The Natural Hydrologic (Water) Cycle



The Impact of Development on Stormwater Runoff

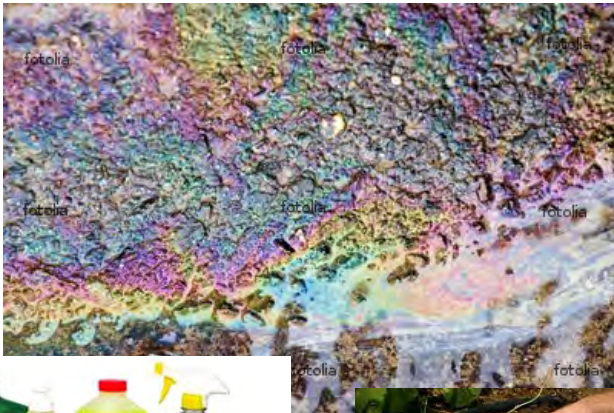


The Urban Hydrologic (Water) Cycle



Examples of Nonpoint Source Pollutants

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



Water Quantity (flooding)



More Flooding



And even more flooding



Fixing the Problem

- Enforcing existing environmental regulations will limit the impact from new development
- The U.S. Farm Bill and Natural Resources Conservation Service (NRCS) will help farmers reduce their environmental impact
- We must focus on retrofitting existing development with stormwater management practices

Albert Einstein was not a believer in excuses; "Man must cease attributing his problems to his environment, and learn again to exercise his will - his personal responsibility."



President **Barack Obama** called on all American citizens with; "Change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek."

Is Green Infrastructure a solution?

...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

Stormwater management practices that protect, restore, and mimic the native hydrologic condition by providing the following functions:

- Infiltration
- Filtration
- Storage
- Evaporation
- Transpiration



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



TYPES OF BIORETENTION



Larger Bioretention Systems

- Single-family lots
- Commercial areas
- Parking lots



Planters & Planter Boxes

- Highly urban areas
- Right-of-way and adjacent to buildings



Rain Gardens

- Single-family lots
- Small commercial areas



Bioretention Swales/ Bioswales/Vegetated Swales

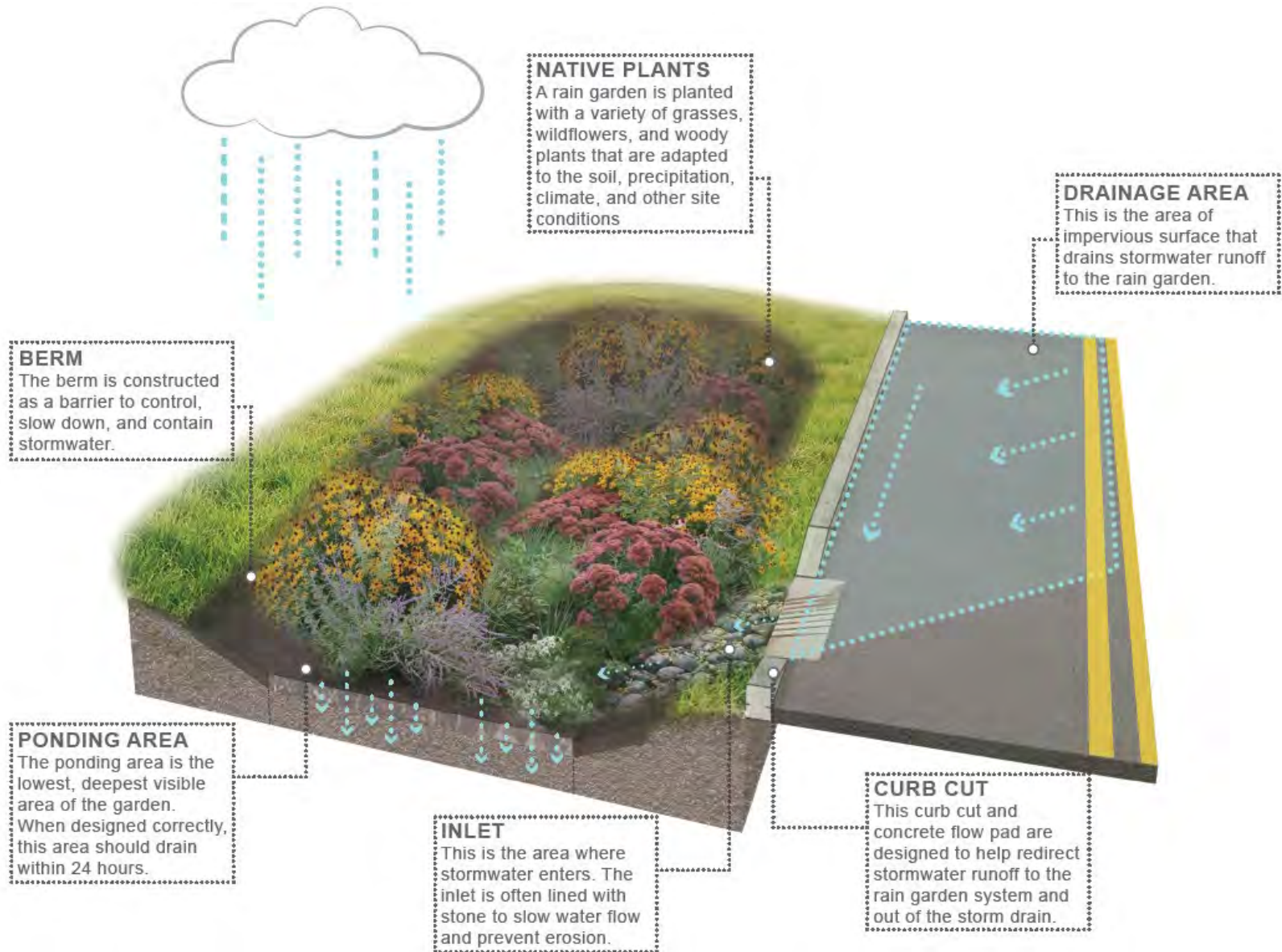
- Typically in right-of-way



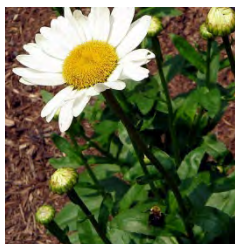
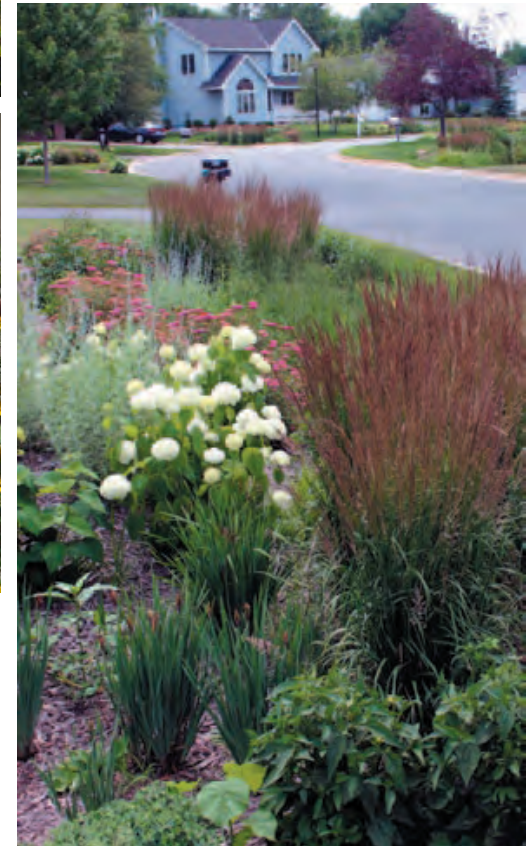
Vegetated Curb Extensions

- Bioretention incorporated into right-of-way in urban and suburban areas

Rain Gardens



Lots of Rain Gardens





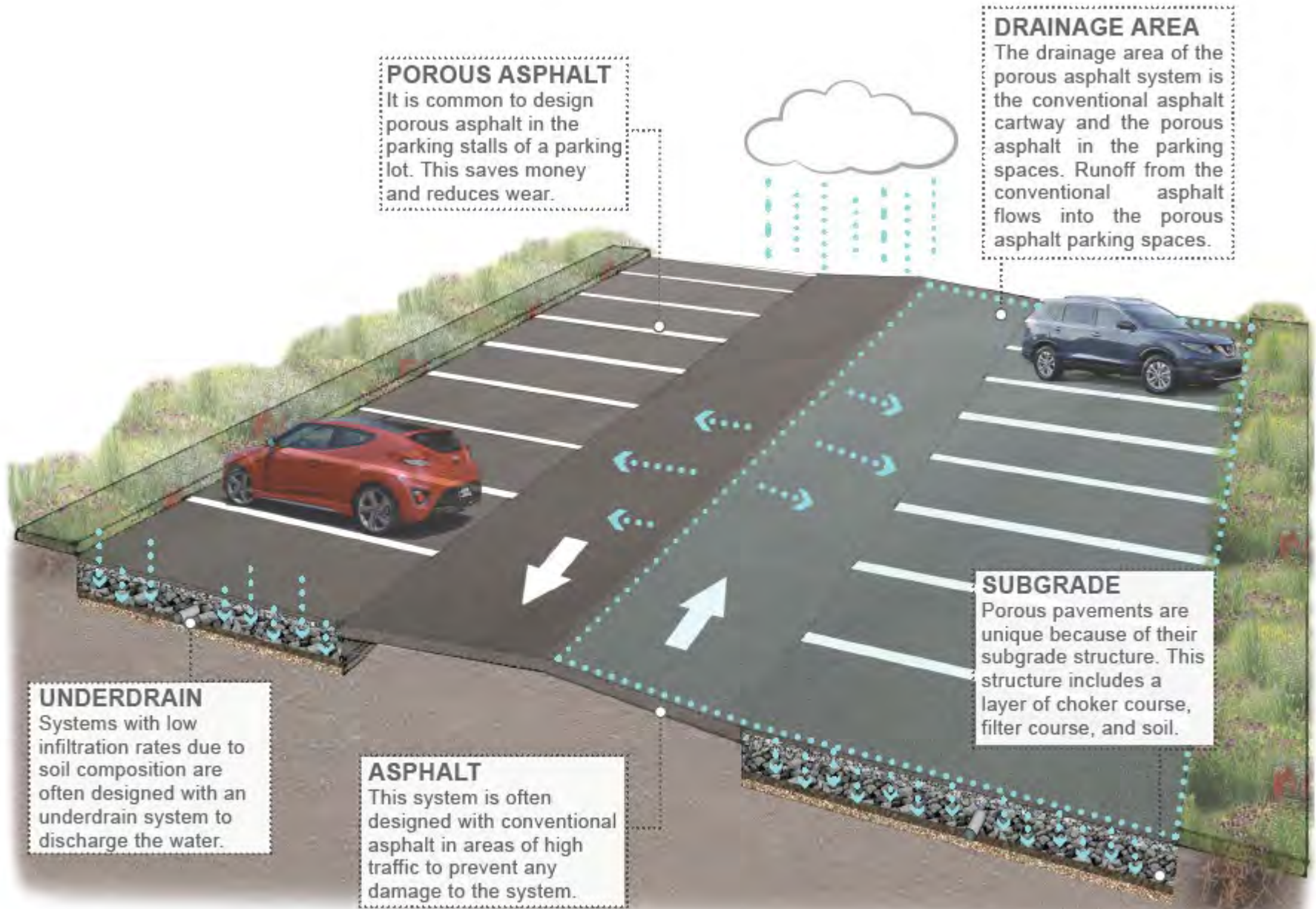


Blue Garden
This garden is a beautiful example of a blue garden. It features a variety of blue flowers, including hydrangeas, delphiniums, and cornflowers. The garden is also filled with green foliage, including hostas and ferns. The overall effect is a cool and refreshing look that is perfect for a summer garden.





Permeable Pavement



Permeable Pavements

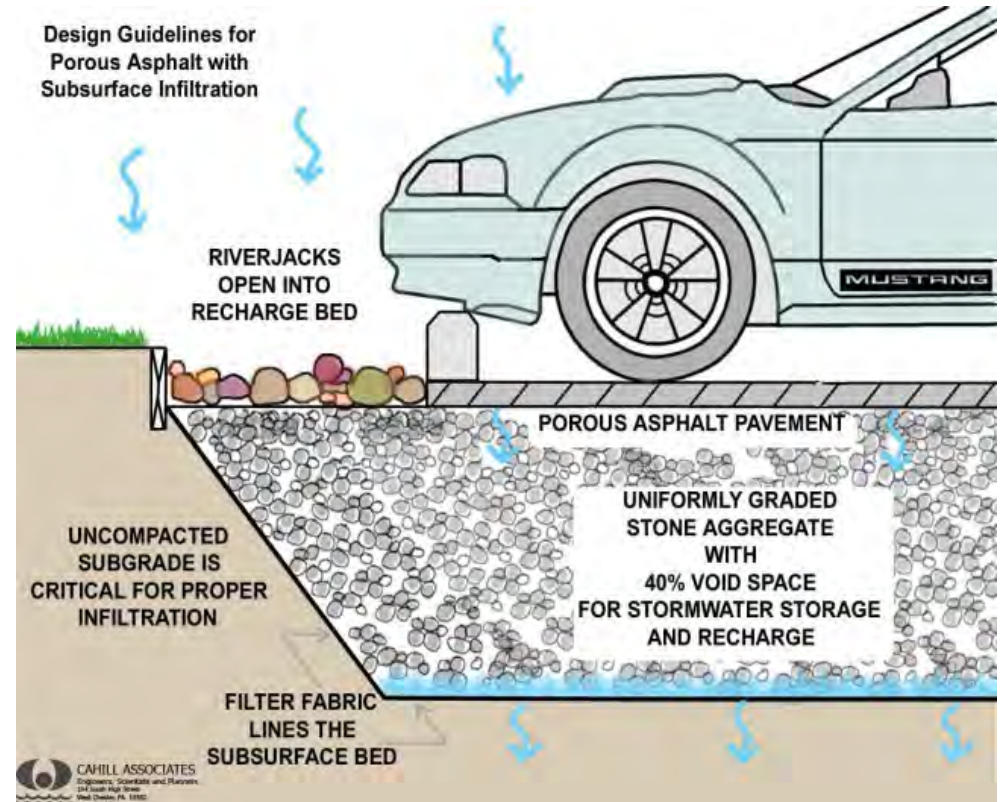
- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without "fine" materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Permeable pavers systems are concrete pavers with infiltration between the spaces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



ADVANTAGES

- 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



Porous Asphalt





Pervious Concrete

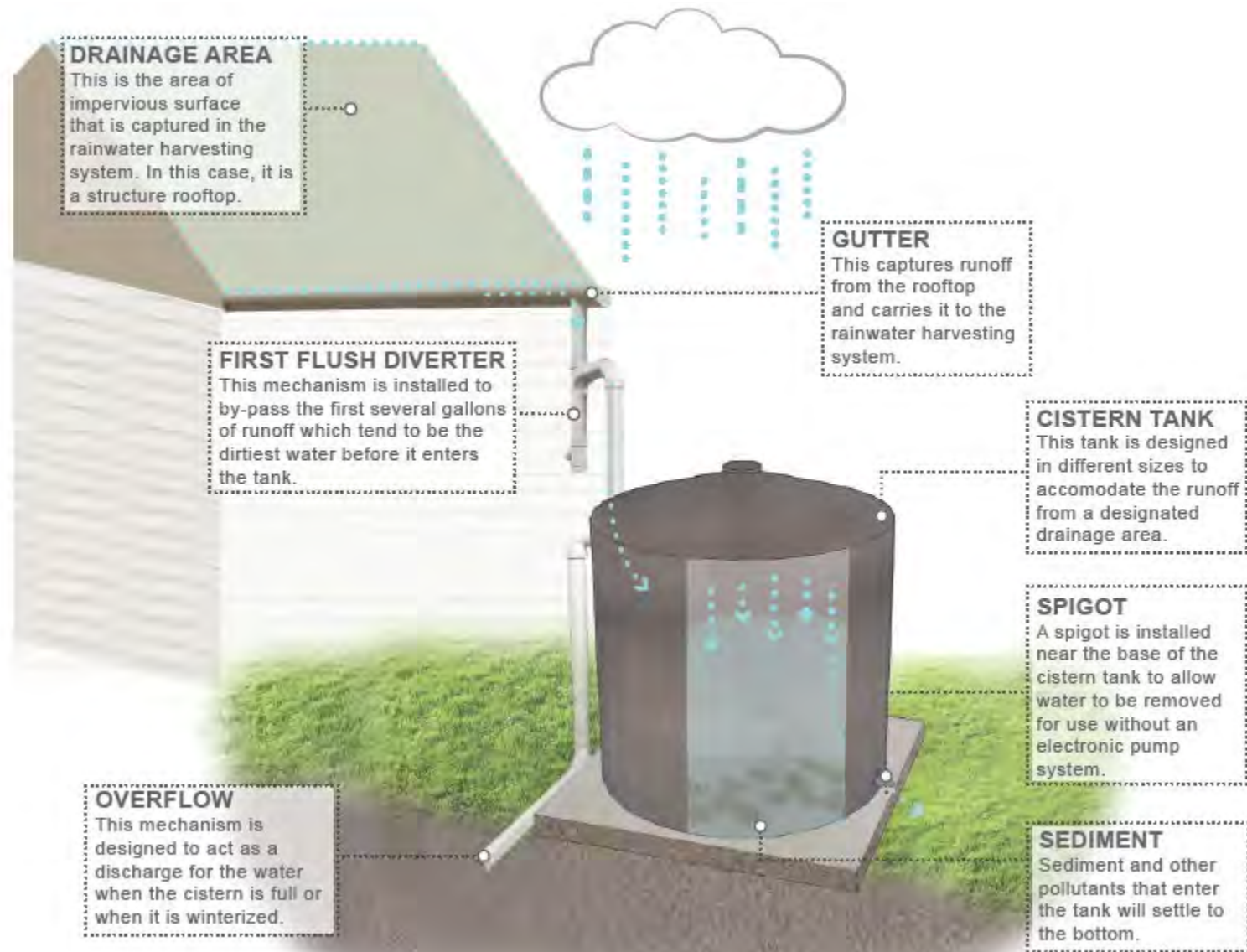


Permeable Pavers

A photograph of a driveway paved with interlocking concrete grass pavers. The pavers are arranged in a grid pattern, with green grass growing through the central square openings. The surface is covered with fallen autumn leaves in shades of brown, orange, and yellow. To the right of the paved area is a pile of dry, yellowed grass and more fallen leaves. In the upper left corner, the rear wheel and a portion of a dark-colored vehicle are visible. The background shows a chain-link fence and more foliage.

Grass Pavers

Rainwater Harvesting Systems



Rain Barrels



Cisterns









Let's get back to flooding – bioretention is an option but does it take up too much space?

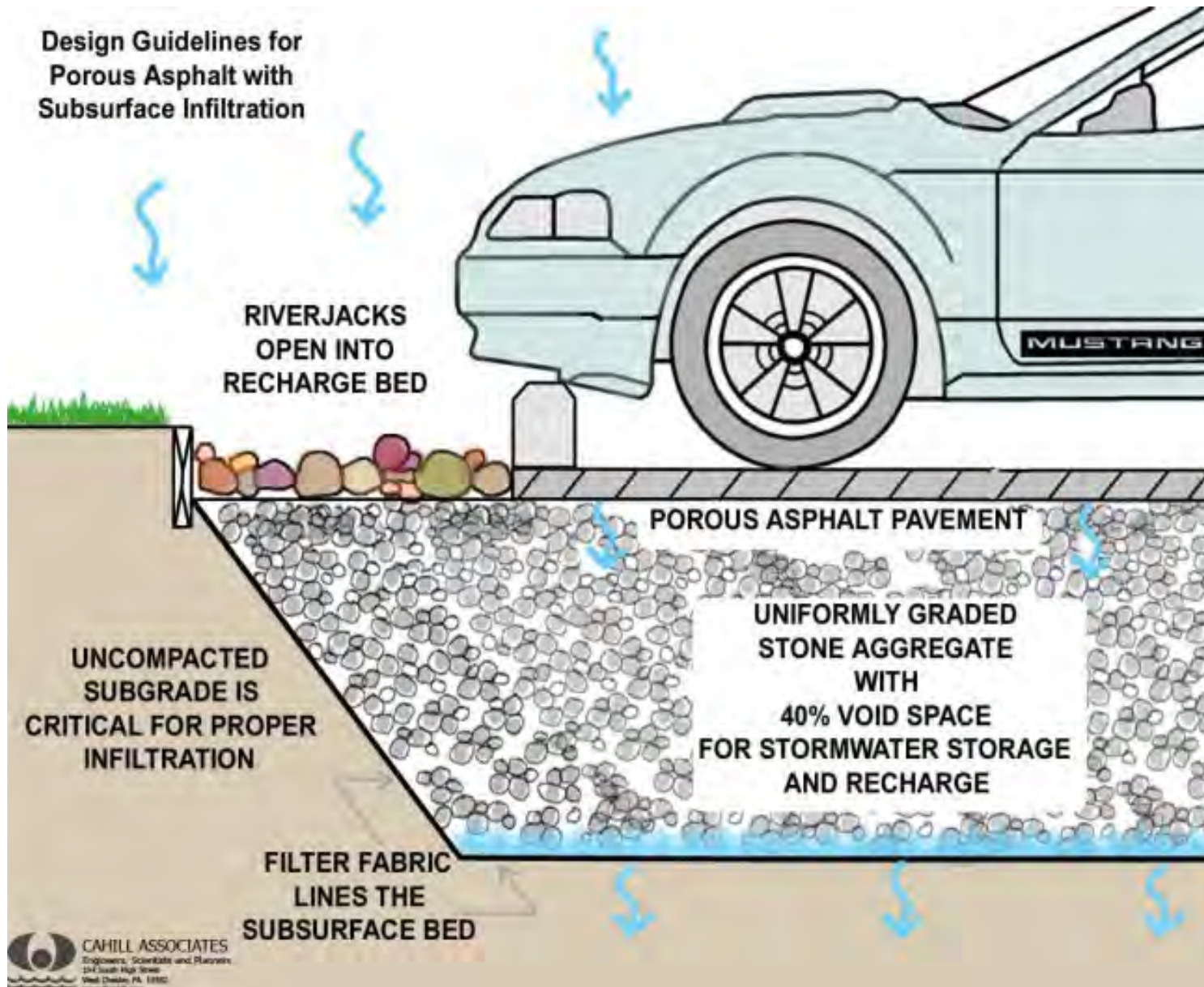








**Design Guidelines for
Porous Asphalt with
Subsurface Infiltration**



What if ...

every time we repave a parking lot in New Jersey, we convert it into a stormwater management system. For every acre of parking lot, we can capture stormwater runoff from the 100-year storm from four to five acres of impervious surfaces. When we include a rain garden, we can further increase the benefits.

Ready to Take the Next Step?

Become a Green Infrastructure Champion



Green Infrastructure Champion

Green Infrastructure Champions are key players in implementing green infrastructure as a stormwater management approach in their community.

Rutgers input to the Green Infrastructure Champion Program

- Training classes on green infrastructure planning and implementation
- Technical support for demonstration project design
- Networking with fellow Green Infrastructure Champions
- Grant writing guidance and support

Short-term results/impacts

- Learn green infrastructure practices and planning
- Develop skills to engage and advocate in your community
- Identify and secure funding opportunities for green infrastructure

Long-term results/impacts

- Green infrastructure practices widely implemented
- Standard practice for stormwater management
- Reduce localized flooding
- Water quality improves
- Increase community resilience

Green Infrastructure Champions Virtual Class Schedule

All sessions: Fridays | 10:00 AM – 12:00 PM

1. Identifying Green Infrastructure Projects
2. From Planning to Implementation
3. Maintaining Green Infrastructure Practices
4. Stormwater Regulations, Policies & Ordinances
5. Green Infrastructure & Sustainable Jersey
6. Green Infrastructure for Targeted Audiences
7. Designing & Building a Rain Garden
8. Retrofitting Detention Basins
9. Green Infrastructure Master Planning
10. Green Infrastructure & Climate Resilience

Attend at least 5 sessions to earn certification.

Registration & Program Information

Get Involved!

Program Website:

water.rutgers.edu/Projects/GreenInfrastructureChampions/GIC.html

Register Here:

rutgers.zoom.us/webinar/register/WN_BZfp2vQvREeqeYJecHGHEQ

Who Should Attend?

Municipal staff & elected officials

Community leaders & volunteers

**Any resident interested in
protecting and restoring
our waterways**



The great aim of education is not knowledge but action.

- Herbert Spencer





Questions?