

Green Infrastructure: An Approach to Stormwater Management

Slow it down • Spread it out • Soak it in

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Environmental
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Why Stormwater Management

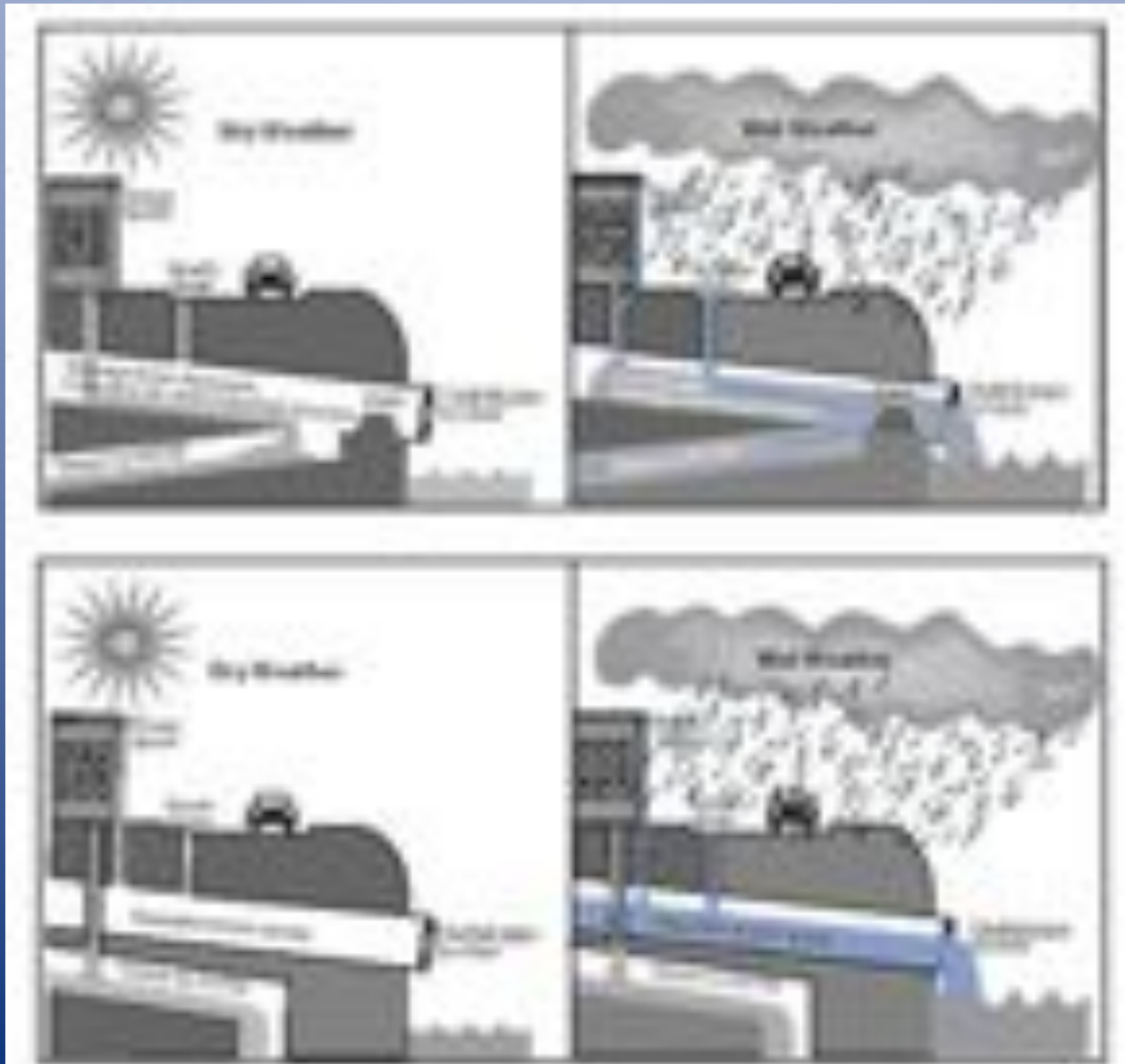
- Reduces stress on our waste water infrastructure
- Runoff Threatens Water Quality
- Manages water at point of entry



- 80 percent of pollution to the aquatic environment comes from land-based sources, such as runoff pollution.
- New York has identified nonpoint sources as the primary cause of water quality problems in 91 percent of its priority waterbodies

<i>Pollutant</i>	<i>Common Sources</i>
Sediment (sand, silt, clay particles)	Bare spots in lawns and gardens, construction sites, streambank erosion, sloping areas, farm fields, wastewater from washing vehicles
Nutrients (nitrogen, phosphorous, others)	Over-application or spilled fertilizer, pet waste, livestock manure, grass clippings, leaves
Pesticides	Over-application or spilled material, leaks, sprayer wash-out
Disease-causing Organisms (bacteria, viruses)	Pet waste, livestock manure, garbage
Hydrocarbons	Engine exhaust, fuel and oil spills and leaks, vehicle tire wear, burning plastics
Metals	Vehicle brake and tire wear, engine exhaust, metal gutters and downspouts, scrap piles
Organic and non-organic debris	Leaves, grass clippings and litter
Road Salts	Winter!

Combined Sewer Overflows



CSOs continued...



More than 772 cities in the U.S. have CSOs

In 1994, the U.S. Environmental Protection Agency (EPA) adopted a Combined Sewer Overflow Control Policy designed to reduce and eliminate combined sewer overflows nationwide. The purpose of the CSO Control Policy was to elaborate on the 1989 EPA CSO Control Strategy and to facilitate compliance with Clean Water Act (CWA) requirements.

The three objectives of the 1989 CSO Control Strategy are:

- Ensure that if CSOs occur, they are only as a result of wet weather.
- Bring all wet weather CSO discharge points into compliance with the technology-based and water-quality-based requirements of the CWA.
- Minimize the impacts of CSOs on water quality, aquatic biota and human health.

Impacts of Fertilizers on Waterways

- Nuisance algal blooms
- Taste and odor problems
- Taste problems
- Fish kills due to low dissolved oxygen
- Formation of disinfection byproducts
- Increased drinking water costs



Impacts on Drinking Water Supplies

- Disinfection by-products (DBP) form
- Turbidity levels increase
- Salt levels rise
- Increase in pathogens (e.g., Giardia, coliform)
- Rise in organic and inorganic chemicals
- Spills, leaks, and accidents more likely to occur
- Increase drinking water treatment costs

Why Green Infrastructure?

- Reduced & delayed stormwater runoff volumes
- Enhanced groundwater recharge
- Stormwater pollutant reduction
- Reduced sewer overflow events
- Increased carbon sequestration
- Urban heat island mitigation & reduced energy costs
- Improved air quality
- Additional wildlife habitat & recreational space
- Improved human health
- Increased land values

Tools for Stormwater Management

Rain Barrels



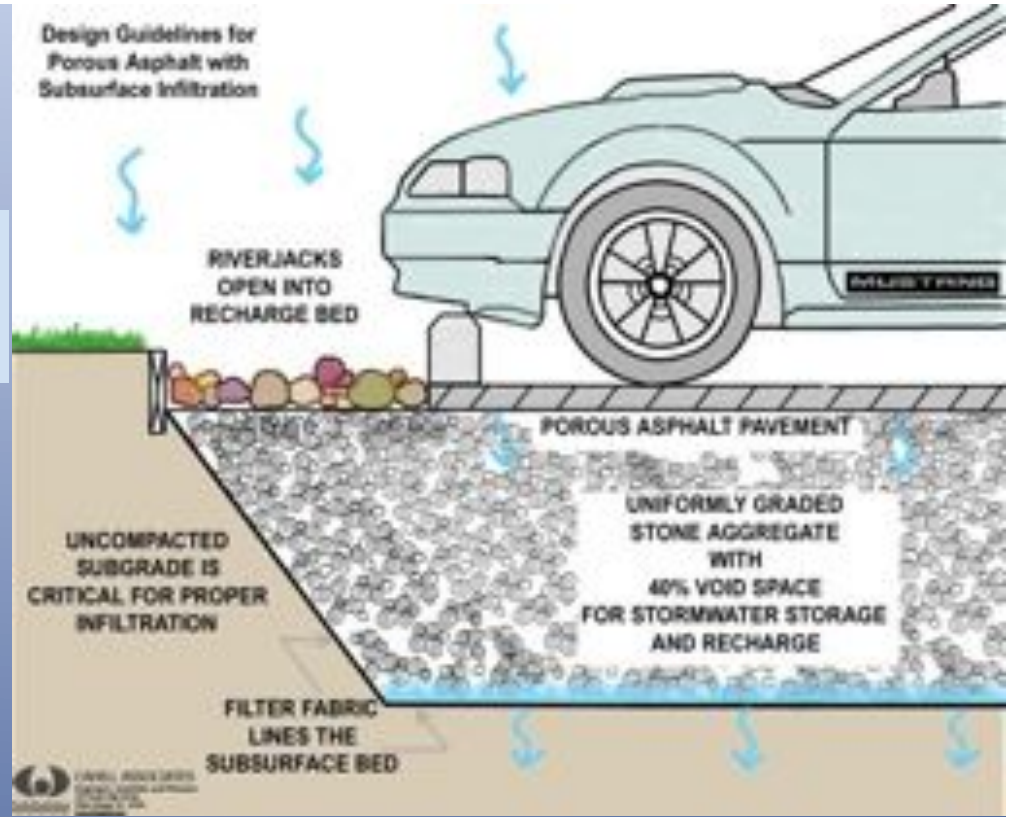
Green walls



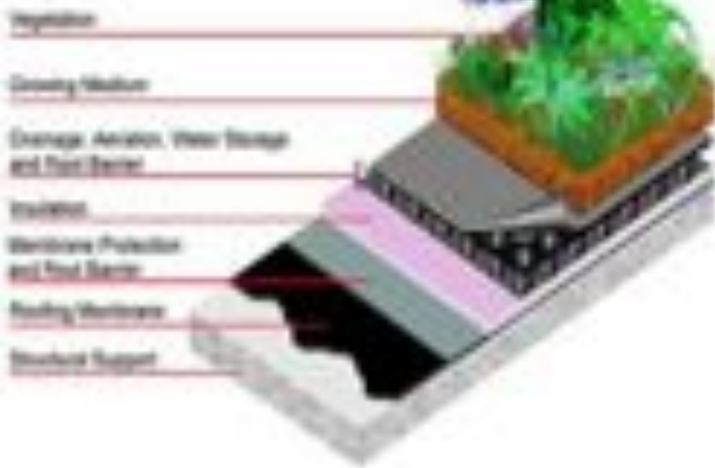
Rain Barrels



Porous Pavement



Green Roofs





Bioswales, Curb Cuts, Curb Extensions



Vegetated curb extensions and gardens decrease stormwater runoff in Lansing's downtown while also improving sidewalk aesthetics.

Building a rain garden

- The rain garden should be at least 10 feet from the building so infiltrating water doesn't seep into the foundation.
- Soil type (clay, silt, sand)
- Lawn slope
- Distance from downspout
- Roof area to be drained

A Rain Garden as Outreach



Things to consider

- Find a publically-accessible site
- Involve the public
- Collaborate with other groups to increase visibility, support and labor
- Check for Utilities
- Develop and install signage





Welcome to the Oswego City Hall Rain Garden



Salvia
Rosy-stemmed Salvia

What Is A Rain Garden?

A rain garden is a shallow depression landscaped with native plants and designed to absorb and filter stormwater runoff from nearby impervious surfaces like roofs, sidewalks, and driveways. Rain gardens remove surface water and filter out pollutants at the source of the runoff while adding aesthetic value to a property. They help to eliminate the need for costly stormwater management infrastructure.



Salvia
Purple-stemmed Salvia

How Do They Work?

The plants in the garden encourage it to collect in the garden depression where it soaks into the ground. The garden filter with charged heavy metal pollutants, and thereby reduces pathogens, and plants provide nutrients for the worms and insects. By the time the stormwater seeps through the rain garden, up to 99% of pollutants can be removed, leaving the groundwater safe.

They Are Important

Rain gardens are an effective alternative method for stormwater management. Land development often involves the removal of natural surfaces or impervious areas, such as roofs and sidewalks, which increase runoff and contribute to erosion and flooding. Rain gardens help to reduce runoff and increase soil stability, reduce erosion, improve water quality, and provide habitat for birds, insects, and other wildlife. The rain garden restores the natural process of absorbing the water into the natural system.

How They Help You

The native plants in rain gardens require no watering or chemical treatments (pesticides or fertilizers), usually eliminating the need for lawn maintenance. The garden decreases the need to mow or trim it and many require little or no lawn care. Many native plants also attract butterflies, birds, and helpful insects that can decrease the populations of unwanted insects and weeds, including the invasive Japanese Knotweed.



Salvia
Green-stemmed Salvia



Salvia
Yellow-stemmed Salvia



The garden was built with funding provided by ESDA Rural Development and represents the collaborative work of the Oswego County Environmental Review Board at Oswego University and the Great Lakes Watershed Consortium.









Models and Calculators

- EPA Sites:
 - Municipal Handbook: Funding Options
 - EPA Green Infrastructure Models and Calculators
 - Financing Alternatives Comparison Tool (FACT)
- Green Values Stormwater Calculator-Center for Neighborhood Technology-Chicago.
- Individual City Program Sites: Portland, OR, Seattle, Philadelphia, Cleveland, Kansas City

Additional Resources

- Natural Resources Defense Council (NRDC), 2006
Rooftops to Rivers Green Strategies for Controlling Stormwater and Combined Sewer Overflows
<http://www.nrdc.org/water/pollution/rooftops/contents.asp>
- Green Playbook
<http://www.greenplaybook.org>
- The Low Impact Urban Development Center
<http://www.lid-stormwater.net>
- The Stormwater Managers Resource Center--www.stormwatercenter.net //
- DEC Municipal Guidance Manual for Stormwater Management
<http://www.dec.ny.gov/chemical/9007.html>
- North East Community Forests
The Green Infrastructure Planning Guide
<http://greeninfrastructure.eu/>

Further resources

U.S. Environmental Protection Agency

Managing Wet Weather with Green Infrastructure

<http://epa.gov/npdes/greeninfrastructure>

EPA Office of Wetlands, Oceans and Watersheds Nonpoint Source

<http://www.epa.gov/OWOW/NPS/index.html> epa.gov

EPA Office of Pollution Prevention and Toxics

<http://www.epa.gov/p2/index.html> epa.gov

Partners and other groups that may be available for assistance.

- County Soil and Water Conservation District Offices (SWCD)
- County Water Quality Coordinating Committee Contacts (WQCC)
- The New York State Association of Regional Councils (NYSARC) - composed of ten locally created regional councils throughout New York State, dedicated to studying the needs and conditions of a region and developing strategies that enhance its member counties through intergovernmental cooperation.
- Finger Lakes - Lake Ontario Watershed Protection Alliance

