Green Infrastructure in the Hudson Valley
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New York State Department of Environmental Conservation
In cooperation with Cornell University NYS Water Resources Institute
Presentation Outline

- Hudson River Estuary Program
- Green Infrastructure Examples in the Hudson Valley
- Trees for Tribs
- Case Study: Monitoring Bioretention in Poughkeepsie, NY
Hudson River Estuary Program

Core Mission

- Ensure *clean water*
- Protect and restore fish, wildlife, and their *habitats*
- Provide water recreation and river *access*
- Adapt to *climate change*
- Conserve world-famous *scenery*
Hudson River Estuary Watershed
Green Infrastructure

• Network of natural and engineered systems, generally vegetated, that provide ecosystem services
• Manage stormwater runoff while maintaining or restoring natural hydrology
  – allow stormwater to *infiltrate* and be used by plants
Green Infrastructure

• Applies to both regional and local scales

• Number of benefits
  – Water quality/quantity
  – Improving habitat
  – Cooling urban areas
  – Beautifying neighborhoods
Green Infrastructure Examples in the Hudson Valley

http://www.dec.ny.gov/lands/58930.html

Vassar College Rain Garden

Description

This rain garden is an example of green infrastructure in an institutional setting. The runoff from the maintenance building is directed to the rain garden where it is infiltrated into the ground.

Site Location

- Site Address: Hooker Ave., Poughkeepsie, NY 12001
- Town: Poughkeepsie
- County: Dutchess
- Land Use of Site: College Campus
- Can Site be visited?: Check with College
- Location on Site: North of first building on the right after entering the athletic complex from Hooker Avenue

Practice Information Details

- Intent of Design: Treat parking lot runoff through infiltration and biological uptake.
- Stormwater Management Capacity: 152 Cubic Feet
- Year of Installation: 2007
- Plant Material Used: Unknown
- Annual Operational and Maintenance: Weeding and replacement of any dead vegetation.
- Required Zoning Change or Special Permit: None
Green Infrastructure Examples in the Hudson Valley

- Site-specific practices for stormwater management
- Engineered practices and natural features
- Includes a variety of locations and scales
Rain Gardens

- Manage and treat small volumes of stormwater, filter runoff through soil and vegetation within a shallow depression.
Vegetated Swales

- Natural drainage paths or vegetated channels used to transport water above ground

Subdivision, Pawling

Village Hall, Greenwood Lake
Porous Pavement

- Pervious types of pavements allow stormwater to infiltrate through the surface

Village Hall, Greenwood Lake

Garrison Institute, Garrison

Stewart Airport, New Windsor
Stream Buffer Restoration

• A healthy vegetated buffer helps improve stream health and water quality by filtering and slowing polluted runoff, with many other benefits.

Dinsmore Park, Staatsburg

SUNY Orange, Middletown
Stream Buffer Restoration: Hudson Estuary Trees for Tribs

- Free native trees and shrubs to plant along tributaries to the Hudson River
- Watershed groups, land trusts, municipalities, schools, non-profits, landowners, and more
Hudson Estuary Trees for Tribs

- Plantings in the spring and fall
- We provide:
  - Plant material
  - Technical assistance
  - Site prep
Trees for Tribs Accomplishments

- Since the program began in 2007:
  - 60,000 feet of stream buffers replanted
  - 22,000 native trees and shrubs
  - 2,900 volunteers
  - 180 sites
Case Study: Monitoring Bioretention

- Vassar College, Poughkeepsie, NY
- Called “rain gardens”
- Redevelopment project summer 2008
- Water quality research conducted 2008-2010
- Monitoring and maintenance
Redevelopment Site – Before
Redevelopment Site – After

Rain Garden 1

Rain Garden 2

Untreated Catch Basin
Stormwater Quality Samples

• Analyzed for:
  – Total suspended solids (TSS)
  – Nutrients (Nitrate, Phosphate)
  – Heavy metals (Copper, Lead, Zinc)
Rain Garden Catch Basin

Untreated Catch Basin
n = 6, samples from December 2008, March 2009, April 2009, August 2010, and October 2010
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Rain Garden 2 inlet

Rain Garden 1 inlet
n = 6, samples from December 2008, March 2009, April 2009, August 2010, and October 2010
Summary

• Rain gardens are effective at removing TSS
  – Consistent with many other studies

• May be net exporters of nutrients (affected by the growing season)
  – Some studies found that although total N and P reduced, inorganic nutrients increased

• Do not appear to moderate heavy metal loads
  – Laboratory studies show 88-97% removal of metals from synthetic stormwater
  – Field studies slightly lower removal rates
Summary

• Water quality is very site-specific, based on drainage area and other factors
• Green infrastructure may not function exactly as we think it should
• Important to monitor (water quality or visual observation)
• Adaptive management
Monitoring Through Visual Observations

- Increased retention time for stormwater
- Post-construction management issues
  - Flow patterns
  - Potential sediment sources
  - Other concerns
Flow Patterns

Site grading - water not flowing into rain gardens
Potential Sediment Sources

Catch Basin

Sediment
Other Management Concerns

• Water flow through soil
  – Infiltrating too quickly?
• Plant growth
• Establishment of weeds
• Need maintenance to ensure stormwater benefits (water quantity and quality)
Conclusions

- Green infrastructure has the potential to really benefit communities
- Many examples of projects in the Hudson Valley, and more are on the way
- Need to design, construct, and maintain properly
- Monitoring sites can help ensure that they are functioning correctly
- Using case studies and local examples to guide outreach and support future projects
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