What's the big deal with Green Infrastructure for Stormwater Management?

Slow it down • Spread it out • Soak it in

Khris Dodson

Environmental Finance Center

Water Quality Suffers

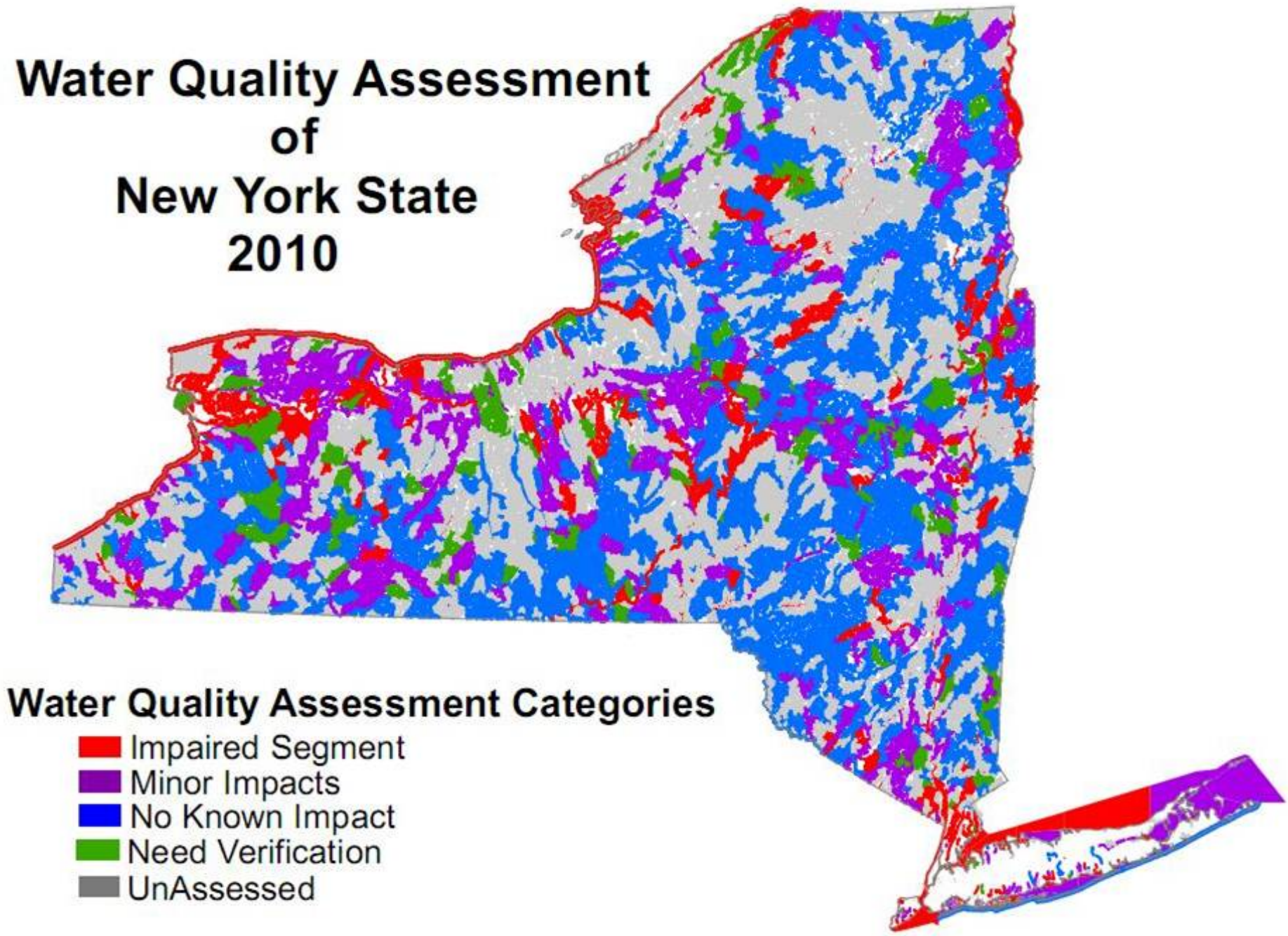
- 80% of water pollution comes from land-based sources, such as runoff pollution.
- New York has identified nonpoint sources as the primary cause of water quality problems in 91% of its priority waterbodies.
- Once a watershed's impervious cover exceeds 20%, water quality suffers.

Water quality, con't.

- According to the 2004 National Water Quality Inventory:
  - 44% of assessed rivers and streams impaired
  - 64% assessed lakes impaired
  - 30% assessed estuaries impaired
- Agriculture and hydromodification are top sources of impairment for rivers and streams

Not a happy constituency

- In 2009, beach closings and advisories exceeded 18,000 for the fifth consecutive year
- Stormwater runoff contributed to ~80% of closings with a reported contamination source



SOURCE: 305 (b) Water Quality Report

Public Infrastructure Act

- Enacted in August 2010
- requires state infrastructure funding to be consistent with smart growth principles, with priority given to existing infrastructure and projects which are consistent with local governments' plans for development.

S.5411-A: NYS Complete Streets Bill

require state and local transportation agencies to consider "complete streets" designs that will make streets and roadways across the state safe and accessible to all New Yorkers

Complete streets design principles have been proven to reduce fatalities and injuries, and by taking them into consideration on future projects we will greatly improve the safety of pedestrians, bicyclists, and drivers of all ages and abilities," said Senator Charles Fuschillo, Jr. (R-Merrick), the bill's champion in the Senate.

Assemblyman David Gantt said, "With this legislation, future state and local transportation projects will be planned in a way that is more mindful of all users of our roadways. Thanks to this new approach to road design, New Yorkers will be able to realize the convenience, energy savings and health benefits that all forms of mobility have to offer."

Funding Opportunities

- Green Innovation Grant Program (GIGP): JC will discuss this
- NYS DEC WQIP
  - Statewide Grant Program
  - Supports water quality improvements
  - Competitive, reimbursement grant program
  - Directs funds from the NYS Environmental Protection Fund to projects that:
    - Reduce polluted runoff
    - Improve water quality
    - Restore habitat in New York's waterbodies
  - Depending on the type of project, reimbursement is available for up to 85% of the total cost of the project

NYS DEC WQIP

Eligible Applicants

- Municipalities (villages, towns & cities)
- Soil and Water Conservation Districts
- Not for Profit Corporations (in some cases)

Eligible Project Types

- Municipal Wastewater Treatment
- Municipal Separate Storm Sewer Systems (MS4s)
- Nonagricultural Nonpoint Source Abatement and Control
- Aquatic Habitat Restoration
- Water Quality Management

Other Methods of Funding GI

- Taxes
- Public Enterprise Fees
  - Stormwater Management/Utility fees
  - Drinking water/wastewater fees
  - Impact fees
- Regulatory fees
- Fines and Penalties
- Contractual agreements
- Assessments

Guidances:
EPA's Water Quality Scorecard

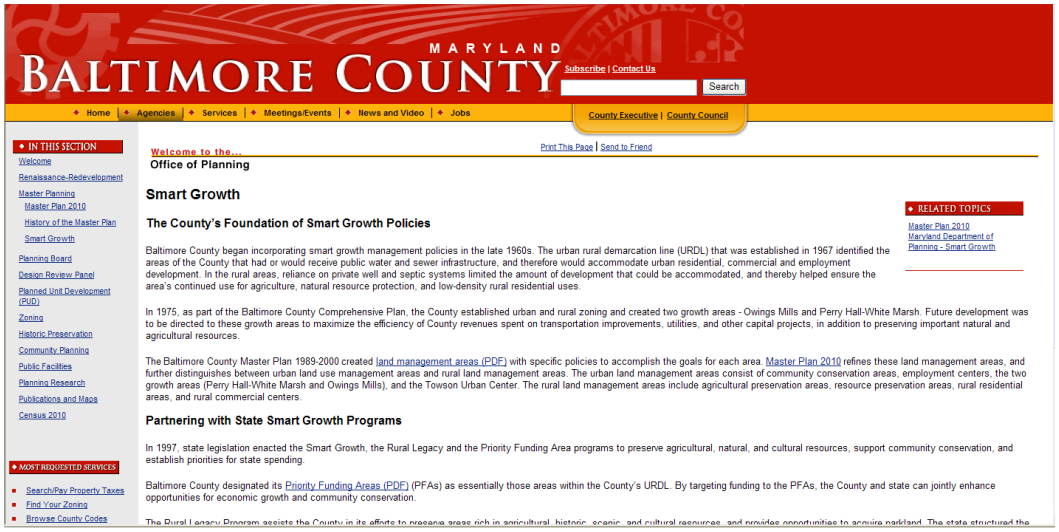
- Provides framework for engaging representatives from multiple departments
- Identifies drivers of impervious cover at regional, neighborhood, site scales

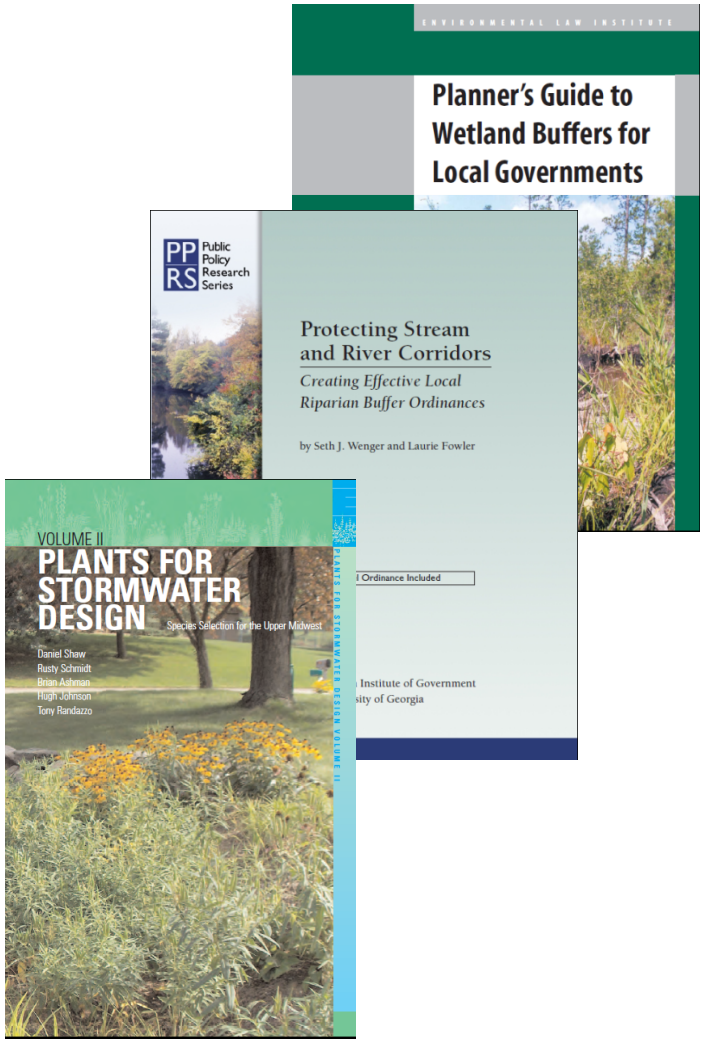
What is the Scorecard?

- An auditing tool to
  - Assess local ordinances, codes, plans, and programs through the lens of water quality management
  - Guide municipal staff in adapting diverse policies and programs to consistently support green infrastructure

What is the Scorecard?

- A resource containing
  - References
  - Case studies





The New York State Stormwater Management Design Manual
http://www.dec.ny.gov/chemical/29072.html

Table 5.1 Planning Practices for Preservation of Natural Features and Conservation Design	
Practice	**Description**
Preservation of Undisturbed Areas	Delineate and place into permanent conservation undisturbed forests, native vegetated areas, riparian corridors, wetlands, and natural terrain.
Preservation of Buffers	Define, delineate and preserve naturally vegetated buffers along perennial streams, rivers, shorelines and wetlands.
Reduction of Clearing and Grading	Limit clearing and grading to the minimum amount needed for roads, driveways, foundations, utilities and stormwater management facilities.
Locating Development in Less Sensitive Areas	Avoid sensitive resource areas such as floodplains, steep slopes, erodible soils, wetlands, mature forests and critical habitats by locating development to fit the terrain in areas that will create the least impact.
Open Space Design	Use clustering, conservation design or open space design to reduce impervious cover, preserve more open space and protect water resources.
Soil Restoration	Restore the original properties and porosity of the soil by deep till and amendment with compost to reduce the generation of runoff and enhance the runoff reduction performance of post construction practices.

EPA Stormwater Rulemaking

- "By ~~**September 30, 2011**~~, [Soon?] EPA will propose a regulation under section 402(p) of the Clean Water Act to expand the universe of regulated stormwater discharges and to control, at a minimum, stormwater discharges from newly developed and redeveloped sites… EPA ~~will~~ [might?] take final action on the regulation by **November 19, 2012**."

What's it for?

- Objective is to maintain or restore receiving water form and function by reducing pollutant loads and stream channel erosion
- Preferred approach is to require post-construction hydrology to mimic natural hydrology

Rulemaking Considerations

- Establishing substantive post-construction requirements for new and redevelopment
- Expanding the universe of regulated discharges beyond the urbanized area
- Addressing stormwater discharges from existing development through retrofitting
- Establishing specific requirements for transportation
- Establishing specific provisions for the Chesapeake Bay

Post-Construction Requirements

EPA will consider

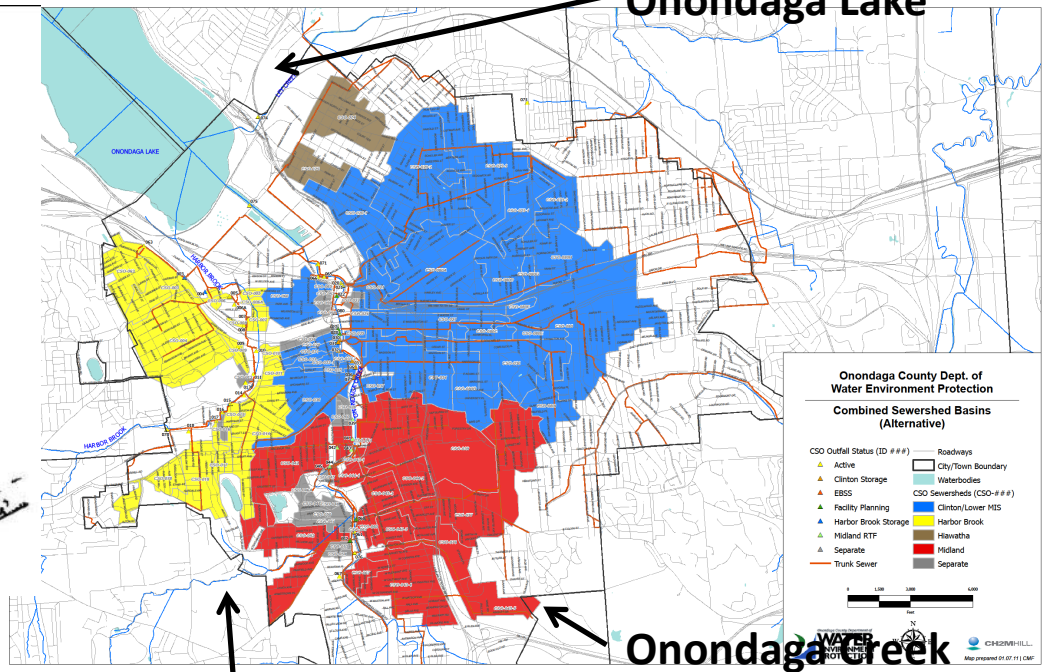
- Whether the standard should be different for discharges from new development vs. redevelopment
- What flexibility must be included to account for local variability, site constraints and water rights law
- Whether unique standards be developed for transportation

Post-Construction Requirements

- Standard could include:
  - On-site retention of a certain size storm event determined by EPA
  - On-site retention of a certain size storm event determined by permitting authority [DEC]
  - Other approach determined by permitting authority and consistent with objective

Onondaga County, New York

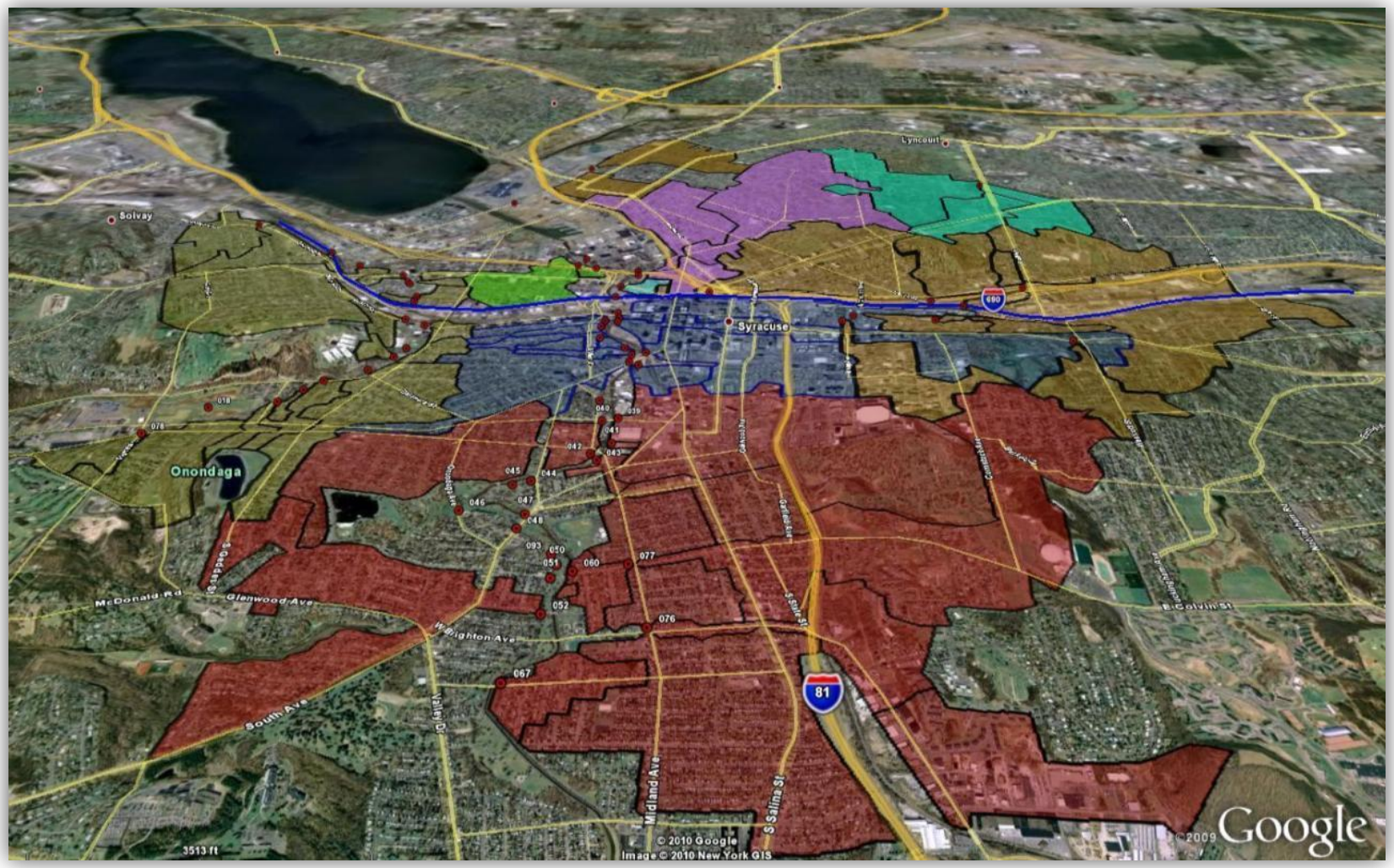
City of Syracuse



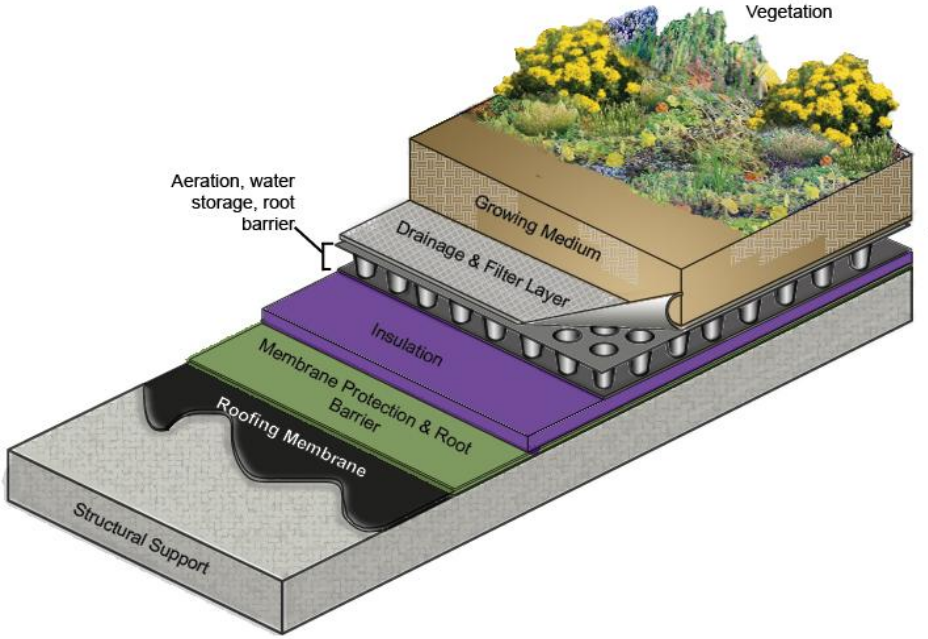
- 7,660 acres
- 49 CSOs

6.3% Capture Using Green Infrastructure (GI)

- Green 470 acres and reduce 247 MG/yr of CSO by 2018

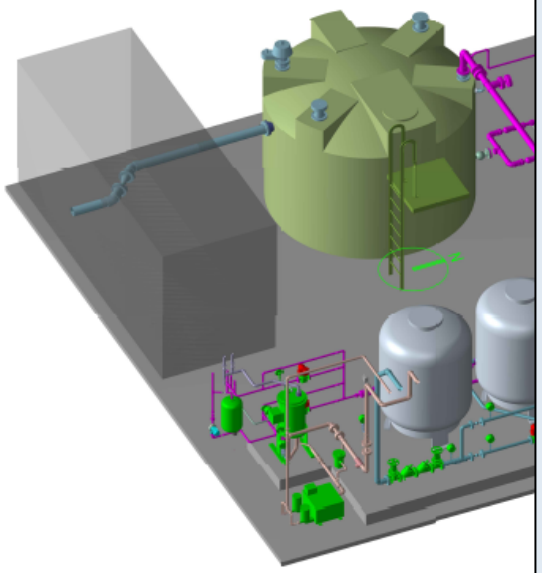


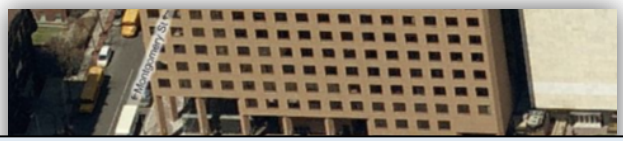
OnCenter Convention Center
60,000 Square Foot Green Roof



GI Technology:	Green Roof
Project Owner:	Onondaga County
Capture Area:	59,000 square feet
Runoff Reduction:	1,033,000 gallons/yr
Construction Cost:	$1,038,000 (bid)
$/gallon:	$1.00

OnCenter War Memorial Water Reuse



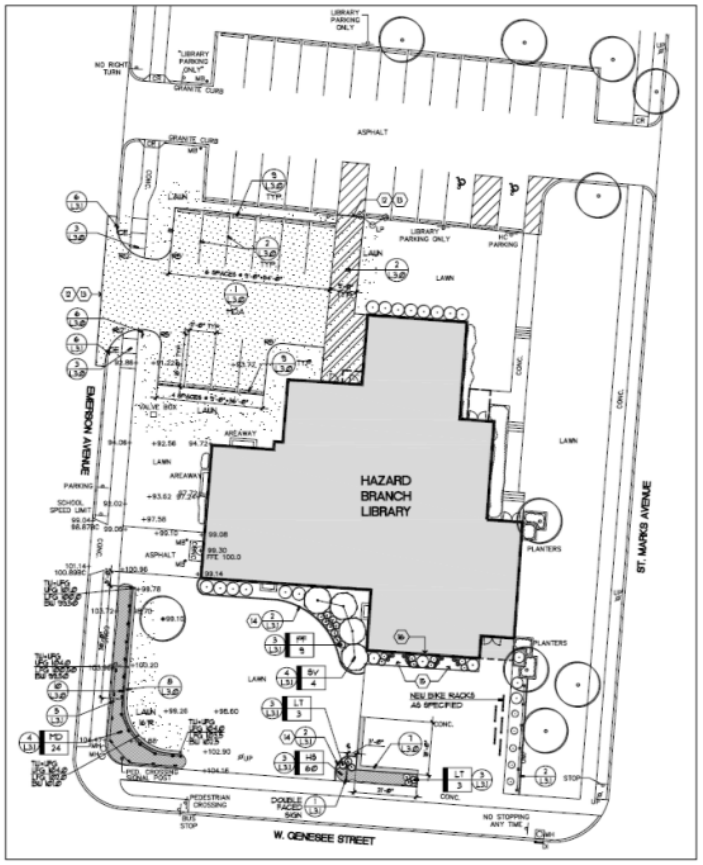


GI Technology:	Rain cistern
Project Owner:	County
Capture Area:	44,000 square feet
Runoff Reduction:	400,000 gallons/yr
Construction Cost:	$1,229,000 (bid)
GI Grant:	$720,000
$/gallon:	$1.80 without grant $1.27 with grant
Estimated Annual Potable Water Savings:	127,000-300,000 gallons

Reusing rainwater allows the ice making to
than using potable water resul

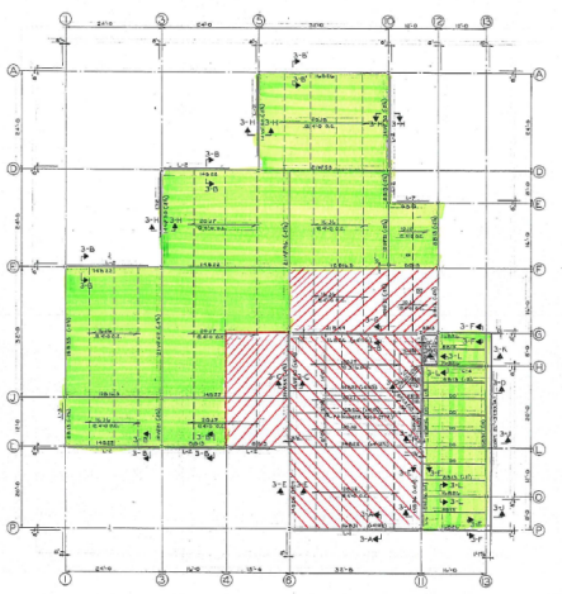
Wetland Restoration Project

Green Roof at Hazard Branch Library

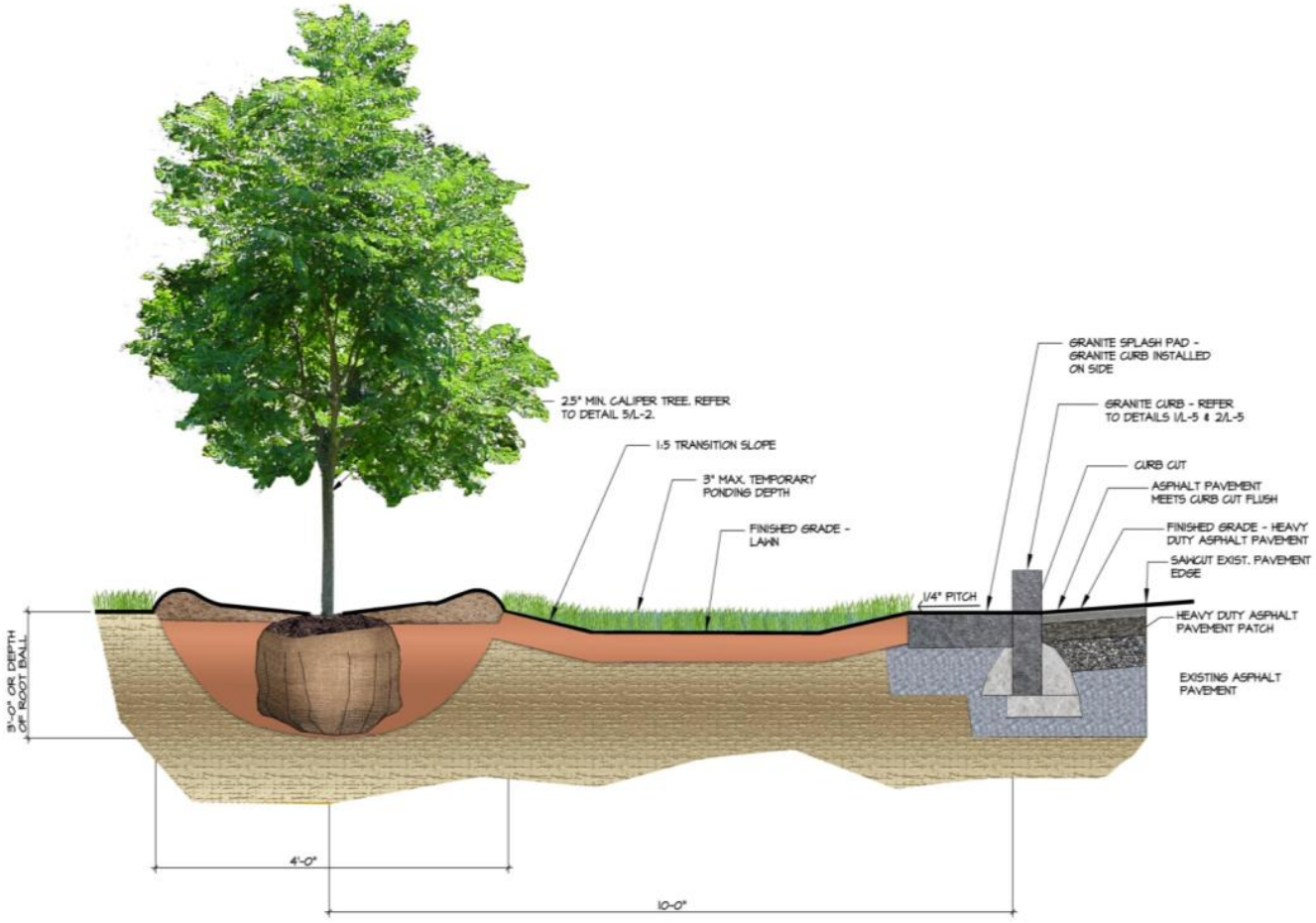


LAYOUT PLAN

- Roof Membrane 2010
- Green Planting, Spring 2011
- 563,000 gallons/year CSO reduction



Street Tree Plantings – 8,500 by 2018



GI Technology:
600 trees

Project Owner:
various

Capture Area:
53,000 square feet

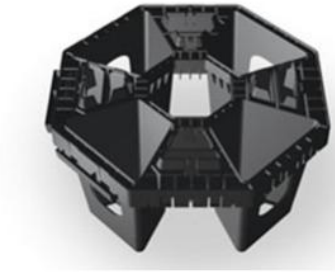
Runoff Reduction:
1,200,000 gallons/year

Construction Cost:
$122,350 (bid)

$/gallon: $0.10

Structural Soil Systems Allow for Adequate Rooting Volume and Provide Stormwater Management Opportunities

Silva Cell



StrataCell

Modular Storage Units?
(e.g. StormTank)

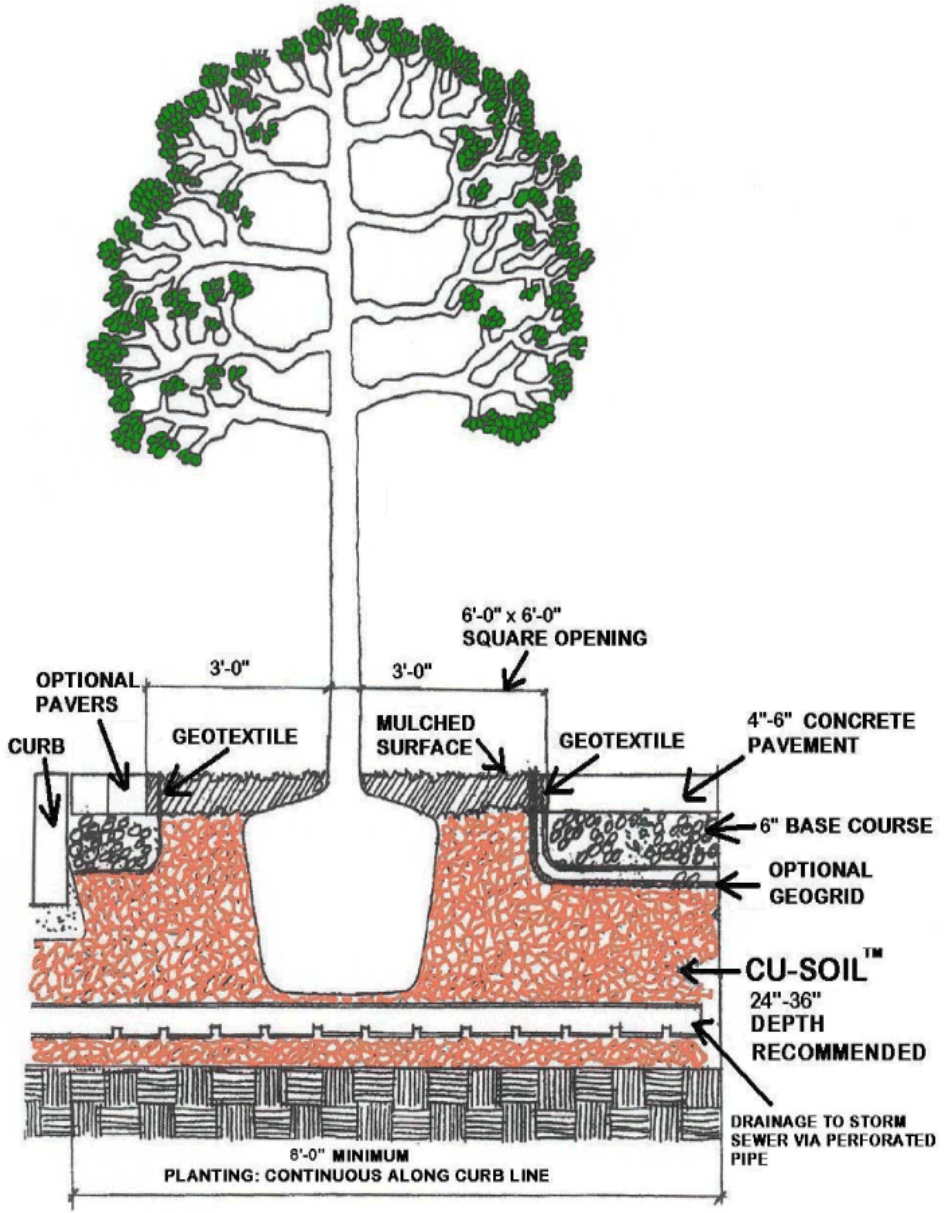
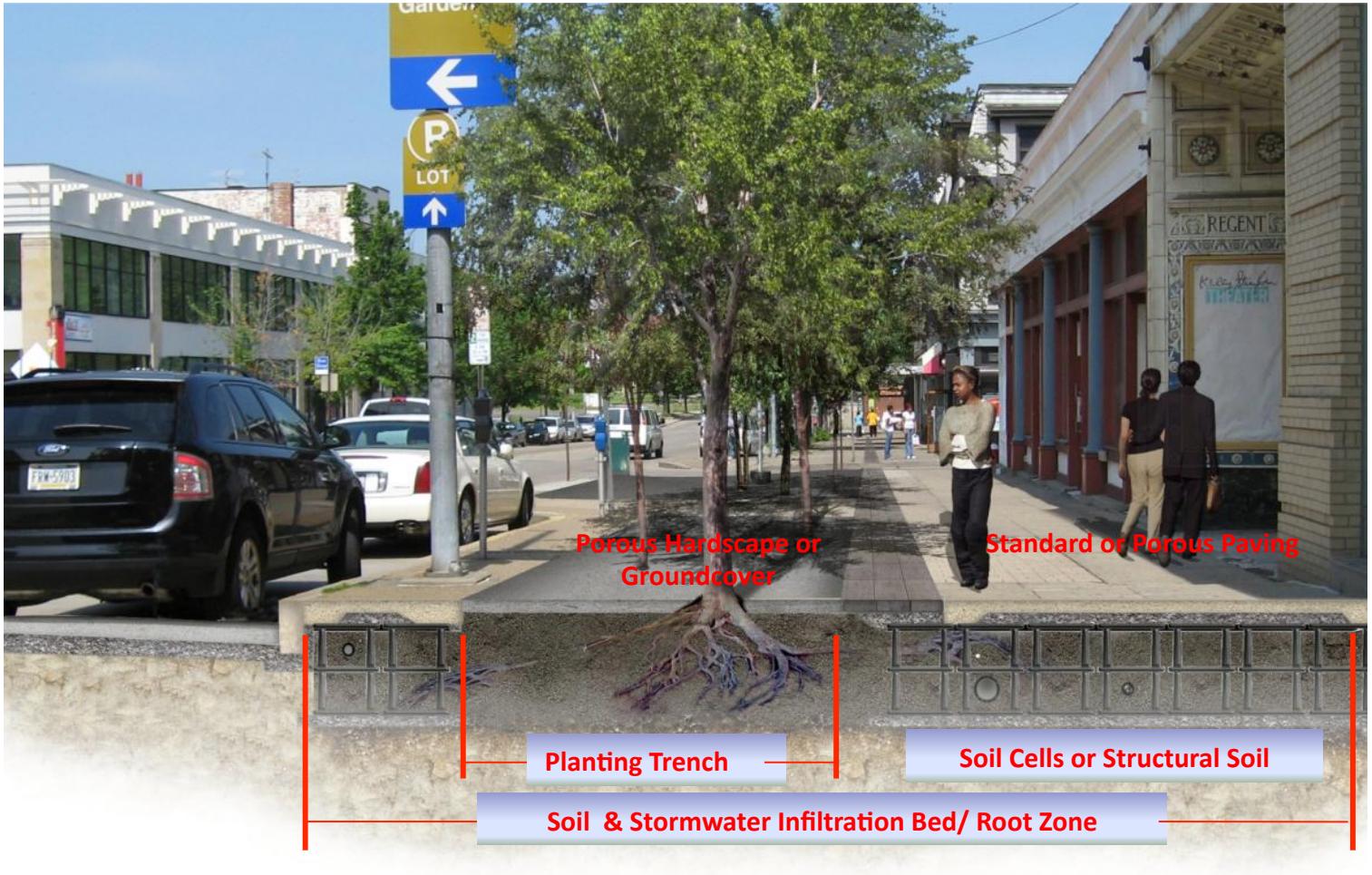


Photo: Country View, Inc.

Goal: Provide 400-1200 cubic feet of soil per tree (varies depending on size & species)



Rendering by Viridian Landscape Studio

Creekwalk Project Greening: Jefferson to Walton

Porous Asphalt
Strip in Parking Lot

Bioretention
Rain Garden

Flexi-pave Porous
Walkway

Porous Asphalt
Parking Lot

Volume capture: 135,000 gallons/year

A Variety of Porous Pavement Systems Can be Used

Porous Pavers

Porous Concrete

Porous Asphalt

Porous Resin Bonded Aggregate

Porous Pavement / Infiltration Practices in Onondaga County, NY

- Design Assumptions / Guidelines:
  - Static storage of first inch of runoff
  - Maximum loading ratio of 10:1 (impervious area to infiltration area); 5:1 is preferred
  - Geotextile liner separating rock from soil (non-woven or woven… or sand?)
  - Impervious liner where needed (proximity to utilities, buildings, etc)
  - Observation well and cleanouts
  - Perforated distribution pipe and/or underdrain

Porous Pavement / Infiltration Practices in Onondaga County, NY

- More Design Assumptions / Guidelines:
  - Dewater within 72 hours
  - Level bed/trench bottom
  - Maximum surface grade change of 1-2 feet; steeper sloped areas may warrant a change in bottom elevation (via berms or other)
  - Upper 3” of the infiltration bed subgrade should be scarified prior to bed installation (if necessary)
  - Total facility depth should between 24-31 inches (frost consideration)
  - Protect existing utilities

Porous Pavement / Infiltration Practices in Onondaga County, NY

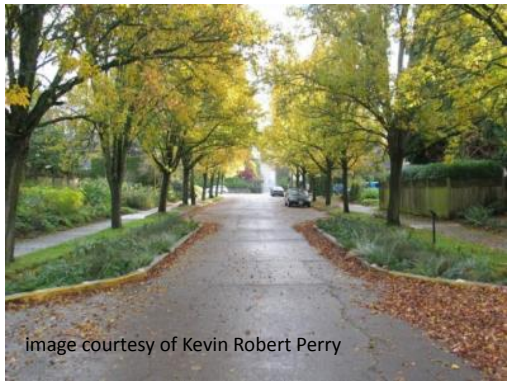
- More Design Assumptions / Guidelines:
  - Setbacks:
    - 10ft to buildings with basements
    - 3ft to buildings without basements
    - 3ft from utility structures, vents, poles, etc

Developing Green Street Prototypes to Reduce Urban Runoff and Combined Sewer Overflows

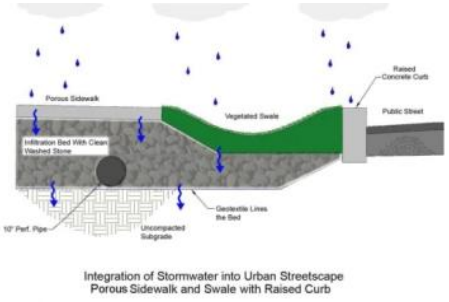
CH2M HILL:
Andrew Potts, P.E.
Daniel Wible, P.E.
Brian Marengo, P.E.

CH2MHILL

Why Green Streets?



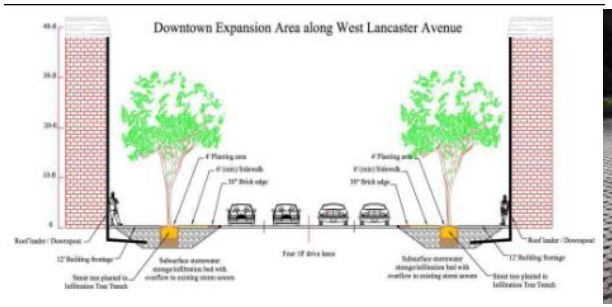
- Because they represent 25-35% of the total urban impervious area
- Because opportunities often exist within the Right-of-Way, even in confined urban areas (utilities, etc)
- Reduce runoff volume and improve water quality (infiltration, evapotranspiration, filtration, detention, etc)
- Reduce combined sewer overflows (CSOs)
- Align well with urban greening efforts and goals (Green Infrastructure); good for business, property values, etc



Integration of Stormwater into Urban Streetscape
Porous Sidewalk and Swale with Raised Curb

Green Streets achiev
multiple objectives

- Enhance pedestrian accessibility
- Reduce or eliminate localized flooding
- Provide traffic calming (vegetated curb extensions, porous pavement, etc)
- Improve street aesthetics (i.e. visual enhancement)
- Provide educational opportunities
- “Greening the grey”
- “Piggyback” with utility or other improvements



Green Street Technologies

- Porous Pavement
- Infiltration Trenches
- Vegetated Curb Extensions and Swales
- Inlet Filter Inserts and Water Quality Inlets
- Tree Infiltration Trenches and Enhanced Street Trees
- Planters and Bioretention
- Pavement removal
- Others?
- Factors: maintenance, cost, aesthetics, space, constructability, integration with other site features, etc

Looking Forward and Beyond

- Moving from CSOs to suburban MS4s
- Demonstration Projects
- Participating in NYS Great Lakes Green Infrastructure communities; soon expanding to additional upstate communities
- Inter-government collaboration; sharing between communities; stormwater coalitions
- New EPA stormwater rule

Want to know more?

- Save the Rain Website:
  www.savetherain.us
- US EPA's Green Infrastructure website:
  www.epa.gov/greeninfrastructure
- NYS Department of Environmental Protection:
  http://www.dec.ny.gov/chemical/8468.html
- Center for Watershed Protection:
  http://www.cwp.org/

Contact Us

Khris Dodson

Communications and Program Manager

Environmental Finance Center

315-443-8818

kdodson@syracusecoe.org

Environmental Finance Center
Syracuse University