Green Infrastructure: Not Just About the Water

Moderator
Roxanne Blackwell
Director of Federal Government Affairs, American Society of Landscape Architects

Panelists
Kyle Dreyfuss-Wells
Manager of Watershed Programs, Northeast Ohio Regional Sewer District

Mark A. Focht, PLA, FASLA
First Deputy Commissioner of Parks and Facilities, City of Philadelphia, PA

Christopher Wierzbicki, PE
Deputy Director, Road Services Division, King County Department of Transportation

Stacey Eriksen
Urban Watershed Revitalization Coordinator USEPA Region 8

Tamara Mittman
Environmental Engineer, US EPA Office of Wastewater Management

ASLA Green Roof:
Michael Van Valkenburgh
Green Infrastructure: The Triple Bottom Line

City of Greensburg Main Street Streetscape
BNIM

Nueva School
Andrea Cochran Landscape Architecture

Sonoran Landscape Laboratory
Ten Eyck Landscape Architects, Inc.

Green Infrastructure: Not Just About the Water
Green Infrastructure
Systems that mimic a natural hydrologic cycle to take stormwater & slow it down, spread it out, & soak it in.

Green Roofs, Planter Boxes, Rain Gardens, Bioswales / Bioretention Cells, Vegetated Swales, Tree Trenches, Ponds, Porous Pavements, Wetlands, Riparian areas, Rainwater Harvesting, etc.

Can be integrated into:
✓ Parks, open space, urban forestry
✓ Parking lot landscaping requirements
✓ Climate adaptation strategies
✓ Smart growth / sustainability / resilience strategies
✓ Flood restoration
Value of Green Infrastructure

- Stormwater management
- Climate adaptation
- Urban heat island reduction
- Biodiversity
- Air quality improvements
- Clean water
- Healthy soils
- Recreation
- Quality of life
Green Infrastructure Resources

Green Infrastructure Case Studies

www.asla.org/stormwater

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Green Infrastructure: Not Just About the Water

The Innovative Stormwater Infrastructure Act (H.R. 3449, S.1677)

- Implementation Grants
- Technical Assistance (model codes, BMPs)
- Regional Centers of Excellence

Green Infrastructure Policy

City of Greensburg Main Street Streetscape

BNIM
Green Infrastructure: Not Just About the Water

- Provides less expensive, and more cost-effective, approaches to managing runoff.

Green Infrastructure Can Save Municipalities Money and Provide Economic Benefits Community-wide

A joint report by American Rivers, the Water Federation, the American Society of Landscape Architects, and ECONorthwest.
Green Infrastructure: Not Just About the Water

A joint report by American Rivers, the Water Federation, the American Society of Landscape Architects, and ECONorthwest.

- Provides less expensive, and more cost-effective, approaches to managing runoff.

- Increases energy efficiency and reduces energy costs
Green Infrastructure: Not Just About the Water

- Provides less expensive, and more cost-effective, approaches to managing runoff.
- Increases energy efficiency and reduces energy costs
- Reduces the economic impacts associated with flood events

GREEN INFRASTRUCTURE CAN SAVE MUNICIPALITIES MONEY AND PROVIDE ECONOMIC BENEFITS COMMUNITY-WIDE

A joint report by American Rivers, the Water Federation, the American Society of Landscape Architects, and ECONorthwest.
Green Infrastructure: Not Just About the Water

• Provides less expensive, and more cost-effective, approaches to managing runoff.
• Increases energy efficiency and reduces energy costs
• Reduces the economic impacts associated with flood events
• Protects public health and reduces illness-related costs

GREEN INFRASTRUCTURE CAN SAVE MUNICIPALITIES MONEY AND PROVIDE ECONOMIC BENEFITS COMMUNITY-WIDE

A joint report by American Rivers, the Water Federation, the American Society of Landscape Architects, and ECONorthwest.
Green Infrastructure: Not Just About the Water

Kyle Dreyfuss-Wells
Manager of Watershed Programs, Northeast Ohio Regional Sewer District
Green Infrastructure:
Not Just About the Water

Project Clean Lake
Great Lake • Great Future

Northeast Ohio Regional Sewer District
Green Infrastructure: Not Just About the Water

Northeast Ohio Regional Sewer District

355 square miles
Northeast Ohio Regional Sewer District Responsibility

- $3 billion in 25 years
- CSO control
- Sewer fees
- Regional flooding and erosion issues
- Impervious surface fee
Northeast Ohio Regional Sewer District Responsibility

- $3 billion in 25 years
- CSO control
- Sewer fees
- Regional flooding and erosion issues
- Impervious surface fee

Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water

Project Clean Lake: The gray and the green of CSO control

Northeast Ohio Regional Sewer District
What is a Combined Sewer?

Dry Weather Flow to treatment plant

Additional Conveyance Capacity Available for wet-weather

Combined Sewer Overflow Discharge to Stream/Lake
What is a Combined Sewer Overflow?
Green Infrastructure: Not Just About the Water

Combined Sewer Area
Green Infrastructure: Not Just About the Water

126 CSO Locations Throughout Combined Sewer Area
EPA Requires CSO Problem Reduced in 25 Yrs

Baseline (1970s) | Early 2000s | Re-Baseline (2011) | Target (2036)

9 | 6.2 | 4.5 | 0.494

Typical Year CSO Volume Remaining (BG)

96% Capture

Green Infrastructure: Not Just About the Water
CSO Consent Decree includes two options for Green Infrastructure

Appendix 3: “Gray plus Green” (District Green Infrastructure Plan December 2011)

Appendix 4: “Gray vs. Green” (Opportunity to “right-size” gray using green)
CSO Consent Decree includes two options for Green Infrastructure

Appendix 3: “Gray plus Green” (District Green Infrastructure Plan December 2011)

Appendix 4: “Gray vs. Green” (Opportunity to “right-size” gray using green)

**Appendix 3 Green Infrastructure**

$42 Million for 44 Million Gallons in 8 Years with Green Infrastructure
NEORSD GREEN INFRASTRUCTURE
Looking across combined sewer area for opportunities to manage stormwater before it enters combined system
Project Clean Lake
Promoting GI for CSO Control in Cleveland

• Engage City of Cleveland
  • They have the land
  • We have the consent decree

• Work with Community Development Corporations and neighborhoods

• Connect to development activities
Appendix 3 GI Projects:
- ≈46 MG of CSO Control
- ≈$80 million Capital Cost
- 10 Projects: 2013-2019
Green Infrastructure: Not Just About the Water
Fleet Avenue Green Infrastructure Project

Green Infrastructure: Not Just About the Water
Fleet Avenue Green Infrastructure Control Measure

Existing Site
• 3 Vacant Parcels
• 0.27 total acres

Integrated with City street reconstruction

Green infrastructure result of neighborhood planning project
Fleet Avenue Green Infrastructure Project

Green Infrastructure: Not Just About the Water
### Green Infrastructure: Not Just About the Water

<table>
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<td>Fleet Avenue*</td>
<td>Q1 2014</td>
<td>$1,300,000</td>
<td>9.00</td>
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Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water
Urban Agricultural Innovation Zone
Urban Agricultural Innovation Zone – Existing Conditions
Urban Agricultural Innovation Zone – Existing Conditions
Green Infrastructure: Not Just About the Water

Rid-All Green Partners – Urban Agricultural Innovation Zone

Ohio State Extension
Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water
### Green Infrastructure: Not Just About the Water

<table>
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<td>Urban Agriculture</td>
<td>Q2 2014</td>
<td>$5,607,126</td>
<td>9.50</td>
<td>1.80</td>
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Assessment of Benefits

*Construction Costs only
(does not include O&M)
Assessment of Benefits

Life-Cycle Costs

Gray

Capital Costs
Operations & Maintenance Costs
Asset Life Period

Green

Capital Costs
Operations & Maintenance Costs
Asset Life Period
Assessment of Benefits

CO-BENEFITS

GRAY

Ecosystem Benefits
Job Creation

GREEN

Ecosystem Benefits
Job Creation
Environmental Justice
Energy Savings
Climate Change Effects
Provision of Recreation
Air Quality
Property Values
Aesthetics
NEORSD Green Infrastructure for CSO Control

Summary

• Project Clean Lake’s commitment to Green Infrastructure – Appendix 3 and Appendix 4
• $82 million committed to capture 46MG
  – Construction costs average $1.79/gallon
• Replace gray infrastructure with green
  – Actively searching for options
• Volume control
  – Stormwater capture ≠ CSO reduction
Green Infrastructure: Not Just About the Water

Mark A. Focht, PLA, FASLA
First Deputy Commissioner of Parks and Facilities, City of Philadelphia, PA
Philadelphia, PA

Population: 1,526,000 (2010)

Median Income: $37,090 (USD, 2008)

Persons Below Poverty Level: 23.8% (2008)

Land Area: 135 sq. mi.

Annual Rainfall: 42 inches
Green Infrastructure: Not Just About the Water

**TYPES OF SEWERS IN PHILADELPHIA**

**Combined Sewer**
- **Dry Weather**
  - Downspout
  - Storm drain
  - Sewage and stormwater
  - Dam
  - Outfall pipe to creek
  - Sewer to Water Treatment Plant

**Separate Sewer**
- **Dry Weather**
  - Downspout
  - Storm drain
  - Stormwater
  - Sewage
  - Outfall pipe to creek
  - Sewer to Water Treatment Plant

60% of Philadelphia

40% of Philadelphia
Green Infrastructure: Not Just About the Water

TYPES OF SEWERS IN PHILADELPHIA

Combined Sewer
- Wet Weather
- Downspout
- Storm drain
- Sewage and stormwater
- Dam
- Outfall pipe to creek
- Sewer to Water Treatment Plant

Separate Sewer
- Wet Weather
- Downspout
- Storm drain
- Stormwater
- Sewage
- Outfall pipe to creek
- Sewer to Water Treatment Plant

60% of Philadelphia

40% of Philadelphia
TRIPLE BOTTOM LINE BENEFITS

Economic/Environmental/Social

Environmental Benefits
- Fishable, Swimmable
- Habitat Enhancement
- Air Quality
- Energy Savings
- Carbon Footprint

Social Benefits
- Recreation
- Aesthetics
- Public Health
- Equity

Economic Benefits
- Property Values
- Job Creation
- City Competitiveness

Green Infrastructure: Not Just About the Water

[Logos for American Society of Landscape Architects, Northeast Ohio Regional Sewer District, and Philadelphia Parks & Recreation]
AN UNCONVENTIONAL PATH
Rationale for the Green Infrastructure Approach
GREEN CITY, CLEAN WATERS

• Maintain and upgrade the infrastructure network
• Advance City-wide Sustainability Programs
• Improve public health / quality of life
  – greening our neighborhoods,
• Transform river and stream corridors
  – restoring our waterfronts,
  – improving our outdoor recreation spaces, and
• Preserve and restore aquatic habitat
• Maximize return on every dollar spent
April 10, 2012: The U.S. EPA and the City of Philadelphia joined in a partnership to advance green infrastructure for urban wet weather pollution control. This partnership demonstrates EPA’s strong support for sustainable storm water management yielding multiple benefits for community livability and other urban environment improvements.

“[Philadelphia] has earned a place as a national and global leader on sustainable innovation and clean water protection.”

Lisa Jackson, EPA Administrator

June 1, 2011

25-year Program

June 1, 2036

Green Infrastructure: Not Just About the Water
GREEN CITY, CLEAN WATERS

Green Stormwater Infrastructure
$800 million

Wet Weather Treatment Plant Upgrades
$200 million

Adaptive Management
$200 million

Green Infrastructure: Not Just About the Water
WHAT IS A “GREENED ACRE”?  
Rationale for the Green Infrastructure Approach

Greened Acre (GA) = one acre-inch = 27,158 gallons

- One Greened Acre is equivalent to 1 inch of managed stormwater from 1 acre of impervious drainage area, or 27,158 gallons of stormwater.

GA = IC * Wd

Impervious cover  Water Depth
## Green Stormwater Goals

<table>
<thead>
<tr>
<th>Year</th>
<th>Greened Acres</th>
<th>Square Miles</th>
<th>% Impervious cover removed</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>750</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>10</td>
<td>2,100</td>
<td>3</td>
<td>8%</td>
</tr>
<tr>
<td>15</td>
<td>3,800</td>
<td>6</td>
<td>14%</td>
</tr>
<tr>
<td>20</td>
<td>6,400</td>
<td>10</td>
<td>23%</td>
</tr>
<tr>
<td>25</td>
<td>9,600</td>
<td>15</td>
<td>34%</td>
</tr>
</tbody>
</table>
7th and Washington

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Green Public Open Space

- Water Inlet
- Drainage Area
- Entry Walk
- Drainage Swale
- Rain Garden
- Performance Stage
- SLOped Lawn
- Cabion WALL
Green Public Facilities
Columbus Square

Green Infrastructure:
Not Just About the Water
Green Schools

Greenfield Elementary
Center City

Wissahickon Charter
East Falls

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Green Infrastructure: Not Just About the Water

Green Homes Pilot Project
The Big Green Block

Green Infrastructure: Not Just About the Water
The Big Green Block
New Kensington H.S.

Photo by Paul Rider

Green Infrastructure: Not Just About the Water
Green Infrastructure:
Not Just About the Water

The Big Green Block
Shissler Rec Center
The Big Green Block
Shissler Rec Center
Green Homes / Green Public Open Space
Ingersoll Homes & Park

Green Infrastructure:
Not Just About the Water
Can achieve approximately **two ‘Greened Acres’** by redirecting surface and sub-surface drainage to Ingersoll Park.
Green Homes / Green Public Open Space
Ingersoll Homes & Park

Green Infrastructure:
Not Just About the Water
Green Infrastructure: Not Just About the Water

Green Homes / Green Public Open Space
Ingersoll Homes & Park
GREEN CITY, CLEAN WATERS LESSONS LEARNED

- Importance of city-wide planning frameworks
- Strong mayoral commitment
- Increased resources
- Concurrent policy efforts
- New partnerships and shared agendas across city agencies
- Commitment to equity and sustainable investment
- Community support
TRIPLE BOTTOM LINE BENEFITS

Economic Benefits
- Annually, **250 people** are expected to be employed in green jobs.
- Increase of up to **$390 million** in property values near parks and green areas over the next 45 years.

Social Benefits
- Increase of up to **10% more** visits to Parks & Recreation sites.
- Reduction of up to **140 fatalities** caused by excessive heat over the next 45 years.
- Up to **1-2 avoided** premature deaths, **20 avoided** deaths from asthma and up to **250 fewer** missed school or work days per year.

Environmental Benefits
- Up to **1.5 billion lbs.** of carbon dioxide emission avoided or absorbed, equivalent to removing close to **3400 vehicles** from roadways each year.
- Up to **$8.5 million** in water quality and habitat improvements over 40 years.

Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water

Christopher Wierzbicki, PE
Deputy Director, Road Services Division,
King County Department of Transportation

Washington Mutual Center Roof Garden
Phillips Farevaag Smallenberg
Winslow Way Reconstruction
City of Bainbridge Island, WA

Presenter: Christopher Wierzbicki, PE
Currently: King County DOT Roads Deputy Director
Formerly: City of Bainbridge Island Deputy Planning Director

Green Infrastructure:
Not Just About the Water
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“...in a great urban street, nobody gets everything they want...everybody gets some of what they want and everybody is safe.”

- Jane Jacobs
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Green Infrastructure: Not Just About the Water

**Tax Supported**
- Undergrounding Power
- Sidewalks
- Parking
- Drive lanes
- Street Lighting
- Furnishings
- Landscaping

**Utility Supported**
- Storm Drainage
- Water
- Sanitary Sewer
- Engineering
- Owner Costs

**CB** = Councilmanic Bonds ($? M)
**VB** = Voted Bonds ($? M)
**TF** = PW Trust Fund Loans (<$10 M)
**G** = Grants ($0.8 M)
**LID** = Local Imp. District (~$0.75 M)
**BID** = Business Imp. District (~$0.75 M)
**TRD** = Trans. Benefits District (<$5 M)
**UB** = Utility Bonds (~$7.5 M)
Identify Service Areas

Green Infrastructure: Not Just About the Water
<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>LID (sewer)</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Water Utility</td>
<td>$750,000</td>
</tr>
<tr>
<td>Sewer Utility</td>
<td>$0</td>
</tr>
<tr>
<td>SSWM Utility</td>
<td>$30,000</td>
</tr>
<tr>
<td>General Fund</td>
<td>$0</td>
</tr>
<tr>
<td>State Grant (trans, storm)</td>
<td>$2,208,206</td>
</tr>
<tr>
<td>Federal Grant (trans, storm)</td>
<td>$1,673,000</td>
</tr>
<tr>
<td>WSDOT</td>
<td>$50,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$5,711,206</strong></td>
</tr>
</tbody>
</table>
Green Infrastructure: Not Just About the Water
7 new council members
1 change in the form of government
5 city managers
1 ratepayer lawsuit
7 new department heads
30% downsizing of staff
Green Infrastructure:
Not Just About the Water
Green Infrastructure: Not Just About the Water

Stacey Eriksen
Urban Watershed Revitalization Coordinator
USEPA Region 8
Green Infrastructure in the Semi-Arid West

New Partners for Smart Growth Conference
February 15, 2014

Stacey Eriksen
Urban Watershed
Revitalization Coordinator
Eriksen.Stacey@epa.gov
303-312-6692
EPA Voluntary Programs

- Urban Waters Partnership
- Partnership for Sustainable Communities
- Green Infrastructure
- Water Sense
- Brownfields
- Revitalization
- Support for FEMA
Improving the Approach to Stormwater Management

Traditional approach - convey stormwater quickly from site to waterbody or detention ponds

Approach is not adequately controlling water quality & quantity impacts from discharges from increased development: pollutant loading, stream erosion, increased runoff/reduced infiltration, changes to stream geomorphology & impacts to aquatic habitat

New approach - using Low Impact Development / Green Infrastructure
• View stormwater as a resource
• Manage stormwater on-site
• Reduce pollutant loads to waterbodies

Green Infrastructure: Not Just About the Water
Denver Housing Authority

- Rain gardens & pervious pavements in their Park Ave development.
- Decreased stormwater infrastructure costs from $850K (vault) to $350K (bioswales & permeable pavements).
- Estimates that they will save $3M at it’s Mariposa site using LID/GI rather than grey infrastructure.

Communities will spend 2-3 times more total to implement stormwater BMPs if each land owner goes it alone than if community pooled money & installed BMPs in optimal locations [http://www.epa.gov/ne/topics/water/pdfs/OptimalSWMngtPlanAlternativesUpperCharlesPilotStudy.pdf](http://www.epa.gov/ne/topics/water/pdfs/OptimalSWMngtPlanAlternativesUpperCharlesPilotStudy.pdf)


Use a systems thinking approach to calculate complete costs & benefits.
Barriers to GI in the Semi-Arid West

- Perceived design, construction & maintenance costs
- Mixed messages & lack of connections from different governmental agencies & departments
- Misperception on economics
- Lack of integration into regional & site planning
- Lack of trust in new technologies
Websites & Tools

- Western examples (CO, UT, MT, WY, ND, SD): http://www2.epa.gov/region8/green-infrastructure
- Barriers analysis in Boulder area: http://www.keepitcleanpartnership.org/
- EPA National Green Infrastructure webpage http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm
- New national stormwater calculator http://www.epa.gov/nrmrl/wswrd/wq/models/swc/
- Green infrastructure tools http://water.epa.gov/infrastructure/greeninfrastructure/
- Colorado Stormwater Center http://stormwatercenter.colostate.edu
UWP Green Infrastructure Projects Using EPA Funding

- DHA GI design charette
- Westerly Creek GI design
- ULC GI design for 38th & Blake
- S. Platte Brownfields corridor planning
- River North GI design
- Sun Valley & Johnson/Habitat Park GI design
- Dry Gulch GI Design
Lessons Learned: Stormwater/GI Charette-DHA

- Look beyond project boundaries to ensure a comprehensive approach & solution
- Identify all key stakeholders & stormwater plans before developing a regional solution
- Identify priorities & tradeoffs between water quantity & water quality solutions
- Define clear goals & metrics of success
- Collaboration & prioritization among city players is crucial for the successful implementation of solutions
- Innovative solutions may require research & testing
- City policies may limit the implementation & effectiveness of some stormwater strategies
Leveraging Resources & Partnerships: GI Technical Assistance Program
Blake TOD: Located at the Intersection of 2 transit lines
Blake TOD: Before

Green Infrastructure: Not Just About the Water

[Logos for American Society of Landscape Architects, Northeast Ohio Regional Sewer District, World Wildlife Fund, and Philadelphia Parks & Recreation]
A Broader Area Vision in 3 Phases

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Green Infrastructure: Not Just About the Water

Analyzing the Site

Designing to the Site
Toolbox Examples

Green Infrastructure: Not Just About the Water
# Phase I Subcatchment Delineations & Runoff Volumes

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Subcatchment Drainage Area (sq ft)</th>
<th>$C_{composite}$</th>
<th>Required Storage Volume for 1-year, 2-hour Storm (cu ft)</th>
<th>Required Storage Volume for 100-year, 2-hour Storm (cu ft)</th>
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<tbody>
<tr>
<td>01</td>
<td>7,990</td>
<td>0.90</td>
<td>610</td>
<td>1,790</td>
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<tr>
<td>02</td>
<td>13,650</td>
<td>0.85</td>
<td>990</td>
<td>2,880</td>
</tr>
<tr>
<td>03</td>
<td>18,900</td>
<td>0.66</td>
<td>1,070</td>
<td>3,120</td>
</tr>
<tr>
<td>04</td>
<td>7,170</td>
<td>0.85</td>
<td>520</td>
<td>1,510</td>
</tr>
<tr>
<td>05</td>
<td>8,000</td>
<td>0.85</td>
<td>580</td>
<td>1,680</td>
</tr>
<tr>
<td>06</td>
<td>25,000</td>
<td>0.66</td>
<td>1,400</td>
<td>4,080</td>
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## Phase I Green Infrastructure Practice Proposed Location & Sizing

<table>
<thead>
<tr>
<th>Subcatchment</th>
<th>Green Infrastructure Practice Type</th>
<th>Location</th>
<th>Width (ft)</th>
<th>Length (ft)</th>
<th>Surface Area (sq ft)</th>
<th>Available Water Storage Volume (cu ft)</th>
<th>Overflow Volume to Underground Detention (cu ft)</th>
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<tbody>
<tr>
<td>01</td>
<td>Planter Box¹</td>
<td>Sidewalk</td>
<td>4.5</td>
<td>189</td>
<td>851</td>
<td>1,800</td>
<td>0</td>
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<tr>
<td>02</td>
<td>Planter Box</td>
<td>Sidewalk</td>
<td>5</td>
<td>95</td>
<td>2,871</td>
<td>3,184</td>
<td>0</td>
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<tr>
<td>03</td>
<td>Bioretention</td>
<td>Perimeter of circular park</td>
<td>11</td>
<td>261</td>
<td>2,871</td>
<td>3,184</td>
<td>0</td>
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<tr>
<td>04</td>
<td>Planter Box</td>
<td>Sidewalk</td>
<td>4.5</td>
<td>81</td>
<td>729</td>
<td>1,543</td>
<td>0</td>
</tr>
<tr>
<td>05</td>
<td>Planter Box</td>
<td>Adjacent to driveway</td>
<td>16</td>
<td>50.4</td>
<td>806</td>
<td>1,707</td>
<td>0</td>
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<tr>
<td>06</td>
<td>Green Roof², Bioretention</td>
<td>Open area behind building</td>
<td>17</td>
<td>167</td>
<td>2,839</td>
<td>4,081</td>
<td>0</td>
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<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>9,499</td>
<td>15,211</td>
<td>0</td>
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</table>

¹ If curbside parking is allowed on this block, pedestrian “bridges” will be needed to cross from the curbside parking to the sidewalk.

² Subcatchment 06 is partially treated by a green roof draining to the bioretention area.
Operations & Maintenance Considerations

- Monitor infiltration & drainage
- Pruning & mowing
- Mulching and mulch removal
- Watering and fertilization
- Remove and replace dead plants
- Inlet, outlet, and underdrain inspections
- Miscellaneous upkeep
- All at different frequencies
Lessons Learned from ULC Design & Charrette

• Comprehensive gathering of local stakeholders leads to a better more implementable design.

• Holistic approach with GI incorporated into the site design improved design & saves money.

• Considering possible future phases led to a better design and made efficient use of resources.

• Environmental conditions affect GI options.

• Cost estimates make incorporating recommendations more likely.
Thank You!

Reduce Runoff - Slow it Down, Spread it Out, Soak it in

Green Infrastructure: Not Just About the Water
Green Infrastructure: Not Just About the Water

Tamara Mittman
Environmental Engineer,
US EPA Office of Wastewater Management
EPA’s Green Infrastructure Program

GOAL: To support the use of green infrastructure to manage stormwater, protect public health and the environment, and enhance community livability.

FOCUS AREAS:

• Federal coordination
• Clean Water Act regulatory support
• Research and information exchange
• Funding and financing
• Partnerships and capacity building
EPA’s Smart Growth Program

GOAL: To help communities grow in ways that expand economic opportunity, protect public health and the environment, and create and enhance the places that people love.

FOCUS AREAS:
- Research
- Tools
- Partnerships
- Case studies
- Grants and technical assistance
Capacity Building

- Technical Assistance Programs
- Funding Sources
- Green Infrastructure Partners
- Campus RainWorks
Green Infrastructure Technical Assistance Program

- Since 2012, EPA’s Office of Water has provided more than $1.7 million in direct assistance to local communities.
- Goal is to build capacity to implement green infrastructure and share lessons learned.
- Projects are identified through a Request for Letters of Interest posted on the Green Infrastructure website (www.epa.gov/greeninfrastructure).
- Selected projects have included code and ordinance reviews, cost benefit analyses, and development of green infrastructure designs.
Community Summit on Green Infrastructure

- In October 2013 EPA and Onondaga County, NY hosted a summit for EPA’s green infrastructure technical assistance communities
- 27 communities gathered to share their experiences implementing green infrastructure
- Best management practices identified at the Summit will be compiled into a recommendations report
Building Blocks for Sustainable Communities

• Since 2011, EPA’s Office of Policy has provided assistance to 131 communities

• Assistance consists of one- to two-day workshops to stimulate discussion about growth and development and build local capacity to implement sustainable approaches

• Workshops that address green infrastructure include:
  – Creating a green streets strategy
  – Land use strategies to protect water quality
  – Sustainable land use code audit
Greening America’s Capitals

• Since 2010, EPA’s Office of Policy has provided assistance to 18 capital cities

• Goal is to help state capitals develop an implementable vision of environmentally friendly neighborhoods that incorporate innovative green infrastructure strategies

• Projects are identified through a Request for Letters of Interest posted on the Smart Growth website (www.epa.gov/dced/)

• Outcomes of design assistance as well as lessons learned are posted on the Smart Growth website
Smart Growth Implementation Assistance

• Since 2005, EPA’s Office of Policy has provided direct technical assistance to 34 communities

• Assistance addresses either policy analysis (e.g., reviewing state and local codes, school siting guidelines, transportation policies) or public participatory processes (e.g., visioning, design workshops, alternative analysis, build-out analysis)

• Projects are identified through a Request for Letters of Interest posted on the Smart Growth website (www.epa.gov/dced/)

• Final reports are also posted on the Smart Growth website
Clean Water State Revolving Fund

- The CWSRF program is available to fund a wide variety of water quality projects including all types of nonpoint source, watershed protection or restoration, and estuary management projects.
- Since 2009, the Green Project Reserve, or GPR, has required all CWSRF programs to direct a portion of their capitalization grant toward projects that address green infrastructure, water efficiency, energy efficiency, or other environmentally innovative activities.
- To date the GPR has provided $2 billion in loans, including $400 million for green infrastructure projects.
Section 319 Nonpoint Source Grants

• Under Section 319 of the CWA, EPA provides grants to states, territories and tribes to implement projects or programs that will help to reduce nonpoint sources of pollution

• In accordance with guidance issued by EPA, Section 319(h) funding decisions are made by the states. States submit their proposed funding plans to EPA. If a state’s funding plan is consistent with grant eligibility requirements and procedures, EPA then awards the funds to the state

• Total grant funding in 2013 was $155.9 million
Urban Waters Small Grants

• The goal of the Urban Waters Small Grants program is to fund local projects that will advance the restoration of urban waters while supporting community revitalization and other local priorities.

• Through the 2011/2012 competition, the program funded 55 projects in 36 states and Puerto Rico. Organizations received grants of $30,000-$60,000 for a total of $3.2 million.

• Through the 2012/2013 competition, the program will award approximately $1.6 million in grants of $40,000 - $60,000 each.
Brownfields Grants

- EPA's Brownfields Program provides direct funding for brownfields assessment, cleanup, revolving loans, and environmental job training
- Green infrastructure can be integrated into the reuse of brownfields properties to promote sustainable stormwater management as well as revitalization
Catalog of Federal Funding Sources for Watershed Protection

A searchable database of financial assistance sources (grants, loans, cost-sharing) available to fund a variety of watershed protection projects.
Green Infrastructure Partners

- EPA collaborates with 7 partner organizations to promote green infrastructure as an environmentally preferable approach to stormwater management
  - American Rivers
  - Association of Clean Water Administrators
  - Low Impact Development Center
  - National Association of Clean Water Agencies
  - Natural Resources Defense Council
  - Water Environment Federation
  - US Water Alliance
Recent publications/tools prepared by our partners include:

- The Green Edge: How Commercial Property Investment in Green Infrastructure Creates Value (NRDC, 2013)
- Hosting a Low Impact Development Design Competition (WEF, 2013)
- The Economic Benefits of Green Infrastructure: A Case Study of Lancaster, PA (CNT and American Rivers, 2014)
EPA’s Office of Water conducts an annual green infrastructure design contest for college and university students. Goals are to engage students in assessing the technical and economic potential of green infrastructure, to provide a hands-on learning experience, and to promote the use of green infrastructure on campuses. Since 2012, more than 300 student teams have submitted green infrastructure designs. Contest rules and winners are posted on the Campus RainWorks website (www.epa.gov/campusrainworks).
Green Infrastructure Tools

• EPA National Stormwater Calculator
• EPA Water Quality Scorecard
• USFS i-Tree
• CNT The Value of Green Infrastructure
National Stormwater Calculator

- In July of 2013, EPA released the National SW Calculator
- Goal is to assist development and design community in estimating runoff from a site given different land cover and BMP scenarios
- The National SW Calculator is a SWMM-based modeling tool that automatically accesses national soil and meteorological databases and calculates rainfall and runoff statistics for a site
- The green infrastructure controls that can be modeled include: downspout disconnection, rain gardens, planter boxes, infiltration trenches, green roofs, and permeable pavement
- A climate change module will be released in 2014
Water Quality Scorecard

• Released October, 2009

• Developed by EPA’s Smart Growth Program and EPA’s Office of Water with more than 11 external reviewers

• 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
i-Tree

- Released in August 2006

- A software suite that helps communities to strengthen their urban forest management efforts by quantifying the structure of community trees and the environmental services that trees provide

  - i-Tree Eco quantifies urban forest structure, environmental effects, and value to communities

  - i-Tree Streets assesses street tree populations

  - i-Tree Hydro assesses hydrological impact of vegetation and impervious cover on a watershed scale
The Value of Green Infrastructure

• Guide produced by the Center for Neighborhood Technology and American Rivers

• Provides a generalized methodology for valuing the multiple benefits of green infrastructure

• Compiles extensive research on the benefits of five green infrastructure practices in eight benefit categories: Water, Energy, Air Quality, Climate Change, Urban Heath Island, Community Livability, Habitat Improvement, Public Education
Questions?