Integrating Green Infrastructure into Nonpoint Source Management in Georgia

2018 National Nonpoint Source Training Workshop 11-6-2018
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Christine McKay, EPA Region 4
Overview

GA Land Development Trends

GA NPS Pollution and Water Resource Impacts

Green infrastructure Best Management Practices

Site, Neighborhood and Landscape/Watershed Scales

GA NPS Program Green Infrastructure

• NPDES stormwater policy and permits
• Project Examples
• Planning
• Technical Assistance + Research
• Training

Barriers to Adoption and Next Steps
Changes in Land Use: Housing Density

Housing Density in Georgia from 1970 – 2030 (Source: Radeloff, et al)
Current Land Development Practices Impact Water Quality and Quantity

2014 St. Marys Watershed Management Plan: "an additional cause for low dissolved oxygen is decreased base flow attributed to land alterations from development and the resulting increase in impervious surfaces."

Stormwater Hydrograph
### Water Quality: Urban Stream Syndrome

<table>
<thead>
<tr>
<th>Stressor Category</th>
<th>Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water / sediment quality</td>
<td>↑ nutrients</td>
</tr>
<tr>
<td></td>
<td>↑ toxics</td>
</tr>
<tr>
<td></td>
<td>Δ suspended sediment</td>
</tr>
<tr>
<td>Temperature</td>
<td>↑ temperature</td>
</tr>
<tr>
<td>Hydrology</td>
<td>↑ overland flow frequency</td>
</tr>
<tr>
<td></td>
<td>↑ erosive flow frequency</td>
</tr>
<tr>
<td></td>
<td>↑ stormflow magnitude</td>
</tr>
<tr>
<td></td>
<td>↑ flashiness</td>
</tr>
<tr>
<td></td>
<td>↓ lag time to peak flow</td>
</tr>
<tr>
<td></td>
<td>Δ baseflow magnitude</td>
</tr>
<tr>
<td>Physical habitat</td>
<td>↑ direct channel modification (e.g., channel hardening)</td>
</tr>
<tr>
<td></td>
<td>↑ channel width (in non-hardened channels)</td>
</tr>
<tr>
<td></td>
<td>Δ pool depth</td>
</tr>
<tr>
<td></td>
<td>↑ scour</td>
</tr>
<tr>
<td></td>
<td>↓ channel complexity</td>
</tr>
<tr>
<td></td>
<td>Δ bedded sediment</td>
</tr>
<tr>
<td>Energy sources</td>
<td>↓ organic matter retention</td>
</tr>
<tr>
<td></td>
<td>Δ organic matter inputs &amp; standing stocks</td>
</tr>
<tr>
<td></td>
<td>Δ algal biomass</td>
</tr>
</tbody>
</table>

Proctor Creek, West Atlanta, GA

Big Creek at Chattahoochee River from Roswell Road bridge. August 8, 2014
Map of GA Water Quality Monitoring Results 2014 Impairments
## Probable Sources of Impairments

**GA Rivers and Streams 2014**

### Site-specific Targeted Monitoring Results

**Probable Sources**  
*Georgia Rivers and Streams 2014*

<table>
<thead>
<tr>
<th>Probable Source</th>
<th>Probable Source Group</th>
<th>Miles Threatened or Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Point Source</td>
<td>Unspecified Nonpoint Source</td>
<td>6,420.0</td>
</tr>
<tr>
<td>Unspecified Urban Stormwater</td>
<td>Urban-Related Runoff/Stormwater</td>
<td>2,767.0</td>
</tr>
<tr>
<td>Industrial/Commercial Site Stormwater Discharge (Permitted)</td>
<td>Urban-Related Runoff/Stormwater</td>
<td>295.0</td>
</tr>
<tr>
<td>Municipal Point Source Discharges</td>
<td>Municipal Discharges/Seavage</td>
<td>216.0</td>
</tr>
<tr>
<td>Combined Sewer Overflows</td>
<td>Municipal Discharges/Seavage</td>
<td>93.0</td>
</tr>
<tr>
<td>Industrial Point Source Discharge</td>
<td>Industrial</td>
<td>71.0</td>
</tr>
<tr>
<td>Dam Or Impoundment</td>
<td>Hydromodification</td>
<td>20.0</td>
</tr>
</tbody>
</table>
Frequency of Flood and Drought

Flash flooding was the leading cause of weather-related deaths in the U.S. in 2015.
What is Green Infrastructure?

Green infrastructure practices build nature into land development by conserving nature and/or using engineered systems that mimic nature to treat/manage stormwater through infiltration, evapotranspiration, and/or harvest and reuse.

Hall County, GA (Vision 2030) Goal
“to have comprehensive greenspace network of at least 20% of its land area that is permanently protected...Now is the time to begin treating greenspace as infrastructure.”
Conservation of forests, floodplains, stream buffers, and wetlands in a network of hubs and corridors serve as an anchor water quality and other eco-system services.
Neighborhood Scale Green Infrastructure

Marsh Creek Rain Garden Park

Marsh Creek GI BMP Project
City of Sandy Springs
GA NPS 319 Funding
Site Scale Green Infrastructure

- Storms 1 inch or less are to be retained on site through infiltration, evapotranspiration and harvest/reuse.
- The first flush of stormwater is the dirtiest

EPA, EPD and Partners
Raingarden Installation
Fire Station #16
City of Atlanta
Boone Boulevard
Earth Day 2012
Proctor Creek Watershed

USGS 02336360 NANCY CREEK AT RICKENBACKER DRIVE, AT ATLANTA, GA

- Daily sum precipitation
- Period of approved data

3–5 seconds
3 times
# Green Infrastructure Co-Benefits

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Reduces Stormwater Runoff</th>
<th>Improves Water Quality</th>
<th>Reduces Grey Infrastructure Needs</th>
<th>Reduces Flooding</th>
<th>Increases Available Water Supply</th>
<th>Increases Groundwater Recharge</th>
<th>Reduces Salt Use</th>
<th>Reduces Energy Use</th>
<th>Improves Air Quality</th>
<th>Reduces Atmospheric CO₂</th>
<th>Reduces Urban Heat Island</th>
<th>Improves Aesthetics</th>
<th>Increases Recreational Opportunity</th>
<th>Reduces Noise Pollution</th>
<th>Improves Community Cohesion</th>
<th>Improves Urban Agriculture</th>
<th>Improves Habitat</th>
<th>Cultivates Public Education Opportunities</th>
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<tbody>
<tr>
<td><strong>Practice</strong></td>
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<tr>
<td>Green Roofs</td>
<td>Yes</td>
<td>Yes</td>
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<td>Tree Planting</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Bioretention &amp; Infiltration</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Permeable Pavement</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Water Harvesting</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>

[infrastructureusa.org](http://infrastructureusa.org)
Distributed vs. Centralized Stormwater Management with Green Infrastructure

Hogan and Loperfido, USGS, Fact Sheet 2012-3079, June 2012
Incorporating Green Infrastructure into GA NPS Management

LANDSCAPE/ WATERSHED

NEIGHBORHOOD

SITE
NEW/ REDEVELOPMENT
RETROFIT

Savannah Clean Water Trust Fund
Priority Conservation Areas

City Hall Wetland, Covington, GA
GA 319 Funding

6,680 sq. ft. Green Roof
High Museum
Atlanta, GA
GA 319 Funding
GA Nonpoint Source Management Plan

Urban Nonpoint Source Program Goals – Stormwater

1. Research
2. Outreach
3. Tools
4. Regulatory
5. Economics/Funding
6. Partnerships
Facilitating Green Infrastructure Adoption in Georgia

- Regulatory
  - Stormwater Management Manual
  - NPDES
    - Construction SW
    - MS4

- Non-Regulatory
  - Planning
  - Technical Assistance + Trainings
  - Section 319-Funded Projects
MS4 Permit Requirements

- Post-Construction Stormwater Management
  - For all MS4s, new and redevelopment projects that disturb at least 1 acre of land or create at least 5,000 square feet of impervious surface must:
    - Protect water quality by:
      - Retaining the first 1 inch of rain onsite, or
      - Treating the first 1.2 inches of rain to reduce pollutants by 80%
    - Protect stream channels from getting eroded
    - Protect downstream areas from flooding from 25 year and 100 year storms

Bioretention Area
MS4 Permit Requirements

3.3.11(b) Green Infrastructure/Low Impact Development

The permittee must implement a program to address post-construction runoff. At a minimum, the program must contain the elements listed in Table 3.3.11(b)(2) below to address post-construction runoff and descriptions of how they are implemented:

- Legal Authority
- GI/LID Program
- GI/LID Structure Inventory
- Inspection and Maintenance Program
2014 St. Marys Watershed Management Plan: “an additional cause for low dissolved oxygen is decreased base flow attributed to land alterations from development and the resulting increase in impervious surfaces.”
Landscape/Watershed Scale Land Acquisition

Silver Lake Wildlife Management Area
- Decatur County, GA – Contributed $6M
- $3M GEFA CWSRF Loan – SPLOST (Special Purpose Local Option Sales Tax) funds to repay
- 9,200 acre purchase
- Other $ Contributors: State, NGOs, Private Charities
Neighborhood Scale
Retrofit + Community Revitalization

Historic Fourth Ward Park

$500 Million in Redevelopment

- Apartments
- Condos
- Ponce City Market

Site Scale
Rainwater Harvest

Grand Hyatt, Buckhead
Site Scale – Harvest/Reuse
Georgia - Green Infrastructure -319 Implementation Projects

FFY 1999
• Urban Landscaping (UGA)

FFY 2000
• Oakview Drainage BMP (Griffin)
• High Museum Green Roof Installation (Atlanta)

FFY 2001
• Candler Park Brook Restoration (Atlanta)
• East Jester’s Creek Habitat Restoration (Clayton County)
• Porous Pavement Design (Athens-Clarke County)
• Bioretention Facility & Greenroof Pavilion (Alpharetta)
Georgia - Green Infrastructure - 319 Implementation Projects

FFY 2002
• Camp Creek Habitat Restoration (Clayton County)

FFY 2003
• Constructed Wetland at the City Complex (Covington)
• Woodruff Arts Center Green Roof Installation (Atlanta)

FFY 2004
• East Jester’s Creek Habitat Restoration (Clayton County)
• Glenlake Park Streambank Restoration (Decatur)
• Snapfinger Creek Habitat Creation (Pine Lake)
• CoastScapes & Green Growth Guidelines Revision
• Green Subdivisions Program (UGA MAREX)
Georgia - Green Infrastructure -319 Implementation Projects

**FFY 2005**
- Meadows Wet Detention Pond (Alpharetta)
- Flat Creek Streambank Restoration (Gainesville)
- North Fork Peachtree Creek Streambank Restoration (Gwinnett County)
- Watershed Improvement for Urban, Suburban & Transitional Watersheds (Athens-Clarke County)
- A Paired Watershed Approach to Evaluate Low Impact Development (UGA)

**FFY 2007**
- Constructed Wetland at the City Complex (Covington)
Georgia - Green Infrastructure - 319 Implementation Projects

FFY 2008
• Clayton/Rabun County Watershed Project (Clayton)
• East Jester’s Creek Habitat Restoration (Clayton County)

FFY 2009
• Piedmont Park North Woods Expansion Stream Restoration (Atlanta)
• Flat Creek Streambank Restoration (Gainesville)
• McDaniel Branch Stream Restoration (Atlanta)
Georgia - Green Infrastructure -319 Implementation Projects

FFY 2010
• Regional Pond & Streambank Restoration (McDonough)
• Midway Park Stream Restoration (Forsyth County)
• Soque River Protection Plan Implementation (Clarkesville)
• Potato Creek Stream Restoration (Griffin)
Georgia - Green Infrastructure -319 Implementation Projects

FFY 2011
• East Jester’s Creek Habitat Restoration (Clayton County)
• Hazel Creek Sediment Abatement (Clarkesville)
Georgia - Green Infrastructure - 319 Implementation Projects

**FFY 2013**
- Flat Creek Streambank Restoration (Gainesville)
- Proctor Creek GI (Atlanta)
- Marsh Creek Headwaters BMP Project (Sandy Springs)

**FFY 2014**
- Cabin Creek/Kelsey Ave Ecosystem Restoration (Griffin)
- GI & BMP Revolving Fund (Roswell)

**FFY 2015**
- GI (Clarkesville)
- GI (Hartsfield Jackson Atlanta Airport)
Georgia - Green Infrastructure -319 Implementation Projects

FFY 2016
• Green Infrastructure Implementation and Capacity Building (Folkston)
• BMP Installation and Education Curriculum Implementation (Augusta)

FFY 2017
• Coastal Urban SW BMP Retrofits using GI/LID Phase 1 (St. Marys)
• Coastal GI/LID BMP Implementation Project (UGA)
• East Alley SW Improvement Project (Roswell)

FFY 2018
• Coastal Urban SW BMP Retrofits using GI/LID Phase 2 (St. Marys)
Technical Assistance + Research
Training

LEARNING OBJECTIVES

- Read and interpret a landscape plan for Best Management Practices (BMPs).
- Interpret a topographic map and perform slope calculations in order to understand the effects of grading and drainage on BMPs.
- Identify soil mixtures for BMPs and calculate soil and material volumes.
- Identify and select appropriate plants for BMPs based upon habitat, region and compatibility.
- Successfully install and establish new BMPs.

Basics of Stormwater Development Plan Review

SAVE THE DATE:
April 10-11, 2018
GAWP Spring Conference & Expo
Jekyll Island, GA

GAWP is proud to offer a 1-day workshop for professionals engaged in the review and approval of land development projects that incorporate stormwater management best practices found in the Georgia Stormwater Management Manual and the Coastal Treatment. The course will cover:

- Understanding the role of stormwater in a development plan
- Stormwater management plan contents
- The plan review process
- The role of runoff reduction, green infrastructure, and LAI
- How to use the stormwater design development review tool
- How to apply the stormwater treatment credit

A focus will be placed on understanding the limitations and application of structural and non-structural BMPs. The workshop will be a combination of lecture and practical application exercises. Attendees should bring a laptop and calculator.

Registration is included with a conference registration. Limited to the first 50 registrants.
Barriers to Adoption and Path Forward

• Barriers
  • Unknown/Resistant to change
  • Costly
  • Complicated
  • Maintenance

• NPS GI Strategic Action Plan