Managing Wet Weather with Green Infrastructure
Core Group of the Partnership for Strategy Development

- American Rivers
- Association of State and Interstate Water Pollution Control Administrators
- Low Impact Development Center
- National Association of Clean Water Agencies
- Natural Resources Defense Council
- U.S. Environmental Protection Agency
Memo from EPA Assistant Administrator Ben Grumbles to EPA Regional Administrators, March 5, 2007, *Using Green Infrastructure to Protect Water Quality in Stormwater, CSO, Nonpoint Source and other Water Programs*

*Green Infrastructure Statement of Intent,* signed by NRDC, NACWA, LID Center, ASIWPCA and EPA on April 19, 2007.
Strategy Categories

- Research
- Outreach & Communication
- Tools
- Clean Water Act Regulatory Support
- Economic Viability & Funding
- Demonstrations & Recognition
- Partnerships & Promotion
Green Infrastructure Website
www.epa.gov/npdes/greeninfrastructure

- General Information
- Key Resources
- Case Studies
- Guidance
- Partnership Contacts
- Statement of Support
Green Infrastructure Periodicals

- Relevant activities, events, conferences, publications, partner profiles
- Issued approximately every 2 months
- 6 to-date
- Distributed electronically and on the website
Partnership Statement of Support

To-date 71 organizations have signed the Statement of Support for Green Infrastructure

Stakeholder Statement of Support for Green Infrastructure

Purpose
To bring together organizations that recognize the benefits of using green infrastructure in mitigating overflows from combined and separate sewer systems and reducing stormwater pollution and to encourage the use of green infrastructure by cities and wastewater treatment plants as a prominent component of their Combined and Separate Stormwater Overflow CSO & SSQ and Municipal Stormwater (MS4) programs.

Goals
Green infrastructure can be both a cost-effective and an environmentally preferable approach to reduce stormwater and other excess flows entering combined or separate sewer systems in combination with, or in lieu of, centralized hard infrastructure solutions. The undersigned organizations support:

- Use of green infrastructure by cities and utilities where it is an effective and feasible means of reducing stormwater pollution and sewer overflows;
- Development of models to quantify stormwater detention, retention, and filtration potential of green infrastructure to better identify opportunities to successfully use green infrastructure in CSO, SSQ, MS4 and nonpoint source programs;
- Monitoring to verify the amount of CSO, SSQ, and stormwater discharge reduction that cities obtain through using green infrastructure;
- Measurement of economic and environmental benefits realized from the use of green infrastructure in sewer systems and quantification of its life-cycle costs;
- Increased federal, state, and local funding for green infrastructure initiatives;
- Elimination of barriers to the incorporation of green infrastructure in stormwater and sewer system programs;
- Development and funding of a plan to identify research needs to further green infrastructure;
- Preparation of guidance documents to assist cities and wastewater treatment plants in developing green infrastructure initiatives in their CSO, SSQ, and MS4 programs; and
- Development of model provisions to incorporate green infrastructure into CSO and MS4 permits; SSQ capacity, management, operations, and maintenance plans; and consent decrees and other enforcement vehicles.
Research Forum

- Research forum to focus on filling green infrastructure research gaps held January 17 and 18, 2008 in D.C. at American Institute of Architects.
- 4 research areas identified: unit processes (performance of practices), watershed effects; economics; modeling.
- Benefits group (leadership: GRHC, CNT)
- Unit Processes group (leadership: EWRI)
Green Infrastructure Performance Information

- Updating Urban BMP Performance Tool to include performance study results for green infrastructure practices.
- Highlighting performance research on the website.

<table>
<thead>
<tr>
<th></th>
<th>Vegetated Swale</th>
<th>Biofilter</th>
<th>53.95</th>
<th>17.84</th>
<th>-209%</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Portland, OR - Bureau of Environmental Services, 1999 Russell Pond Bioswale: 2 component BMP - sedimentation forebay followed by a bioswale</td>
<td>Russell Pond Bioswale</td>
<td>Biofilter</td>
<td>17.24</td>
<td>17.93</td>
<td>75%</td>
</tr>
</tbody>
</table>
Stormwater Management Model (SWMM)

- Extending SWMM to allow it to handle more green infrastructure options in a more efficient manner, including to overcome the problem of scaling up controls applied at the individual lot level to larger land area units.
- Create simple user interface for green infrastructure portion of SWMM.
Washington, D.C.
Green Build-out Model

Estimates the effects of greening the city with green roofs, rain gardens, rights-of-way bioretention, permeable pavements, trees, rain barrels and cisterns on discharge reductions from both combined sewer systems and separate storm sewer systems.
Stormwater Management Calculator

- Modify current CNT calculator to make it more nationally applicable, estimate the amount of green infrastructure needed to achieve a runoff reduction goal, and provide ‘green’ vs ‘conventional’ costs.
- Modification of the runoff volume control to a user-specified goal of depth or predevelopment conditions.
- Addition of more controls, such as disconnected downspouts, amended soils, cisterns/rain barrels, reduced street widths, and elimination of curb and gutter.
- Complete early 2009.
Life Cycle Cost Tool

- Expanding WERF’s 2005 spreadsheet cost tool to create a standardized format for collecting and reporting capital and O&M cost information for green infrastructure projects.
- Working with WERF and University of Utah on enhancement.
- Estimated completion early 2009.
Use of Green Infrastructure in NPDES Permits and Enforcement

- Memo issued August 16, 2007
- Jointly issued by WPD and WED
- Clarifies that green infrastructure controls can be implemented within current regulatory framework
Underground Injection Control Clarification

- Memo & guide issued June 13, 2008 by WPD & DWPD
- Clarifies which infiltration practices are generally considered class V wells
- Notes procedures for complying with UIC requirements
- Typically most green infrastructure practices are not class V wells
MS4 Permit Language

- Working collaboratively with certain states and regions that have specifically requested assistance.
- Proposed performance based standards that promote infiltration, reuse and evapotranspiration.
- Includes incentives for smart growth practices, e.g., redevelopment, mixed use.
- Includes assessment work that will provide foundation for additional provisions in the next round.
West Virginia Proposed Small MS4 Permit

- Proposed July 2008
- Technical meetings with public and MS4
- WVDEP responding to comments
- Probably finalized in early 2009
Green Infrastructure
Permitting & Enforcement Guide

- For NPDES permit writers and enforcement staff.
- Information on how to include and/or review green infrastructure components in permits and enforcement documents for stormwater, SSOs, CSOs
- Has been through one round of external reviews (EPA regions, states, NACWA, NRDC), and is in revision process.
Enforcement-related Case Studies

- First set of 5 case studies have been compiled and posted on the website.
- Case studies in this set are all supplemental environmental projects (SEPs).

**Green Infrastructure in Enforcement Actions**

When an organization or individual has failed to comply with federal environmental laws, the agency may initiate an enforcement action against them. Enforcement actions are taken in order to compel the individual or company to return to compliance and to deter others from committing similar violations in the future.

As part of a settlement agreement for an enforcement action, an alleged violator may voluntarily agree to undertake a Supplementary Environmental Project, or SEP, in exchange for mitigation of the penalty to be paid. SEPs are projects that are designed to protect and improve the environment and public health beyond that achieved by standard compliance with applicable laws. These projects offer a unique opportunity to further our nation's goals of ensuring clean air and water, safe food, better waste management, and the public's right to know about environmental issues. SEPs have existed since the early 1980s, and since that time their inclusion in EPA's settlement agreements has become more commonplace.

More information on SEPs can be found at [http://cfpub.epa.gov/compliance/resources/policies/civil/seps](http://cfpub.epa.gov/compliance/resources/policies/civil/seps)

In wet weather enforcement actions, a growing number of SEPs have involved the use of green infrastructure techniques to mitigate environmental damage. To date, green infrastructure SEPs have been used in settlements with:

- The Board of Water and Sewer Commissioners of the City of Mobile, Alabama
- The Board of County Commissioners of Hamilton, Ohio and the City of Cincinnati
- The District of Columbia Water and Sewer Authority and the District of Columbia
- The Washington Suburban Sanitary Commission
- Sanitation District No. 1 of Northern Kentucky
Reducing Stormwater Costs through LID Strategies and Practices

- Released December 2007
- 17 case study comparisons of traditional vs green infrastructure development costs.
Municipal Workshops

- Chicago, September; Louisville, November
- Planned and/or tentatively discussed for 2009: New York, Virginia, DC, Texas, Missouri, Pennsylvania, Alabama, West Virginia . . .
- Covers topics identified by municipalities as challenging: modeling, designs, O&M, codes & ordinances, financing, incentives . . .
Municipal Handbook

The Municipal Handbook is a series of guidance documents to help local officials implement green infrastructure in their communities. Modules will be released as completed, including:

- Municipal Policies to Promote Rainwater Harvesting
- Green Streets and Right-of-Way Design
- Funding Options
- Urban Retrofit Policies
- Operation & Maintenance
- Municipal Incentives
Clean Water State Revolving Fund

- Fact sheet released July 2008 promoting and explaining the use of CWSRF for green infrastructure projects

This factsheet identifies several ways in which states, communities, and individuals can use the Clean Water State Revolving Fund (CWSRF) to finance green infrastructure projects. A general overview of green infrastructure and the CWSRF program are provided, as well as case studies highlighting specific projects from across the country.

- What is green infrastructure?
  "Green infrastructure" is a relatively new and flexible term that has been used to describe a variety of contexts. For the purposes of this factsheet, the term "green infrastructure" refers to systems and practices that use or mimic natural processes to infiltrate, evapotranspire (the return of water to the atmosphere through evaporation or transpiration), or reuse stormwater. Examples of green infrastructure approaches currently in use include green roofs, trees and tree boxes, rain gardens, vegetated swales, pond wetlands, infiltration planters, permeable pavements, riparian buffers, and floodplains.

- What are additional benefits of green infrastructure?
  In addition to reducing the overall volume of stormwater runoff and the frequency of sewer overflows, green infrastructure can help communities enjoy a number of additional environmental and economic benefits, including:
  - Cleaner Air
  - Reduced Urban Temperatures
  - Climate Change Benefits
  - Increased Energy Efficiency
  - Source Water Protection
  - Community Benefits
  - Cost Savings

Read more about the benefits of green infrastructure at: [www.epa.gov/water/greeninfrastructure](http://www.epa.gov/water/greeninfrastructure)
Large Retail Initiative

- ‘Big Box’ initiative to promote incorporation of green infrastructure practices as standard design elements.
- To date, interest expressed by Kohl’s, Costco, and Whole Foods.
- Working on site designs for large retail operations.
Green Capitals

- Green right-of-way retrofits at/near state capitol buildings for high profile, visible, demonstration projects
- Offering design and mentoring services
- Vermont in 2009

Nashville TN state capitol grounds

“Sec. 438. Storm Water Runoff Requirements for Federal Development Projects. The sponsor of any development or redevelopment project involving a Federal facility with a footprint that exceeds 5,000 square feet shall use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow.”
Design to Control a Specified Volume

% Average Annual Rainfall Approach

<table>
<thead>
<tr>
<th>City</th>
<th>90%</th>
<th>95%</th>
<th>99%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington DC</td>
<td>1.2”</td>
<td>1.7”</td>
<td>2.4”</td>
</tr>
<tr>
<td>Atlanta GA</td>
<td>1.6”</td>
<td>2.1”</td>
<td>3.4”</td>
</tr>
<tr>
<td>Seattle WA</td>
<td>1.3”</td>
<td>1.6”</td>
<td>1.7”</td>
</tr>
<tr>
<td>Salt Lake City UT</td>
<td>0.6”</td>
<td>0.8”</td>
<td>1.2”</td>
</tr>
</tbody>
</table>
## Analyses of 95% Volumes

<table>
<thead>
<tr>
<th>Location</th>
<th>95% 24-hr Rainfall (in)</th>
<th>% Impv</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charleston, WV</td>
<td>2.05</td>
<td>73%</td>
</tr>
<tr>
<td>Denver, CO</td>
<td>1.96</td>
<td>55%</td>
</tr>
<tr>
<td>Cincinnati, OH</td>
<td>2.38</td>
<td>51%</td>
</tr>
<tr>
<td>Portland, OR</td>
<td>1.75</td>
<td>95%</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>1.54</td>
<td>47%</td>
</tr>
<tr>
<td>Boston, MA</td>
<td>2.76</td>
<td>69%</td>
</tr>
<tr>
<td>Atlanta, GA</td>
<td>2.97</td>
<td>70%</td>
</tr>
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## Atlanta, Georgia Military Base

<table>
<thead>
<tr>
<th>Area (acres)</th>
<th>Sandy</th>
<th>Loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Roof</td>
<td>0</td>
<td>2.36</td>
</tr>
<tr>
<td>Porous Pavement</td>
<td>0</td>
<td>1.80</td>
</tr>
<tr>
<td>Bio-retention</td>
<td>2.26</td>
<td>3.12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Proportion%</th>
<th>Sandy</th>
<th>Loam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Roof</td>
<td>0.0%</td>
<td>60.0%</td>
</tr>
<tr>
<td>Porous Pavement</td>
<td>0.0%</td>
<td>16.7%</td>
</tr>
<tr>
<td>Bio-retention</td>
<td>36.1%</td>
<td>50.0%</td>
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