United States Environmental Protection Agency

EPA Office of Research and Development Green Infrastructure Research

Alice Gilliland, Ph.D.
Assistant Laboratory Director for Water
National Risk Management Research Laboratory
Office of Research and Development

2012 AridLID Conference
Green Infrastructure and Low Impact Development in Arid Environments
March 27-29, 2012
Tucson, AZ

Agency Green Infrastructure Agenda

- April 2011 Green Infrastructure (GI) Agenda announced, EPA activities to encourage communities to adopt GI solutions for stormwater management:
  - Community partnerships;
  - Clarifying green infrastructure within the regulatory and enforcement contexts;
  - Outreach and information exchange;
  - Financing; and
  - Tool development and capacity building.
- April 2011 OW-OECA Joint Memo supporting and encouraging use of GI for wet-weather control and provided MS4 and Enforcement Action GI examples
- www.epa.gov/greeninfrastructure



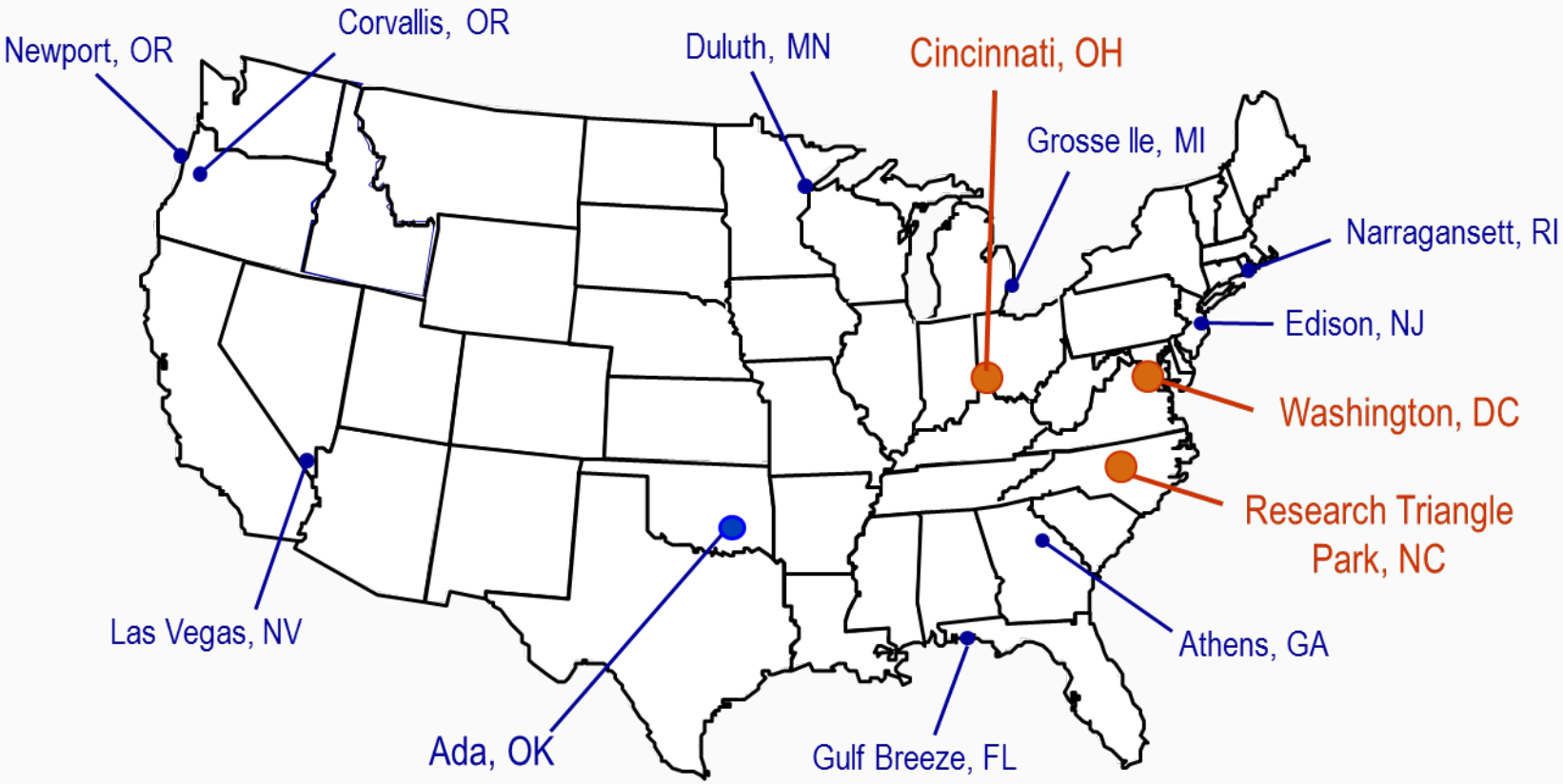


EPA's Office of Research and Development (ORD) research to further EPA's Green Infrastructure Agenda

1. Modeling Tools for GI and Stormwater Planning
2. Technical Guidance in Adaptive Management for GI in enforcement
3. Generating and Collecting Data on GI Performance, O&M, Costs, Socio-Economic benefits in the field
   - *Field study locations influenced by the geographic location of ORD facilities*

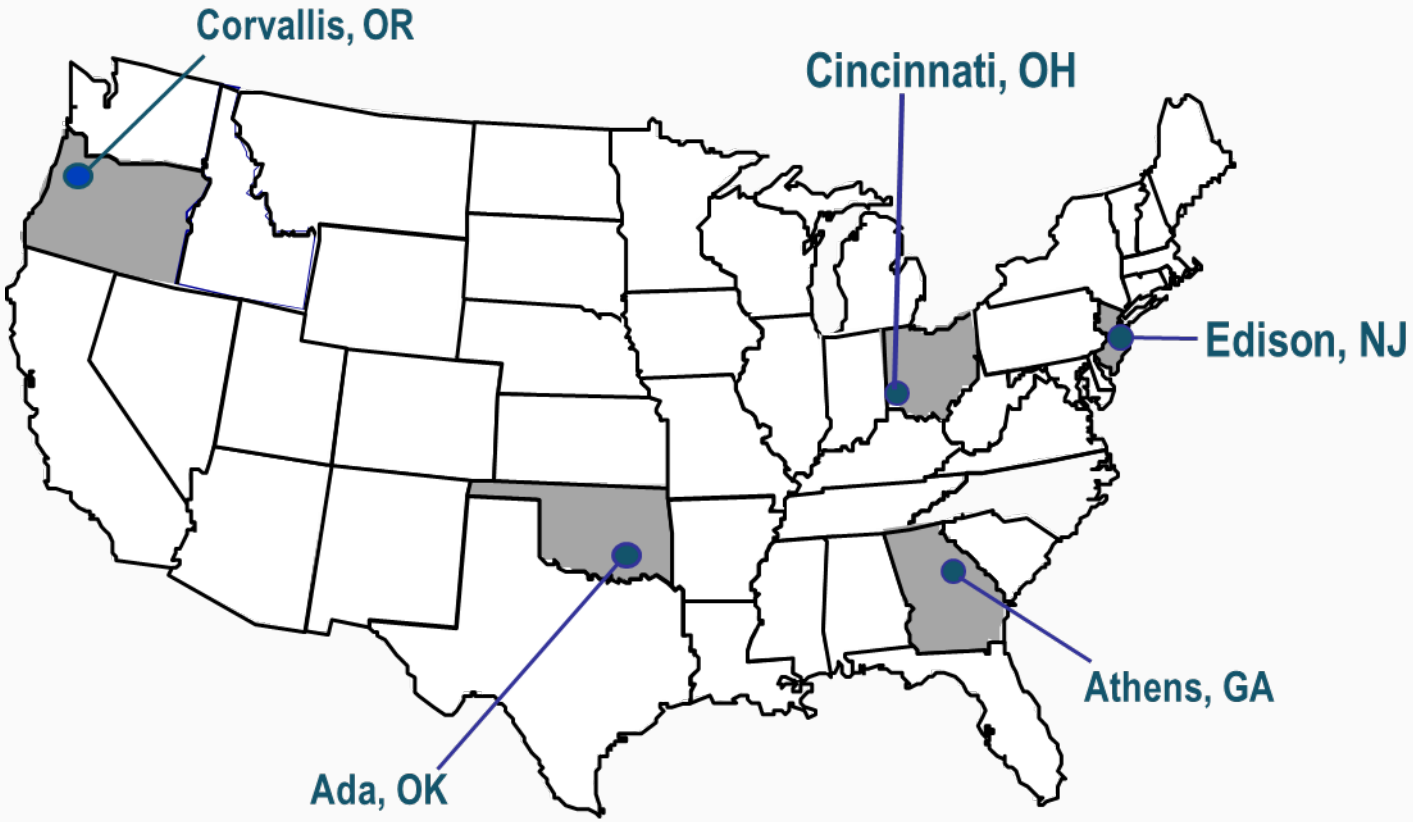
These research activities, explicitly designed to support the GI Agenda, are housed within ORD's Safe and Sustainable Water Resources research program

EPA Office of Research and Development Locations



Ongoing Green Infrastructure Studies at EPA Office of Research and Development Locations

ORD Field Study Facilities



- Some facilities serve as a field study sites (Cincinnati, Edison, Athens)
- Other field studies are often in near vicinity of EPA ORD facilities

EPA's Office of Research and Development (ORD) research to further EPA's Green Infrastructure Agenda – Modeling Tools

1. **Modeling Tools for GI and Stormwater Planning**
2. Technical Guidance in Adaptive Management for GI in enforcement
3. Generating and Collecting Data on GI Performance, O&M, Costs, Socio-Economic benefits in the field
   - *Field study locations influenced by the geographic location of ORD facilities*

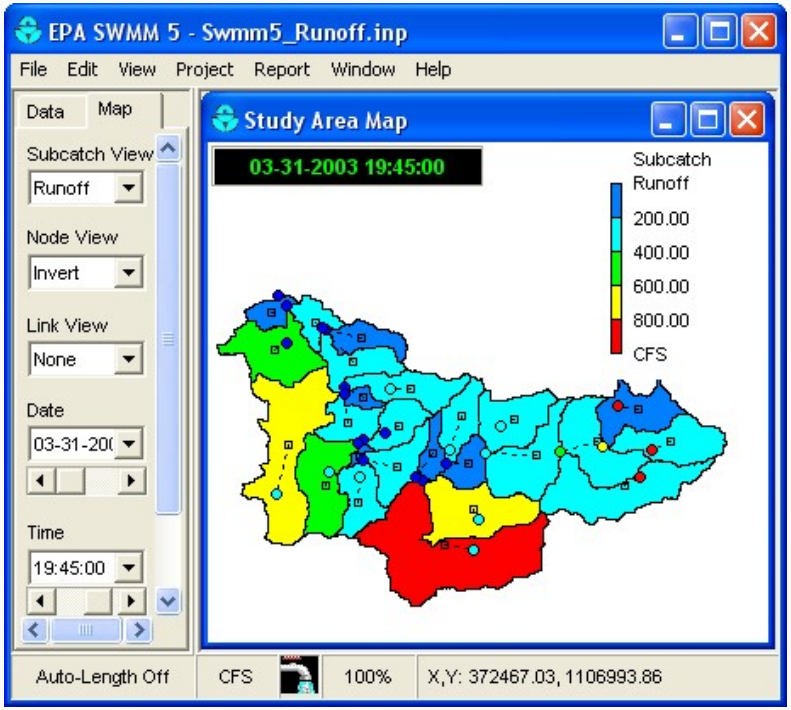
These research activities, explicitly designed to support the GI Agenda, are housed within ORD's Safe and Sustainable Water Resources research program

1. Modeling Tools

Storm Water Management Model (SWMM)

v.5 with Low Impact Development:

Planning, analysis and design related to stormwater runoff, combined sewers, sanitary sewers, and other drainage systems in urban areas

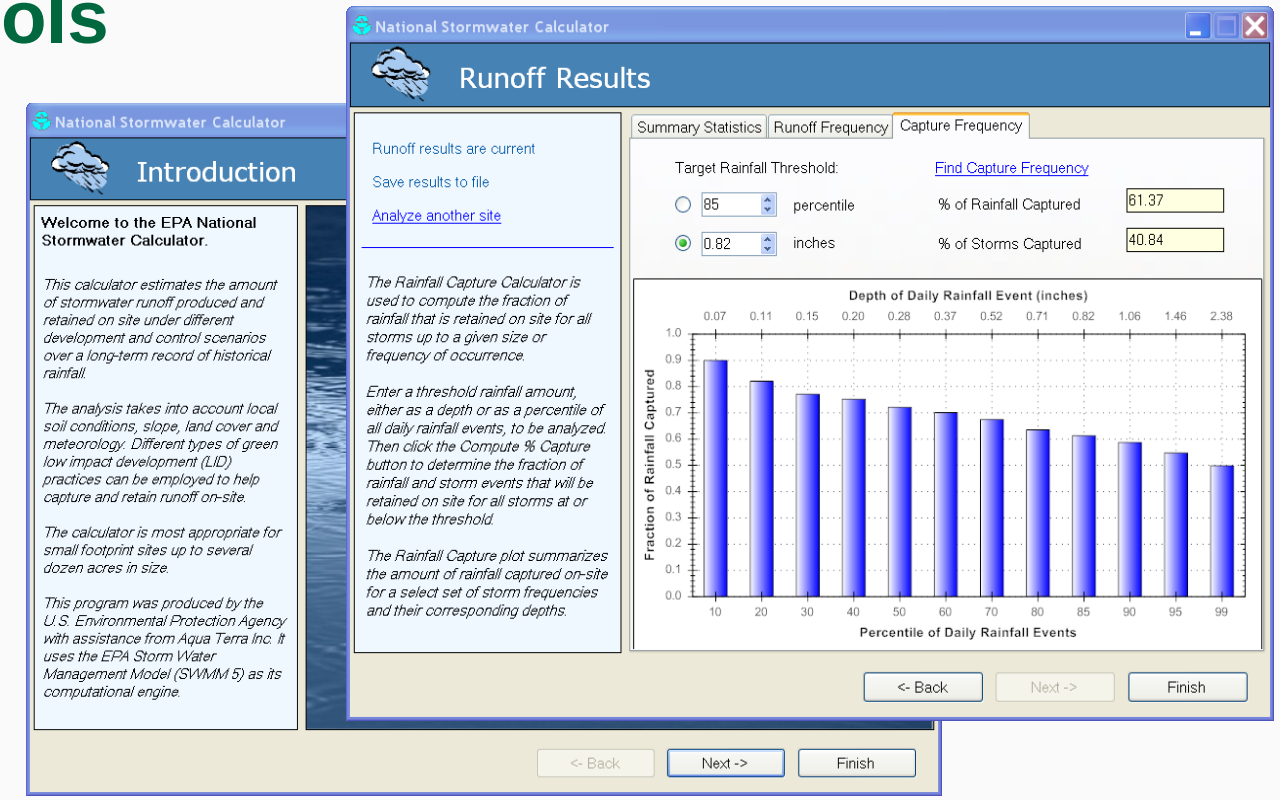


How would GI BMPs in an urban environment impact stormwater and contaminant runoff and reduce CSO events?

1. Modeling Tools

Stormwater Calculator

(note: SWMM v5 engine)



- *Package modeling solutions (e.g., SWMM-LID) into usable tools for engineers and planners*
- *Collaboration between ORD and OW – potential technical support tool for Stormwater Rule*

EPA's Office of Research and Development (ORD) research to further EPA's Green Infrastructure Agenda – Technical Guidance

1. Modeling Tools for GI and Stormwater Planning
2. **Technical Guidance in Adaptive Management for GI in enforcement**
3. Generating and Collecting Data on GI Performance, O&M, Costs, Socio-Economic benefits in the field
   - *Field study locations influenced by the geographic location of ORD facilities*

These research activities, explicitly designed to support the GI Agenda, are housed within ORD's Safe and Sustainable Water Resources research program

2. Technical Guidance for Integrating GI into Enforcement

Adaptive Management

GI Agenda (2a) *"Demonstrate how green infrastructure can be incorporated into combined sewer overflow (CSO) control plans."*

GI Agenda (4d) *"Address the green infrastructure implementation obstacle of real or perceived risk, and investigate ways to help insulate communities from perceived risk related to choosing green infrastructure technologies."*

- Cleveland case study: ORD and Region 5 "Green Team" proposal (adopted) for an integrated green-gray approach for Cleveland consent decree
- Approach to integrate GI that would share risk and employs adaptive management for green-gray options that evolves based on actual conditions and outcomes
- Performance measurement offers opportunity to adapt green-gray approach and take advantage of additional GI opportunities or co-benefits

ORD products coming from Cleveland Case Study

Developed R&D in Cleveland to address GI part of CD process:

- *Developed protocol for assessing soils potential for stormwater detention in vacant lots*
- *Characterized impact of residential demolition on future land use options*
- *Design an experiment to study an adaptive management approach for GI in Slavic Village neighborhood, evaluate social capital via public participation and hydrologic, ecosystem service benefits*
- *Develop and beta-test vacant land re-use decision support tool*
- *Evaluate and assess utility of a candidate environmental justice metric*
- *Site-scale monitoring and assessment of effectiveness and performance (water volume, water quality) for GI practices*

EPA's Office of Research and Development (ORD) research to further EPA's Green Infrastructure Agenda - Field

1. Modeling Tools for GI and Stormwater Planning
2. Technical Guidance in Adaptive Management for GI in enforcement
3. **Generating and Collecting Data on GI Performance, O&M, Costs, Socio-Economic benefits in the field**
   - ***Field study locations influenced by the geographic location of ORD facilities***

These research activities, explicitly designed to support the GI Agenda, are housed within ORD's Safe and Sustainable Water Resources research program

3. Data on GI Performance, O&M, Costs, Socio-Economic benefits

- Monitoring of GI BMPs such as permeable parking lots and rain gardens (O&M, long term performance)
- Field sites are located primarily in the Northeast and Midwest – Combined Sewer Systems (CSS), Green Infrastructure primarily implemented for keeping stormwater out of CSS
- New research also underway related to water reuse and exposure issues

New water reuse efforts @ EPA ORD

Overall Perspective

Water reuse offers sustainable, alternative water supply which can be appropriately matched to quality of water required for particular application (nonpotable, potable, etc.).

Federal regulations/guidelines needed to provide uniform minimum standards of health protection

Rigorous risk assessment methodology needed to determine and manage potential water reuse risks

Research gaps/needs

Determine chemical and biological composition of captured rain water, storm water, and urban runoff: untreated, minimally treated, and fully treated recycled water

Determine risks associated with intended use of reused water (inside or outside of building, drinking, etc.)

New USEPA-ORD Project (2012 Region 6 RARE Project (ORD-Cincinnati, University of Texas)

Microorganisms Associated with Rainwater Collection Systems Providing Non-potable or Potable Water

- Identify best management practices for harvesting rainwater that result in minimum microbial growth and pathogen persistence.
- Disseminate results among project collaborators (EPA Region 6, ORD, Region 6 State Health Departments, and state primacy agencies)
- Recommend methods for rainwater harvesting and storage with greatest public health benefit

3. Data on GI Performance, O&M, Costs, Socio-Economic benefits (cont'd)

- Monitoring of GI BMPs such as permeable parking lots and rain gardens (O&M, long term performance)
- Field sites are located primarily in the Northeast and Midwest – Combined Sewer Systems (CSS), Green Infrastructure primarily implemented for keeping stormwater out of CSS
- Next slides (Michelle Simon, EPA ORD) will share more detail on monitoring of GI BMPs: Approaches and lessons learned and new effort re: Albuquerque stormwater modeling

Questions?