



International Low Impact Development Conference

Nashville, TN | August 12-15, 2018



JW Marriott Nashville

Final Program

www.lidconference.org

#EWRILID18

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Contents

Welcome to LID.....	2
Meet the Host.....	4
Meet the LID Committee.....	5
General Information.....	8
Schedule at a Glance.....	10
Special Events	
Opening Plenary & Keynote.....	12
Monday Luncheon Keynote.....	13
Opening Reception.....	14
Key Social.....	15
Technical Tours.....	16
Technical Program	
Sunday.....	20
Monday.....	22
Tuesday.....	38
Wednesday.....	58
Exhibitors.....	66

Welcome to LID



On behalf of EWRI and the steering committee, I want to welcome you to Nashville and the 2018 International LID Conference!

This conference brings together a diversity of colleagues from the field of green infrastructure – from the academics who provide us cutting edge research; to the practitioners who provide design innovations and real-world solutions; to the municipal staff and regulators who oversee implementation, long term maintenance, and program development. There is something here for everyone!

Start your conference experience with one of our workshops exploring timely topics in the field, and then be sure to catch the keynote of the distinguished and dynamic Joan Iverson Nassauer discussing the interrelationships between civic commitments and green infrastructure.

Our program has been crafted with a number of panel discussions to give you the opportunity to immerse yourself in a topic and hear from experts in the field. These sessions are complimented by plenty of traditional session tracks ranging from social perspectives to LID design and performance. Don't forget to kick back with your colleagues at the key social event at City Winery. Finally, save time at the end of the conference to explore the green side of

Nashville through one of our tours. You will even have the chance to ride a Segway!

If you have extra time to spend in Middle Tennessee, there are lovely parks nearby for a hike or paddle. Or, if you're feeling more adventurous, stay in town and test your taste buds with hot chicken, chase it down with a cold one, and sit back in a local honky tonk! Rumor has it there's some decent music here. Once again, there is something for everyone!

We look forward to seeing you at the conference!

Best,

Rebecca Dohn
Conference Chair

Meet the Host



Created in 1999, the Environmental and Water Resources Institute (EWRI) is a specialty organization, over 26,000 members strong, that functions semi-autonomously within the American Society of Civil Engineers (ASCE) to integrate technical and public policy expertise and promoting the planning and management, design, construction, and operation of environmentally sound and sustainable infrastructure impacting air, land, and water resources.

In addition to Governing Board-Level Committees, EWRI is organized around three primary interest areas: Technical Activities, Products, and Institute Operations. If you are not a member of EWRI, we invite you to consider the benefits of membership. Visit the EWRI Web site or stop by the registration desk. If you have registered as a non-member for this conference you will receive a complimentary 2018 EWRI membership.

EWRI of ASCE

1801 Alexander Bell Drive, Reston, VA 20191

Tel: 703-295-6380 | Fax: 703-295-6371

International 1-800-548-2723 ext. 6380

www.asce.org/ewri

Meet the LID Committees

Steering Committee

- **Chair:** Rebecca Dohn, *Metro Water Services, Nashville, TN*
- **Co-Chair:** Crystal Bishop, *Hamilton County Water Quality Program*
- **Technical Program Chair:** Jon Hathaway, *University of Tennessee, Department of Civil Engineering*
- **Technical Program Vice-Chair:** Gale Fulton, *University of Tennessee, School of Landscape Architecture*
- **Local Host Chair:** Jennifer Watson, *Tennessee Stormwater Association*
- **Committee Member:** Michael Clar, *Ecosite, Inc.*
- **Committee Member:** James Lenhart, *Contech Engineered Solutions*
- **Committee Member:** Brian Bledsoe, *University of Georgia*
- **Committee Member:** Robert Traver, *Villanova University*
- **Committee Member:** Scott Struck, *Geosyntec Consultants*

Conference Scientific Committee

- **Technical Program Chair:** Jon Hathaway, *University of Tennessee, Department of Civil Engineering*
- **Technical Program Vice-Chair:** Gale Fulton, *University of Tennessee, School of Landscape Architecture*
- Bram Barth, *Lose and Associates, Inc.*
- Eban Bean, *University of Florida*
- Brian Bledsoe, *University of Georgia*
- Robert Brown, *Ecological Planning Group*
- Ted Brown, *Biohabitats*
- Kathlie Jeng-Bulloch, *City of Houston, Texas*
- Karina Bynum, *TDEC Water Resources*
- Michael Clar, *Ecosite, Inc.*
- Jane Clary, *Wright Water Engineers*
- Brad Collett, *University of Tennessee, Knoxville*
- Rebecca Dohn, *City of Nashville, Tennessee*
- Jay Dorsey, *Ohio State University*
- Hunter Freeman, *WithersRavenel*
- Kathy Gee, *Longwood University*
- Robert Goo, *US Environmental Protection Agency*
- Ruth Hocker, *City of Lancaster, Pennsylvania*
- Bill Hunt, *North Carolina State University*
- Mikael Isensee, *Washington Conservation District, Minnesota*
- Anand Jayakaran, *Washington State University*
- Matthew Jones, *Hazen and Sawyer*
- James Lenhart, *Contech Engineered Solutions*
- Keith Lichten, *California Environmental Protection Agency*
- Kelly Lindow, *CityScape Engineering*

- Bill Lord, North Carolina State University
- Andrea Ludwig, *University of Tennessee, Knoxville*
- Susan McCrary, *Metropolitan St. Louis Sewer District*
- Trisha Moore, *Kansas State University*
- Elodie Passeport, *University of Toronto*
- Holly Piza, *Urban Drainage and Flood Control District, Denver, Colorado*
- Saya Qualls, *Hazen and Sawyer*
- Andrew Reese, *Wood Group*
- Amy Rowe, *Rutgers University*
- David Sample, *Virginia Polytechnic Institute*
- John Schwartz, *University of Tennessee, Knoxville, Tennessee*
- David Smith, *Interlocking Concrete Pavement Institute*
- Jonathan Smith, *Tetra Tech*
- Scott Struck, *Geosyntec Consultants*
- Robert Traver, *Villanova University*
- Steven Trinkaus, *Trinkaus Engineering LLC*
- Harris Trobman, *University of the District of Columbia*
- Bridget Wadzuk, *Villanova University*
- Ryan Winston, *Ohio State University*
- Jason Wright, *Tetra Tech*

ASCE Staff

- Brian Parsons, *Director, EWRI*
- Barbara Whitten, *Technical Manager, EWRI*
- Mark Gable, *Senior Conference Manager, EWRI*
- Nicole Erdelyi, *Program Coordinator, EWRI*
- Jennifer Jacyna, *Manager of Member Services, EWRI*
- Susan Dunne, *Conference Registrar, ASCE*

ADA Compliance: The JW Marriott Nashville is barrier-free in compliance with the Americans with Disabilities Act (ADA). While ASCE/EWRI Institute will make every effort to meet the needs of the physically challenged, accommodations cannot be guaranteed without prior notification.

Badge Policy: Your name badge is your admission to the conference. Please wear your badge at all times while at the venue. ASCE recommends you remove your badge when leaving the venue. Where tickets are required, please bring them with you as you will not be admitted without one.

Conference Attire: The dress code for the conference is business casual. Meeting room temperatures will vary, so layered clothing is recommended. We also recommend attendees wear comfortable shoes.

Hotel Information: JW Marriott Nashville
201 8th Avenue South, Nashville, TN 37203
Main Phone: (615) 291-8600 | Guest Fax: (615) 981-8959

No Smoking Policy: ASCE supports a “No Smoking” policy. Smoking is prohibited at the JW Marriott Nashville and all venues hosting ASCE events.

Cancellation Policy: Please refer to www.lidconference.org/registration to review ASCE/EWRI’s cancellation and refund policy.

Weather: The average high is 83-89 degrees F during the day. The average low is 62-70 degrees Fahrenheit. In August, the average chance of precipitation is 33%.

Medical Emergencies: ASCE/EWRI hopes that your visit will be free of medical incident. However, if you become ill, please contact the front desk and tell them you have a medical

General Information

emergency that requires attention. The closest hospital is: St. Thomas Midtown Hospital, at 2000 Church St, Nashville, TN 37236

Post-Conference Evaluations: An electronic evaluation will be sent to all attendees immediately following the conference.

Professional Development Hours (PDHs): You may earn PDHs by attending concurrent sessions and workshops. ASCE follows NCEES guidelines on continuing professional competency. Since continuing education requirements for P.E. license renewal vary from state to state, ASCE strongly recommends that individuals check with their state registration board(s) for their specific requirements. For details on your state's requirements, please go to www.ncees.org/licensure/licensingboards.

Recording Policy: Photographic, video or audio recording of any education session is strictly prohibited without prior written permission from both ASCE and the session presenter(s).

Photograph Release: By attending this conference, I hereby release any photographs that may be incidentally taken of me by ASCE/EWRI Institute during these events to be used for any purpose.

Liability Waiver: By attending this conference, I agree and acknowledge that I am participating in ASCE/EWRI events and activities as my own free and intentional act. I am fully aware that possible physical injury might occur to me as a result of my participation. I give this acknowledgment freely and knowingly that I am, as a result, able to participate in ASCE/EWRI events, and I do hereby assume responsibility for my own well-being. I also agree not to allow any other individual to participate in my place.

Schedule at a Glance

Sunday, August 12	
8:00 a.m. - 12:00 p.m.	Technical Workshops*
1:00 - 5:00 p.m.	Technical Workshops*
1:00 - 6:00 p.m.	Committee Meetings
4:00 - 7:00 p.m.	Registration
5:30 - 7:00 p.m.	Opening Reception - Exhibit Hall
Monday, August 13	
7:30 a.m. - 6:00 p.m.	Registration
8:30 - 10:00 a.m.	Opening Plenary
10:00 a.m. - 7:00 p.m.	Exhibit Hall Open
10:00 - 10:30 a.m.	Networking Break & Poster Session
10:30 a.m. - 12:00 p.m.	Concurrent Technical Sessions
12:00 - 1:00 p.m.	Lunch with Keynote in the Exhibit Hall
1:00 - 2:00 p.m.	Poster Session & Exhibitor Showcase
2:00 - 3:30 p.m.	Concurrent Technical Sessions
3:30 - 4:00 p.m.	Networking Break
4:00 - 5:30 p.m.	Concurrent Technical Sessions
6:00 - 8:00 p.m.	Rooftop Reception at Gresham, Smith and Partners

Tuesday, August 14	
7:30 a.m. - 5:00 p.m.	Registration
8:30 - 10:00 a.m.	Concurrent Technical Sessions
10:00 - 10:30 a.m.	Networking Break & Poster Session
10:30 a.m. - 12:00 p.m.	Concurrent Technical Sessions
12:00 - 1:00 p.m.	Lunch in the Exhibit Hall
1:00 - 2:00 p.m.	Poster Session & Exhibitor Showcase
2:00 - 3:30 p.m.	Concurrent Technical Sessions
3:30 - 4:00 p.m.	Networking Break
4:00 - 5:30 p.m.	Concurrent Technical Sessions
6:00 - 9:00 p.m.	Key Social - City Winery Nashville*
Wednesday, August 15	
8:00 a.m. - 12:00 p.m.	Registration
8:30 - 10:00 a.m.	Concurrent Technical Sessions
10:00 - 10:30 a.m.	Networking Break
10:30 a.m. - 12:00 p.m.	Concurrent Technical Sessions
12:00 - 6:00 p.m.	Technical Tours*
Conclusion of Conference	

* *additional ticket required*

Opening Plenary & Keynote Lecture

Griffin Ballroom

Monday, August 13 | 8:30 - 10:00 a.m.



Joan Iverson Nassauer, University of Michigan, Professor in the School for Environment and Sustainability, University of Michigan, develops ecological design proposals and investigates how human experience is affected by and can sustain socially and environmentally beneficial landscape patterns. Linking environmental

performance with social benefits, she has developed green infrastructure approaches for several cities. Currently, she leads the NEW-GI project, Neighborhood, Environment, and Water research collaborations for Green Infrastructure in Detroit.

She also leads social science investigations for the NSF-funded Smart and Connected Communities project: “Overcoming Social and Technical Barriers for the Broad Adoption of Smart Stormwater Systems.” The author of more than 80 refereed papers and books, she wrote about water quality and health in agricultural landscapes in *From the Corn Belt to the Gulf: Societal and Environmental Implications of Alternative Agricultural Futures*, and urban green infrastructure in *Placing Nature: Culture and Landscape Ecology*.

Joan’s presentation, entitled “**A Commitment to Civic Well-being**,” focuses on how the installation of green infrastructure (GI) becomes more pervasive and integral to the functioning of stormwater management systems, and ways in which civic commitments implied by GI differ from the objectives of grey infrastructure deserve further attention.

Lunch Keynote
Exhibit Hall

Monday, August 13 | 12:00 - 1:00 p.m.



Troy Piripi Brockbank, BE(Civil), MEngNZ, is a civil engineer and the Stormwater360 New Zealand Design Manager.

With over 10 years professional experience in the stormwater industry across engineering consultancies, civil contractors & suppliers, Troy is a real asset to the Stormwater360 team.

Having a passion for water sensitive design, Troy aims to deliver innovative solutions that will protect and restore the quality of waterways and the environment for the future generations.

Regularly called on to contribute to water policy with government steering groups and offering technical advice to Iwi for environmental & 3-water matters, Troy is one of New Zealand's leading stormwater management specialists.

Troy's presentation is entitled **“The Importance of Water: A Indigenous Māori Perspective of Culturally Enhanced Water Sensitive Design.”**

This presentation will provide an overview of the our intrinsic links to water, and explore indigenous values and cultural considerations through case studies.

Opening Reception

Exhibit Hall

Sunday, August 12 | 5:30 - 7:00 p.m.

The opening reception is the perfect opportunity to network with other conference attendees, view the latest exhibitor products, reconnect with old colleagues or make new friends.

Rooftop Reception (Open to Everyone)

Monday, August 13 | 6:00 - 8:00 p.m.



G R E S H A M
S M I T H A N D
P A R T N E R S

Join us for a free rooftop reception on the 12th floor balcony, overlooking the Cumberland River. Hosted by Gresham, Smith and Partners, this venue is located at 222 Second Avenue South, and is just 7 short blocks (0.5 miles) away from the JW Marriott.

**Key Social
City Winery Nashville
Tuesday, August 14 | 6:00 - 9:00 p.m.**

wood.

The EWRI Low Impact Development Conference is excited to hold the key social at the City Winery Nashville, which is just a few short blocks from the JW Marriott. Hosted by Wood, the City Winery takes great pride in sourcing their grapes from some of the finest vineyards in the world – Cabernet Sauvignon from Bettinelli in Napa, California to Pinot Noir from Hyland Vineyards in Willamette Valley, Oregon or even Malbec from the esteemed Catena Vineyards in Agrelo, Mendoza Argentina. The facility is designed to integrate the wine-making process with consumption and enjoyment of wine.

While you are tasting some of Nashville's finest wines, enjoy the country music of Brassfield Alley. Brothers Bradley and Chadley Brassfield form Brassfield Alley, alongside Aly Cutter. Their music has a relaxed, bluesy feel and a catchy drum hook that draws you in and leaves you tapping your feet along, so don't forget to pack your cowboy boots!

Technical Tours

Wednesday, August 15

Music City Center Sustainability Tour

1:00-2:30 PM | 1.0 PDH

The Music City Center is a LEED Gold-certified building. Learn about green building design and sustainability initiatives including the four-acre green roof, 360,000 gallon rain water cistern, and an array of 845 solar panels. The Music City Center prides itself on its' water conservation, responsible purchasing, green operations, green construction, energy conservation, and indoor air quality.

NOTE: Group will meet at the conference registration desk at 12:45 p.m., and walk to the Music City Center for the tour.

Nashville Green Roof & Green Street Tour

1:00- 6:30 PM | 3.5 PDHs

The Nashville Green Roof & Green Street Tour will visit seven sites, that highlight their sustainability efforts around water issues:

- **The Freeman Webb Building:** The inviting green roof will filter storm water and reduce the building's cooling costs. As Tennessee's first LEED Gold Certified building, and winner of the International Green Apple Environmental Award in 2010, the Freeman Webb Building is proud to be a leader in Tennessee's green infrastructure initiative.
- **28th/31st Avenue Connector:** Completed in the fall of 2012, this Public Works Complete Street project includes landscaped bioswales to capture the stormwater runoff from the road. The 0.3-mile bridge and roadway link, connects neighborhoods while creating a better line of traffic from

Metro General Hospital, Meharry Medical College and TSU to Centennial Medical Center, HCA and Vanderbilt.

- **Cordell Hull Building:** Originally built in the 1950s, this historic landmark underwent complete interior demolition and renovation of the building, installation of a 450-LF underground capitol connector, linking the Cordell Hull building to the State Capitol building, and a three-story parking garage with a green roof. The renovated building now serves as the new home for Tennessee's legislature since November 2017.
- **Deaderick Street:** Deaderick Street sits within the Kerrigan Basin, one of Nashville's Combined Storm Sewer (CSS) basins, that has historically been subject to overflows. It is Nashville's first implementation of LID features in the public right-of-way, the first green street in Tennessee and one of the first green street applications in the southeast. Nashville estimates that over 1.2 million gallons will be removed from the Combined Sewer Overflow (CSO) system on an annual basis through this three block urban street.
- **Metro Public Square:** In addition to transforming a former parking lot into a green roof, the major sustainable feature in this award winning design for the renovated Public Square includes a 57,000 gallon rainwater harvesting tank incorporated into the subterranean parking garage. The harvested rainwater provides for all the site's irrigation.
- **The Pinnacle at Symphony Place:** As the first LEED-CS Gold certified building in the State of Tennessee, the Pinnacle incorporates numerous sustainable design features such as low-E glass and a green roof, located

over the parking garage at level seven, landscaped with native plants to absorb heat and rain water and to provide a pleasant retreat for tower occupants.

- **Korean Veterans Boulevard:** This streetscape continues the “Complete Streets” concept with the inclusion of a bike lane and generous sidewalks, as well as, the implementation of several Green Street sustainable features

Nashville Green Infrastructure Segway Tour

1:00-5:00 PM | 1.0 PDH

The Nashville Green Infrastructure Segway Tour will be conducted completely on two-wheeled, self-balancing scooters. The Nashville Green Infrastructure Segway Tour will visit four sites of Nashville’s Green Infrastructure:

- **Music City Walk of Fame Park:** Nashville’s Walk of Fame Park is a green roof over a downtown parking garage that honors inductees involved in the music world. As part of a renovation, the Music City Walk of Fame Park has increased more green space by adding trees and new environmental lighting. The park features usable green space and better electrical and sound capabilities and it continues to celebrate the Nashville Music Garden, which is home to nearly 300 roses, including some that are very rare.
- **Ascend Amphitheater:** Riverfront Park, a LEED Gold Certified facility, is the continued realization of the ambitious redevelopment of Nashville’s riverfront. This unique 12 acre park redevelopment integrates a commercial 6,500 seat amphitheater into the largest public green space in the downtown core. Bioretention is woven throughout public spaces, treating over 3.35 acres of the park. Other green highlights include a green roof, a rainwater harvesting tank, geothermal heating and cooling, solar panels, and

permeable paving. The park provides a greenway connection and a tree trail with over 250 trees representing 36 species.

- **Cumberland Play Park:** Cumberland Park is an innovative play space for children and families that incorporates unique play structures and water features along with an outdoor amphitheater, which accommodates approximately 1,200 people for events. The 6.5 acre park was formerly a neglected brownfield site that was home to shipyard activities. It now includes green features such as a cistern for irrigation, riparian restoration, an infiltration trench, and over an acre of native species planting.
- **Bridge Building:** Located downtown on the redeveloped riverfront, the historic Nashville Bridge Company Building was converted into office and event space in 2012. The Bridge Building's was awarded LEED Platinum Certification and at the time of its designation was the world's highest rated building within the Core and Shell category. Key green features include: pervious pavers, native plantings, rainwater harvesting, solar water heaters, and a geotherm

NOTE: Buses for this tour will assemble outside the hotel at 12:45 p.m., with a 1:00 p.m. departure. This entire tour will be conducted on a Segway (a two-wheeled, self-balancing scooter). This tour will require some physical exercise and physical ability. Please wear comfortable walking shoes. At the conclusion of the tour, you will be responsible for returning to the hotel. The JW Marriott is .6 miles away and is a 14 minute walk.

Green Infrastructure and LID Practice Construction Workshop

8:00 a.m. – 12:00 p.m. | Brentwood Room

Instructors: Jason Wright, Dan Christian, Troy Dorman, Brad Wardynski, Bill Hunt, Mitch Woodward, Karen Bishop

Design of green infrastructure or LID practices are only a part of properly managing stormwater runoff. If the practices are not properly constructed and maintained, they will not function as they are designed. Maintenance of green infrastructure and LID practices are widely discussed and training has been provided by ASCE with a workshop at a previous EWRI LID Conference. Little guidance has been provided on properly constructing or inspecting the construction of green infrastructure or LID practices.

Incorporating Green Infrastructure into Integrated Planning: Approaches and Tools to Achieve System Resiliency and Efficiency Workshop

8:00 a.m. – 12:00 p.m. | Emory Room

Instructors: Scott Struck, Adrienne Nemura, Andrea Braga, Kevin Koryto

Municipalities engaging in integrated planning can leverage the multiple benefits of comprehensive solutions such as green infrastructure to address both wastewater and stormwater programmatic objectives. However, integrated planning efforts can be a daunting task due to a lack of precedent and uncertainty in approach and anticipated outcomes. This workshop, geared towards municipal and design professionals, will provide attendees with an understanding of integrated planning approaches and tools to consider when thinking about whether an integrated plan is right for you.

Municipal Stormwater Program Development Workshop

1:00 - 5:00 p.m. | Brentwood Room

Instructors: Troy Dorman, Jason Wright, Jonathan Smith, Mike Clar, Kimberly Brewer, Karen Bishop, Kevin Boyer

Green infrastructure and LID have been adopted by many communities and municipalities as an effective approach to stormwater management. The communities that have not adopted or integrated green infrastructure or LID into their stormwater programs are often encouraged to by local, state, and federal regulators. Even areas where there is not pressure or requirements from regulators, often the public, and even some developers, are encouraging municipalities to allow or support green infrastructure because of the economic and social benefits.

Quantifying Stormwater Benefits of Urban Forest Systems Using Public-domain Software

1:00 - 5:00 p.m. | Emory Room

Instructor: Eric Kuehler

Urban forest systems are comprised of trees, shrubs, and soil collectively. These systems reduce significant amounts of stormwater runoff volume. Public-domain and on-line tools are available to help quantify the volume reduction by urban forests. This half-day workshop will demonstrate the use of these tools for estimating stormwater volume reduction, discuss the data needs for each tool, and review how the tools calculate these benefits.

**Each technical workshops earns 4 PDHs*

Monday, August 13

Opening Plenary & Keynote Speaker

8:30 - 10:00 a.m. | Griffin Ballroom

Moderator: Jon Hathaway

Welcome to Nashville

Shari L. Meghreblian, Commissioner, Department of
Environment & Conservation

A Commitment to Civic Well-being

Joan Iverson Nassauer, University of Michigan

Session 1.1: Considering Streams in Stormwater Management Objectives

Moderator: Scott Struck

10:30 a.m. - 12:00 p.m. | Belle Meade I & II

*Coupling Green Infrastructure and Stormwater Hydrology
with Channel Geomorphology to Assess Needs for Stream
Restoration Practices*

John Steven Schwartz, Robert Woockman

*Catchment-scale Evaluation of LID by a Flexible
Surface-subsurface Interaction Model – Case of Sligo Creek,
MD*

Mohammad Almadani, Arash Massoudieh

*Hydrograph Restoration: Multi-benefit Modeling for Basin
Planning*

John Riverson, Ryan Murphy, Patty Dillon, Sam Gould,
Arthur Lee, David Ojala, Keith Hume, Dustin Bambic

Reducing Stream Impacts by Preserving Natural Infiltration Processes in the Watershed and Stream Network using a Holistic Multi-Scale Approach – Oak Gulch Case Study

Jim Wulliman, Andrew Earles, Barbara Chongtoua, Sam Rogers, Brik Zivkovich, Sara Johnson

Long-term Impacts of Neighborhood Level LID: Baseline Hydrological Condition of Creek Side Village

Yin Yin

Recommendation on Reinforcing Current Frameworks for Setting Stream Restoration Prioritization through the Lens of Landscape Architecture

Archana Sharma, Joe Berg

Session 1.2: Municipal Program Development and Advancement

Moderator: Susan McCrary

10:30 a.m. - 12:00 p.m. | Arlington

Portland's Grey to Green Program: 10 years of at-scale Green Infrastructure Implementation

Kerry Rubin

Gotta Be Better Way: MSDGC's Use of Training and Technology for Green Infrastructure Maintenance

Leslie Schehl

It Takes a Village: Boston's Collaborative Journey Towards City-Wide Implementation of Green Infrastructure/Low Impact Development

Kate England

A National Review of Innovative and Integrated Stormwater Management Initiatives

Pinar Balci, Floren Poliseo, Sandeep Mehrotra, Steve Sands, Liza Faber

*Implementing Green Stormwater Infrastructure into a
Municipal Road Program*

Ashley Neptune, Matthew Bagaley

*Watershed Planning with a Focus on Green Infrastructure for
Water Quality and Drainage Management in Atlanta, GA*

Julie Owens, Aylin Lewallen

Session 1.3: Implementation Strategies and Challenges

Moderator: Hunter Freeman

10:30 a.m. - 12:00 p.m. | Brentwood

*Not Your Father's Buick - Beyond Traditional Delivery of
Stormwater Management*

Derick Topping, Ronald Geiger

*The Prince George's County Public Private Partnership:
From Idea to Implementation*

Troy Hunt, Neil Weinstein

*Can a Public-private Partnership Drive Development and
Stormwater Culture Change? The Friday Harbour Story - A
Case Study of Ontario's First Net-zero Phosphorus
Large-scale Development*

Rob Baldwin, Shauna Dudding

*Design-build or Design-bid-build? Project Delivery Lessons
Learned for Stormwater Success*

Bethany Bezak, Caitlin Feehan

Community Land Trusts: A New Model for Urban Equity

Blaine Stand, Petr Stand

Memoir of a Reviewer

Maria E. Price

Session 1.4: LID at the Catchment Scale

Moderator: Elizabeth Fassman-Beck

10:30 a.m. - 12:00 p.m. | Emory

Final Results of Pollutant and Flow Monitoring of the Birnamwood Drive Low Impact Development Roadway in Harris County, Texas

Michael Bloom, Nick Russo

Performance Evaluation of Combined LID Facilities on Runoff Reduction- A Case Of Taipei Tech. Campus in Taiwan

Chi-Feng Chen, Jen-Yang Lin, Chia-Chun Ho, Chao-Ting Kuo

Quantifying Green Infrastructure Performance through Field Scale Research to Inform Urban Planning Decisions: A Case Study from New Haven, CT

Kevin Dahms, Gaboury Benoit, Kelsey Semrod

IDEAS for GI – Interactive Design and Analysis Software for Green Infrastructure

Bardia Heidari Haratmeh, Barbara Minsker, Lawrence Band, Arthur Schmidt, Lorne Leonard, Neely Law

Targeting SCM Design to Measured Residential Runoff Pollutant Loads

Jay Dorsey, Ryan Winston

Getting to 10% Watershed Restoration through Low Impact Development Retrofits in an Urban Environment

James Houle, Thomas Ballestero

Session 1.5: Bioretention Cells under Cold Climate Conditions

Moderators: Elodie Passeport and Jennifer Drake

10:30 a.m. - 12:00 p.m. | Harpeth I & II

Effect of Freeze-thaw Cycles on Bioretention Performance

Elodie Passeport, Brenden Ding, Behrad Gharedaghloo,
Philippe Van Cappellen

Laboratory Study on the Performance of Bioretention for Stormwater Management in Cold Climates

Hannah Kratky, Zhan Li, Tong Yu

Spatial and Temporal Analysis of Hydraulic Conductivity, Snow Depth and Soil Properties of a Bioretention System

Alwish Ranjith John Gnanaraj, Jennifer Drake

Effects of Deicing Salts on Soil Porewater Quality and Soil Metals Retention

Shirley Clark, Karan Jain

Impact of Periodic High Concentrations of Salts on Bioretention Nutrients Performance

Allen Porter Davis, Meigan McManus

Bioretention Cells: Adsorption and Desorption of Naphthalene from Urban Stormwater Runoff

Ceren Akdeniz, Elodie Passeport

Session 2.1: Engaging the Community

Moderator: Robert Goo

2:00 - 3:30 p.m. | Belle Meade I & II

Developing Technical Policy with Non-Technical People

Andrew Reese

Stakeholder Perceptions of Green Infrastructure and Ecosystem Services in New York City

Stephanie Miller, Franco Montalto

Have a Thick Skin, it Pays Off: The Acceptance of Green Infrastructure by the Community

Andy Szatko, Steve Rodie

Lighting the Fire: Generating Enthusiasm for Green Infrastructure through Concept Designs

Chris Carandang, Matt Fabry, Stephen Carter

Using an Integrated Assessment Process to Determine Strategies for Removing Barriers to Green Infrastructure Implementation

Donald Carpenter, Sanjiv Sinha, Avik Basu, Robert Pettit

Utilizing Landscape Visualizations of Bioretention in the Public Right-of-way to Understand Perceptions about Maintenance and Visual Appeal of Green Stormwater Infrastructure

Holly Greenleaf, Stephanie Hurley, Richard Clark

Session 2.2: Challenges and CSO/SSolutions

Moderator: Jay Dorsey

2:00 - 3:30 p.m. | Arlington

ALCOSAN's GROW Program: A Regional Strategy to Reduce Sewage Overflows at the Source

Julia Spicher, Timothy Prevost, Joshua Jedlicka

Columbus Blueprint: Using Green Infrastructure to Address SSOs and Basement Flooding

Jason Sanson, Kathleen Smith

St. Louis MSD CSO Volume Reduction Green Infrastructure Program: Pilot, Full-Implementation and Progress

Melantha Norton, Susan McCrary

Garden of Edenwald Houses - Green Infrastructure for CSO Control in the Bronx

Virginia Roach, Walid Harrouch

Metropolitan Sewer District of Greater Cincinnati's Lick Run Greenway Project; An Innovative Way to Eliminate 400 MGD/Yr of Combined Sewer Overflows

Patrick Arnette

Drain the Rain: Lessons Learned on Disconnecting Downspouts in the Nation's Capital

Caitlin Feehan, Bethany Bezak

Session 2.3: Bioretention and Water Quality

Moderator: Bridget Wadzuk

2:00 - 3:30 p.m. | Brentwood

Removal Efficiency of Phthalates in Urban Highway Runoff in Shanghai by a Bioretention System

Tian Li, Yutong Liu

Aging Bioretention: A Retrospective Comparison of Nutrient Treatment Efficiency in a 16-Year Old Bioretention Cell

Jeffrey Johnson, William Hunt

Field and Laboratory Evaluation of Bioretention Bacterial Removal from Urban Stormwater Runoff in the Lower Rio Grande Valley, South Texas

Ahmed Mahmoud, Augusto Sanchez, Javier Guerrero, Kim Jones

Evaluation of Chemical And Physical Properties of Stormwater Management Greenstreets in New York City
Tatiana Morin, Maha Deeb

Investigating the Microbiology of Bioretention and Filtration
Mindy Hills, Vaikko Allen, James Lenhart

Performance Monitoring of a Simple Retrofit for a Rain Garden in Fort Collins, Colorado
Tyler Dell, Basil Hamdan

Session 2.4: Managing Salt and Gross Solids

Moderator: Jim Lenhart

2:00 - 3:30 p.m. | Emory

Reducing Road Salt Application Rates, Road Salt Pollution and Slip/Skid Hazards using Permeable Interlocking Concrete Pavement
Jeffrey Marvin, Jennifer Drake

Permeable Pavement for Road Salt Reduction
Andy Erickson, John Gulliver

Reducing Nutrients in Urban Stormwater through Municipal Leaf Collection
William Selbig

Deicer Impacts on Pervious Concrete Specimens: Phase IIa: Split Tensile Testing
Liv Haselbach, Nara Almeida, Molly Ross

Sediment and Gross Solids Removal by Pretreatment Practices for Bioretention
Andy Erickson, Matt Hernick, Chris Lord

Monitoring the Environmental Impact of Road Salts on Permeable Pavements versus Traditional Asphalt

Kirti Sehgal, Jennifer Drake, Huimin Zhu

Session 2.5: Panel Discussion: Regulatory Perspectives

Moderator: Kelly Lindow

2:00 - 3:30 p.m. | Harpeth I & II

MS4 Regulatory Overview: Are we there yet? Status and Updates in Tennessee and Nationally

David Smith (EPA Region 9)

Michael Hunt, (City of Nashville)

Jeff Willoughby, (City of Franklin, TN)

Robert Karesh, (Statewide Coordinator for Tennessee Department of Environment and Conservation)

Tom O'Connor, (EPA Office of Research and Development)

Session 3.1: LID Education

Moderator: Crystal Bishop

4:00 - 5:30 p.m. | Belle Meade I & II

Stormwater Education Through School Demonstration Projects

Lucius Jonett

Influence of Education and Outreach for Green Stormwater Infrastructure Development

Nicole Barclay

Enhancing Environmental Awareness, STEM Outcomes and Curriculum Benefits through Rain Gardens: A Successful Project Case Study Analysis

Steve Rodie, Rachael Arens, Andy Szatko

Founding of the Great Lakes Stormwater Tech Transfers Collaborative

Donald Carpenter, Michael Polich, Victoria Pebbles, Derek Berg, Anne Vaara

Chesapeake Bay Landscape Professional Certification Program

David Joseph Hirschman, Beth Ginter

Healing Water And People: Multifunctional and Artful Green Stormwater Infrastructure Design For Cultural Ecosystem Services

Holly Greenleaf

Session 3.2: Quantifying Program and Project Performance

Moderator: Rebecca Dohn

4:00 - 5:30 p.m. | Arlington

Long-Term Assessment of Low Impact Development Performance in Semi-Arid Southern California

Ava Moussavi

Case Studies in Inflow Monitoring of Green Stormwater Infrastructure Systems

Tsega Anbessie, Gary Martens, Morgan Nemtuda

Tracking and Quantifying Performance of Green Infrastructure through a Web-based System

Dustin Bambic, Michael Hunt, Joshua Hayes, Mary Bruce, Kevin Heeney

Ensuring Effective Monitoring to Verify Regulatory Compliance in Gwinnett County: The Development of the Gwinnett County Monitoring Guidance and Equipment Evaluation Manual

Brian Watson, Katherine Atteberry, Charles Crowell, Maureen Harris, Jason Wright

Data Analysis Confirms that Green Infrastructure Performs as Designed in Philadelphia

Raleigh Myers, Stephen White, Taylor Heffernan, Chris Bergerson

A 17 year Performance Evaluation of an LID Subdivision

Michael Clar

Session 3.3: What's going on in there?!? Bioretention Internal Processes and Variability

Moderator: Elodie Passeport

4:00 - 5:30 p.m. | Brentwood

Rain Garden Evapotranspiration Accounting Method

Amanda Hess, Bridget Wadzuk, Andrea Welker

Monitoring the Flow Pattern in the Media of Bioretention System and Design Recommendation

Farzana Ahmed, Michael Borst

Nitrogen Cycling in the Liquid, Soil, Gas, and Plant Phases of Rain Gardens: Overall Impact and Potential Improvements

Nandan Shetty, Ranran Hu, Brian Mailloux, Jessica Hoch, Diana Hsueh, Matthew Palmer, Wade McGillis, Duncan Menge, Kartik Chandran, Krista McGuire, Patricia Culligan

Insitu Field Measurements for Quantifying the Hydrological Performance of Individual Right-of-Way Bioswales

Siyan Wang, Wade McGillis, Ranran Hu, Patricia Culligan

Infiltration and Plant Assessment of Existing Bioretention and Rain Gardens in Omaha, Nebraska

Andy Szatko, Steve Rodie

Spatial Redistribution of Rainfall by Broadleaf Canopies Within a Stormwater Control Measure

Walter Yerk, Franco Montalto

Session 3.4: Ultra Urban Applications

Moderator: Harris Trobman

4:00 - 5:30 p.m. | Emory

Confined Space Bioretention Planters: Hydrologic Monitoring and Modeling

Elizabeth Fassman-Beck, Michael Borst, Samantha Conte, Patrick O'Hara, Firas Saleh

Development of a New BMP: Sand Filter Sidewalk Vaults

Aimee Navickis-Brasch, Jake Saxon, Taylor Hoffman

Evaluating Low Impact Redevelopment in an Ultra-Urban Area Using Field Monitoring and LiDAR

Casey Vaughn, Bridget Wadzuk, Ali Ebrahimian, Virginia Smith, Humaira Jahangiri

The Right GI Practice in the Right Place— A Probabilistic Cost-Performance Model to Address Uncertainty in GI Design

Alice Lancaster, John Phillips, Scott Kindred

Stormwater Treating Street Trees

Katie Balaze

Building a Better Tree Well

Hunter Freeman

Session 3.5: The Journey and the Future of Green Stormwater Infrastructure in Kansas City

Moderator: Brenda Macke

4:00 - 5:30 p.m. | Harpeth I & II

Green Stewards and the Future of Green Stormwater Infrastructure Maintenance in Kansas City

Lisa Treese, Andy Sauer, Priya Iyengar

Intelligent Stormwater Management in Combined Sewer Systems in Kansas City, MO

Priya Iyengar, Jason Garder

The Future: Kansas City's Vision for Green Stormwater Infrastructure, Learning from the Past

Priya Iyengar, Lauren Grubbs

The Past Looking Toward the Future of Green Stormwater Infrastructure in Kansas City

Lisa Treese, Andy Sauer, Priya Iyengar

The Journey and the Future of Green Stormwater Infrastructure in Kansas City

Priya Iyengar, Brenda Macke

Investigating the Impacts of Green Roofs' Vegetation Properties on its Function in Controlling Urban Runoffs

Mohammadsoroush Tafazzoli

A Flexible Tool for Hydraulic and Water Quality Performance Analysis of Green Infrastructure

Arash Massoudieh

Application of Triple Bottom Line Accounting Tools In Green Stormwater Infrastructure Planning: Evidence from Two Case Studies

Madeline Foley

Bioretention Cells for Removal of Benzotriazole from Urban Stormwater Runoff

Elodie Passeport

Blueprint Columbus – Integrated Planning and GI Design Lessons Learned

William Landshof

Canopy Storage Capacity of Broadleaf Plants Under Different Temperature and Wetting Regimes

Walter Yerk

Case Study: Water Quantity and Quality Mitigation Performance of a Constructed Wetland in NYC

Babak Kasaei Roodsari

Comparing of Stormwater Runoff Yield and Concentration Characteristics between Semi-Pervious and Impervious Road

Jianlong Wang

Computer Modelling: A Powerful Tool in the Design of LID Projects and Green Infrastructure

Rocky Keehn

Decentralized Low Impact Development (LID) Practices Addressing the Security of the Water-Energy-Food Nexus

Marina de Macedo

Ecosystem Service Benefits of Compost-Based Sustainable Management Practices (SMPs)

Britt Faucette

Effect of Precipitation on Bioswale Performance for Control of Stormwater Runoff from Roadways

Azadeh Akhavan Bloorchian

Estimating Time of Concentration for Overland Flow on Pervious and Impervious Surfaces for LID Planning

Xiaoning Li

Evaluating the Hydrologic Performance of a Long, Linear Bioswale against Traditional Rain Garden Design in a Highly Urbanized Setting

Elizabeth Calt

Evaluation and Application of Hybrid LID system for Urban stormwater management

Sungmin Cha

Evaluation of the non-point Pollutant Source Reduction Efficiency of LID Permeable Block with activated carbon

Jongyeong Kim

Evaluation on the Applicability of Biological Waste Resources such as Cockle, Walnut, and Gingko Shell as filter media in LID technologies

Minsu Jeon

Exploring LID Niches with Urban Plants

Chih-Wei Chang

Factors affecting Spatiotemporal Media Moisture Content and Temperature Variation in LID Technologies

Sher Gurung

Field Performance Verification of a High Flow Bioretention System for Basic and Enhanced Treatment under the Technology Assessment Protocol - Ecology

Vaikko Allen

Green Street Neighborhood Assessment and Design Lessons-Learned in Montgomery County, MD

Michael Perkins

The Assessment of the Climate Resilience of Landscape Design for Green Stormwater Infrastructure

Nian She

The Case for Maintenance – Green Roof Weeding and Plant Replacement

Susan Morgan

The Stormwater Benefits of High-Performance Urban Trees

Jeremy Bailey

The Study on Water Cycle Efficiency of Green-roof system using SWMM

Hyunsuk Shin

The Study on Water Cycle Efficiency of Low Impact Development using K-LIDM

Hyunsuk Shin

Sustainable Water Remediation Using Permeable Concrete

Ryan Holmes

Validation of the SWMM Green Roof Module for an Extensive Green Roof in Syracuse, NY

Lucie Worthen

Water Quality & Quantity Performance of New Haven (CT) Bioswales

Kimberly DiGiovanni

When Stormwater Fails – Lessons From the Built Environment

Natalie Carmen

Tuesday, August 14

Session 4.1: Connecting With the Community: Case Studies

Moderator: Jason Bernagros

8:30 - 10:00 a.m | Belle Meade I & II

A Community-Driven Framework for Revitalizing the LA River with Green Infrastructure

Chad Helmle, Bradley Wardynski

Connective Regulatory and Stakeholder Needs: LID Design on a Large-Scale Bridge Project in Washington DC

Carmen Franks

Rodney Cook, Sr. Park – How Atlanta is Using Partnerships, Low Impact Development, and Park Design Techniques to Rejuvenate a Community

Robert Bryant, Cory Rayburn, Kimberly Patak

Sunset Area Stormwater Improvements: Connecting Community using Stormwater as a Catalyst

Dustin Atchison, Raymond Chung, Hebe Bernardo

Spring Lake Park: The Transformation of an Underutilized Park Using LID

Ryan Bentley

Session 4.2: Don't Repeat the Past! Better Design through Adaptation and Standards

Moderator: Andy Reese

8:30 - 10:00 a.m | Arlington

Adapting Green Infrastructure Tracking, Design, and Maintenance Methods for a Diversity of Programs
Alysondria Eason

Trust the Process: The Evolution of Philadelphia's Public GSI Design Standards
Ben Clements, Dan Moran

Maximizing the Benefits and Minimizing the Risks Associated with Standardizing Green Infrastructure Design
Eric Lienhard, Laura Bendernagel, Caitlin Feehan

Standardized Stormwater? Developing Standard Green Infrastructure for Cost-effective Design, Permitting, and Construction
Caitlin Feehan, Bethany Bezak

If LID is so easy to implement, how come we keep getting it wrong?
Steven Trinkaus

Green Infrastructure Case Studies in the Midwest: Documenting Project Successes and Creative Solutions to Poorly Functioning Systems
Steve Rodie, Andy Szatko

Session 4.3: The Big Picture: Watershed Scale Planning and Implementation

Moderator: Kathlie Jeng-Bulloch

8:30 - 10:00 a.m | Brentwood

Development and Application of a Multi-Scale BMP Analysis Framework for Integrated Watershed Management Planning
Austin Orr, Aaron Poresky, Venkat Gummadi, Sean Torres

Integrating LID and Stream Restoration at an Educational Site in Gwinnett County, GA
Charles Crowell, Arvind Narayanan, Ray Hyland

Water Quality Target Assessment using LID TTT version 1.0 for LID Designs in Ontario, Canada
Steve Auger, Tim Van Seters, Aman Singh, John Antoszek

Tibbetts Brook Wetland Restoration and Daylighting Concept Design
Julie Stein

Maryland's Watershed Based Permitting Approach to Institutional Stormwater Management
Edward Brown, Celso Guitian, Larry Hennessey

Prioritizing Green Infrastructure for Phosphorus Reduction within Boston's MS4
Matthew Jones, Charles Wilson, Charles Jewell

Session 4.4: Beyond Stormwater Management: Exploring the Many Benefits of LID

Moderator: John Schwartz

8:30 - 10:00 a.m | Emory

Integrating Photovoltaic and Green Roof Systems: Findings of Research Conducted at the University of Toronto's Green Roof Innovation Testing Laboratory

Jennifer Drake, Liat Margolis, Brent Sleep, Ali Jahanfar, Marisa Fryer, Dalia El-Helow

The Combined Effects of LID for Runoff Reduction, Evapotranspiration Enhancement and Microclimate Adjustment in a space between buildings in Shenzhen, China

Huapeng Qin, Yuanyan Zhang

Understanding the Roles of Biodiversity and Functional Diversity in Provision of Co-benefits by Stormwater Biofilter Plant Communities.

Brandon Winfrey, Emily Payne, Richard Ambrose

Quantifying the Thermal and Microclimate Effects of Small Scale Green Stormwater Infrastructure

Lauren Smalls-Mantey, Franco Montalto

Rainwater Harvesting as a Viable Potable Water Source: A Comparison of Three Water Sources in the Blue Ridge Mountains

Kathy Gee, Kaitlyn Dobyms, Katherine Plucinski

Ecosystem Services of SCMs Over Time: A Look at Stormwater Treatment in Wake County Over the Last 20 Years.

Natalie Carmen, Joseph Puckett

Session 4.5: Panel Discussion: Future Direction of Bioretention Technology

Moderator: Mike Clar & Robert Traver

8:30 - 10:00 a.m | Harpeth I & II

Current directions of Bioretention Technology Task Committee

Robert Brown

Puget Sound Bioretention Media Demonstration Study

Curtis Hinman

Bioretention in disturbed urban soils

Elizabeth Fassman Beck

Bioretention issues and lessons learned in High Plains Region

Jason Vogel

Bioretention O & M

Steve Trinkaus

Session 5.1: Show Me the Money: Economic Considerations in Stormwater

Moderator: Jennifer Watson

10:30 a.m. - 12:00 p.m | Belle Meade I & II

National Green Infrastructure Certification—An Investment in GI and the GI Workforce

Adriana Caldarelli

St. Louis MSD's Three Green Infrastructure Grant Programs: One Size Does Not Fit All

Susan McCrary, Melantha Norton

The Long-Term Economic and Social Impacts of Green Infrastructure in New York City

Stephanie Miller, Franco Montalto

A Year in Review - Building an Inspection and Maintenance Program for the City of Virginia Beach

Kyle Logue, Jason Wilson

Economic Development Impacts of Low Impact Green Infrastructure - An Emerging Case Study in Ripple-Effect Infrastructure Economics

Blaine Stand, Petr Stand, Jeremy Stand

The Costs and Benefits of Permeable Pavements at the Neighbourhood Scale

Kirstin Newfield, Yin Yin, Jennifer Drake

Session 5.2: I Have a Plan! Municipal Planning for LID

Moderator: Robert Brown

10:30 a.m. - 12:00 p.m | Arlington

Improving Resiliency in an Urban Industrial and Commercial Area through Green and Gray Infrastructure Planning

Emily Clifton, Steven Roy, Neil Weinstein

Planning and Permitting: Subwatershed-Wide Low Impact Development and Complete Corridor Stormwater Management Approach

Adrienne Sones, Shawna Chambers

Street-Scale, Strategic Green Infrastructure Planning in Los Angeles

Dawn Petschauer, Douglas Krauss, Lauren Amimoto,
Bradley Wardynski, Chad Helmle

High-Resolution, Integrated Watershed Planning: A San Diego Success Story

Raina Dwivedi, Chad Helmle

How the City of Sacramento is Using Data to Plan Cost-Effective Green Infrastructure

Amir Ehsaei, Joseph Burg

A User Friendly Python Code for Planning Large GI Programs

Khaled Abdo, Hazem Gheith

Session 5.3: Science Inspired Planning and Management Approaches

Moderator: Eban Bean

10:30 a.m. - 12:00 p.m | Brentwood

Planning Urban LIDs Using Enhanced Modeling Approach that Couples Detailed Surface Hydrology and Sewers Hydraulics

Hazem Gheith, Qiuli Lu

Ten Years Later: Updating the Runoff Reduction Method

Dan Hirschman, Tom Schueler, Kelly Lindow,
Jon Hathaway, Marcus Aguilar, Rebecca Dohn

NYC's Green Infrastructure Research & Development Project – Monitoring Strategy and Protocols

Fernando Pasquel, Miki Urisaka, John McLaughlin,
Franco Montalto, Valentina Paiva-Acosta

Determining Water Quality Parameters for an Integrated Decision Support Tool for Stormwater Infrastructure Planning

Colin Bell, Ye Li, Wenli Dickinson, Terri Hogue

Utilizing Large-Scale Infiltration Testing Data in Green Infrastructure Program Implementation in Philadelphia, PA

Andrew Baldrige, Stephen White, Dwayne Myers

The Stick and the Carrot: Traction of Novel Ecotechnologies in the Chesapeake Bay Watershed to Help Meet Aggressive MS4 and TMDL Permit Requirements

Edward Brown, Bryan Arvai

Session 5.4: Planning and Designing for an Uncertain Future

Moderator: Kaitlin Vacca

10:30 a.m. - 12:00 p.m | Emory

Incorporating Climate Resiliency into Common Stormwater Designs

Matthew Jones, Andrew Anderson

What Comes After Monitoring and Analysis? Integrating Climate and Design to Improve Green Infrastructure Systems

Cara Albright, Robert Traver, Bridget Wadzuk

Impacts of Climate Change on the Performance of Rainwater Harvesting Systems

Kathy Gee

Effects of Climate Change on Low Impact Development (LID) Performance - a Case of Study in Sao Carlos, Brazil

César Ambrogi Ferreira do Lago, Marina Batalini de Macedo, Marcio Hofheinz Giacomoni, Eduardo Mario Mendiondo

Performance Assessment of Green Infrastructure Practices with Continuous Monitoring and Adaptive Control under Present Day and Climate Change Scenarios

Conor Lewellyn, Bridget Wadzuk

*Mapping Flood Hazards under Precipitation and Land Use
Uncertainty through Probabilistic Flood Inundation Maps*
Timothy Stephens, Brian Bledsoe

Session 5.5: Forest System Contributions to Stormwater Management

Moderator: Eric Kuehler

10:30 a.m. - 12:00 p.m | Harpeth I & II

*Urban Tree Hydrologic Services: What We Know, and What
We'd Like to Know More About*
Tricia Moore, Alireza Nooraei

Rainfall Interception of Urban Trees in the Knoxville Area
Jon Hathaway

*A Controlled Experiment on the Water Quality and Quantity
Benefits of Trees in Bioretention Practices*
Andrew Tirpak

Trees as Sources of Nutrients to Surface Waters
Sarah Hobbie, Lawrence Baker, Jacques Finlay, Benjamin
Janke, Paula Kalinosky, William Selbig

Accounting for Trees in Stormwater Models
Carol Wong, Karen Capiella

*Growing Trees in Gravel Retention Systems to Reduce
Stormwater Runoff*
Eric Kuehler, Jon Hathaway

Session 6.1: Case Studies: Meeting Multiple Objectives

Moderator: Dahlia Thompson

2:00 p.m. - 3:30 p.m | Belle Meade I & II

In the Trenches of Green Infrastructure

Lucius Jonett

Collaboration in GI from Design to Post Installation

Robert Woodman

Soil Cell Design Guidance for Calgary

David Seeliger, Ken Clogg, Bert van Duin, Tayler Marra

The Hillsboro High School Renovation: Planning for the Future

Levi Sciara

Research to Practice: Runoff Reduction Policy, Criteria, and Application in Colorado

Sara Johnson, Holly Piza, Jim Wulliman, Andrew Earles,
Derek Rapp, Brik Zivkovich, Sam Rogers

Making American Street Green Again: Incorporating GSI into an Urban Corridor

Kathryn Drake

Session 6.2: I Came, I Saw, I Retrofit

Moderator: Ted Brown

2:00 p.m. - 3:30 p.m | Arlington

Canadian Low Impact Development Retrofit Approaches: A 21st Century Stormwater Management Paradigm

William Vander Linden, Bill Trenouth

LID Stormwater Retrofits for Puget Sound— Planning, Design, Construction, & Lessons Learned
Robin Kirschbaum

Lowering Capital Costs through a City-funded Private Property Stormwater Retrofit Program
Tim Kurtz

Gray to Green: The Toledo Swan Creek Project
Carol Hufnagel, James Brescol, Scott Sibley

Sustainable Stormwater Analysis for the Ford Site Redevelopment, St. Paul, MN
Bob Fossum

Fees, Sites, and Credits: Alternative Stormwater Compliance in San Francisco
Eric Zickler, Sarah Minick, Pauline Perkins, Katie Pilat

Session 6.3: Using Amendments in Stormwater SCMs

Moderator: Kathy Gee

2:00 p.m. - 3:30 p.m | Brentwood

Field Study on Removal of Dissolved Metals and Nutrients from Parking-lot Runoff by Catch-basin Media Augmented with Water-treatment Residuals
Kirk Barrett, Sunhawach Na Nagara, Virinder Sidhu, Dibyendu Sarkar

Zeolite and Biochar Amendments to Minimize Nutrient Leaching from Extensive Sedum Green Roofs
Elizabeth Fassman-Beck, Yang Cheng, Birgitte Johannessen

A Field Study of Biochar Amended Soils: Water Retention, Infiltration and Nutrient Removal from Stormwater Runoff

Joseph Brown, Sriya Panta, Paul Imhoff, Charles Hegberg, Larry Trout, Ali Nakhli, Jing Tian

Developing High-Performance Bioretention Media and Media Filter Systems for Phosphorus Capture

Curtis Hinman

Mitigating Compaction in New Residential Developments: Kick-starting the Soil Reformation Process

Eban Bean, Allan Bacon

Field Study on Removal of Nitrogen and Phosphorus by Vegetated Plots with Soils Amended with Water-Treatment Residuals

Kirk Barrett, Virinder Sidhu, Dibyendu Sarkar

Session 6.4: LID Modeling

Moderator: Matthew Jones

2:00 p.m. - 3:30 p.m | Emory

Promoting Successful Urban Watershed Restoration through Enhanced Bioretention Cell Modeling

Whitney Lisenbee, Jon Hathaway, Ryan Winston, Lamyaa Negm, Mohamed Youssef

Evaluating Green Infrastructure Performance under Varying Soil Parameters

Reshmina William, Gabrielle Bethke, Ashlynn Stillwell

Use of CHAMPS Model for Simulating Energy and Moisture on an Extensive Green Roof

Yige Yang, Cliff Davidson

Impact of Morphology on Infiltration in Green Stormwater Infrastructure

Richard Ampomah, Victoria Reis, Rebecca Connolly,
Virginia Smith, Kristin Sample-Lord

Modelling the Effects of Inner Structure and Weather Conditions on the Runoff Nitrogen Removal Efficiency of a Bioretention

Kangmao He, Huapeng Qin, Chuansheng Wang, Ming Cheng

Analysis of Low Impact Development using Continuous Simulation Hydrologic Modeling

Patrick McMahon, Clive Sorhaindo

Session 6.5: Panel Discussion: I+M Maintenance Initiatives

Moderator: Kelly Lindow

2:00 p.m. - 3:30 p.m | Harpeth I & II

Workforce Training and Certification Programs for Stormwater Inspection and Maintenance - A Panel Discussion

Kelly Lindow, William Lord, Beth Ginter, Carol Wong, Ted Scott

Session 7.1: Sponge City

Moderator: Steve Trinkaus

4:00 p.m. - 5:30 p.m | Belle Meade I & II

Innovation and Challenges on Sponge City in China

Vincent Lee, Michael Zhao, Kenneth Kwok

China's "Sponge City" Initiative: Program Updates and Case Studies

Yuming Su, Wenliang Wang, Yang Zhao, Shengy Qin

Enhancing the Cultural Specificity of Sponge City Development: Lessons Learned from Chinese Stormwater Values

Rui Wang, Hong Wu

Build the first Sponge park in China

Xiaolin Zhong, Nian She, William Lucas

Transforming the Low-income Neighborhoods to the “Climate-resilient” Neighborhoods by Sponge City Initiatives in Zhenjiang City of China

Hui Chen, Nian She, Xiangqiang Ye, Tueheng Zhang

Sponge City (LID) Masterplan for Chengdu International Airport City

Mathew Bamm

Session 7.2: Tools and Initiatives

Moderator: Scott Dierks

4:00 p.m. - 5:30 p.m | Arlington

Making LID the Preferred and Commonly Used Approach: Lessons Learned Developing Tools, Training, and Implementation in Washington State

Rebecca Dugopolski

Developing Stormwater Strategic Asset Management Tools and Guidance on a National Scale: A Status Update on WE&RF’s Targeted Collaborative Research Project

Mark Van Auken, Fernando Pasquel, Linda Blankenship, Walter Graf, Allison Deines

Placer County’s Stormwater Design Tools: A Compliance Guide for California’s Phase II Municipal Separate Storm Sewer System Permit

Stefan Schuster, Mary Keller

The New Orleans Green Infrastructure Toolkit
Jenny Bywater, Michael Schmidt, Danielle Duhe, Dana Brown, Tyler Antrup

Removing Barriers to Low Impact Development in California
Daniel Apt, Darla Elswick, Wayne Carlson

Comparing Innovative Decision Support Tools and Methods for Green Infrastructure Strategic Planning
Scott Struck

Session 7.3: Park that Stormwater Here

Moderator: Karen Kabbes

4:00 p.m. - 5:30 p.m | Brentwood

Restoring Water Quality in Urban Lakes and Ponds – The East Lake Park Experience
David Mason, Bejan Poureshmenantalemy

DC Water's Green Infrastructure Design Challenge Parks Project
Andrew Potts, Bethany Bezak, Susan Beck, Leah Rominger

Innovative New Ideas for Stormwater Management and Recreation in Calgary, Alberta - West District Central Park
Robert Bryant, Ronald Geiger, Kimberly Patak

LID BMPs in California State Parks; Retrofits that Prioritize Water Quality Protection and Recreation
Yvana Hrovat

Greening the Parks: Incorporating Green Infrastructure into New York City's Parks
Dahlia Thompson, John McLaughlin, Waqas Saeed

Build In My Back Yard! A Look at Trail Oriented Development in Carmel, Indiana

Jeremy Kashman, Neil Myers

Session 7.4: LID in the Transportation Environment

Moderator: Ani Jayakaran

4:00 p.m. - 5:30 p.m | Emory

Improving the Design of Curb Openings in Green Stormwater Infrastructure

Sarah Stoolmiller, Ali Ebrahimian, Bridget Wadzuk

Case Study: Monitoring and Modeling the Hydrologic Performance of a Right-of-Way Bioswale in NYC

Babak Kasaei Roodsari, Wei Chen, Kimberly DiGiovanni

Experimental and Model Study of Road-Bioretenion System

Xiaoning Li, Xing Fang

Assessment of Green Stormwater Infrastructure Practices on Lorton Road, Fairfax County, VA

Charles Burgis, Gail Hayes, Derek Henderson, James Smith

Monitoring 'Airside' Land Uses at ILM Airport: an Example of LID?

Alisha Goldstein, Bill Hunt, Erin Carey

The Comparison of Four Distinctly Different Infiltration BMPs along the same Four Lane Urban Street

Kurt Leuthold

**Session 7.5: SPECIAL SESSION: Soils and Plants Symbiosis
Considerations in GSI Design, O&M and Life Cycle**

Moderator: Neil Weinstein and Mike Clar

4:00 p.m. - 5:30 p.m | Harpeth I & II

*Green Stormwater Infrastructure Soils and Plants
Considerations*

Meredith Upchurch

Fairfax County, VA Bioretention Performance Evaluation

Heather Ambrose

Soils and Plants in GSI in the Southwest

David Hopman

Evapotranspiration processes in GSI

Amanda Hess

Lessons learned in use of GSI in Montgomery County, MD

Ann English

How Can Precast Concrete be Used in Innovative LID Projects? A Look at Technologies and a Super Bowl Case Study

Claude Goguen

How Low Impact Development Strategies can Mitigate High Intensity Rainfall Events

Steven Trinkaus

Implication of sediment accumulation and collection in pre-treatment basins of urban stormwater green infrastructures

Franz Kevin Geronimo

Incorporating storm water inlet efficiency into small – scale urban sub-catchment model to evaluate spatial performance of green infrastructure

Leena Shevade

Inspection System of Green Infrastructure and Low Impact Development Technologies in South Korea

Euihyeok Yoon

Investigating the Hydraulic Constriction of Perforated Conveyance Pipes in a Stormwater Infiltration Planting Trench System

Noura Abualfaraj

Jackson's Grant: A Community Development that has Fully Embraced Sustainability

Neil Myers

Long-term Infiltration Capacity of Different Types of Permeable Pavements

Kirk Barrett

Low Impact Development: Lessons Learned

Jacob Aalfs

Low Impact Development Monitoring, Open Data Strategy, Tracking, and Assessment - California LID Evaluation & Analysis Network

Daniel Apt

Making a Case for Investigating Co-Relation of Soil Composition and Bio-Retention Function: Review of Theory and Practice

Behnaz Safavi

Measuring Above and Beyond – The Chatham Park Exceptional Design Evaluation

Hunter Freeman

Mechanisms in a Subsurface Infiltration Stormwater Control Measure

Jiayu Liu

Modeling Mass Transfer Coefficients in Deep Aeration Tanks

Johnny Lee

Monitoring Infiltration Movement Through the Soil Profile in Urban Rain Gardens

Matina Shakya

Monitoring the Rainfall Runoff Response of a Large-Scale Green Roof

Noura Abualfaraj

Northeastern Ohio LID Adoption Status Update

Christina Znidarsic

Novel Irrigation Technologies for Urban Landscaping

Hailing Yang

Observed Variability in Soil Moisture in Engineered Urban Green Infrastructure Systems

Bitia Alizadehtazi

Optimization of the Runoff Retention Capacity of Urban Green Space System in a Highly Urbanized Catchment

Ming Cheng

Overcoming common challenges of Bioretention with High Flow Modular Biofiltration Systems

Robert Woodman

pH Profiles Around Pervious Concrete in Fresh Water

Liv Haselbach

Play Ball! And Manage Stormwater? Do Artificial Turf Grass Fields Effectively Manage Stormwater?

Miki Urisaka

Preliminary Analysis of Biomass and Water Quality for *Typha angustifolia* in a Controlled Environment

Jaime Thissen

Protecting Stormwater Conveyances & Streams from Encroachment & Destruction

Maria Price

Realizing Our Sustainability Potential: Utilizing Urban Trees for Stormwater Management

Shane Carpani

Replacement of Missing Precipitation Records Amidst Measurement Uncertainty in an Urban Rain Gage Network

Leena Shevade

Stevens' Living Laboratory for Stormwater Green Infrastructure

Elizabeth Fassman-Beck

Streamlining Green Infrastructure/Stormwater BMP Design for Transportation Systems

Anwer Ahmed

Using Trees as a Temperature Mitigation Strategy in Camden, New Jersey

Mostafa Razzaghmanesh

Wednesday, August 14

Session 8.1: Maintenance: Tools and Observations

Moderator: Keith Lichten

8:30 - 10:00 a.m | Belle Meade I & II

Rainwater Harvesting Systems and Mosquitoes: Is There a Problem?

Kaitlyn Dobyns, Kyrstem Gage, Kathy Gee, William Hunt, Shawn Kennedy

Optimizing Operations and Maintenance of LID BMPs

Mikael Isensee, Paige Ahlborg

Challenges with Integrating State-Wide Stormwater System Assets into A Large Enterprise Asset Management System

Natalie Postel, Pete Estes, Anwer Ahmed

Costs of LID Maintenance in North Carolina

Sarah Waickowski, Bill Hunt, Bill Lord

Quantifying Clogging Risk of Roadside BMPs: Development of an Interactive Tool

Kevin Koryto, Aaron Poresky

Maintenance of Low Impact Development and its Impact on Long-Term Performance

Ava Moussavi

Session 8.2: Instigating and Incentivizing

Moderator: Saya Qualls

8:30 - 10:00 a.m | Arlington

Lake Simcoe Phosphorus Offsetting Program (LSPOP) – Moving beyond Trading using New Growth To Reduce Phosphorus Loading and Increase LID Implementation

Rob Baldwin, Mike Walters, Ben Longstaff

Framework for a Performance-Based Green Roof Incentive in New York City

Tyler Carson, Melissa Enoch, Franco Montalto

Low Impact Development Certification System: System Proposed To Protect Water Quality In Lake George, NY

Christopher Navitsky, Michele Adams

Charlotte Post Construction Stormwater Mitigation Fee Program

Jordan Miller

Green = Gold: Demonstrating Sustainability to Achieve SITES Gold in Our Nation's Capital

Altje Macy, Ray Mims, Darren Damone

Development of Raleigh's Voluntary Municipal Green Infrastructure Program

Jonathan Smith, Kevin Boyer

Session 8.3: Planning for Resiliency and Flood Protection

Moderator: Michael Hunt

8:30 - 10:00 a.m | Brentwood

Resiliency Through Green Infrastructure Systems

Dana Brown

Coordinated Watershed Controls for Flood Risk Reduction and Combined Sewer Overflow Mitigation in the City of Albany

Dayton Marchese, Viktor Hlas, William Simcoe

The Transformation of an Urban Residential Street Into a Pedestrian Greenway that Provides Water Quality Treatment and Flood Control While also Enhancing the Neighborhood

Kurt Leuthold

*Mitigating Urban Heat Island Effect with Green Infrastructure
in Gowanus, Brooklyn*

Nancy Choi

*Advancing Green Infrastructure in the Greater New Orleans
Area to Enhance Resilience and Reduce Flooding*

Anthony Kendrick

Session 8.4: Advancements in Permeable Pavement

Moderator: Ken Schiff

8:30 - 10:00 a.m | Emory

*Nutrient Removal Enhanced by Permeable Reactive
Concrete*

Andrew Ramsey, Ryan Holmes, Megan Hart, John Kevern

*Enhanced Infiltration in Permeable Interlocking Concrete
Pavements through Temporary Detention of Stormwater*

Kirti Sehgal, Jennifer Drake

*Stormwater Quality and Quantity Management using Porous
Asphalt Pavements*

Anand Jayakaran, Thorsten Knappenberger, John Stark,
Curtis Hinman

*Stormwater Treatment using Permeable Pavements
Comprising Waste Materials*

John Monroe, Kiran Tota-Maharaj, Chad Staddon,
Abrahams Mwasha

*Enhancing the Functionality of Pervious Concrete
Pavements through Design and Maintenance*

Mohammadsoroush Tafazzoli

Water-Quality and Hydraulic Performance of Three Types of Permeable Pavement under High Sediment Loading Conditions

William Selbig, Nicolas Buer

Session 8.5: Beyond Performance - Measuring the True Value of Green Infrastructure in Urban Communities

Moderator: Jennifer Johnson

8:30 - 10:00 a.m | Harpeth I & II

Beyond Performance – Measuring the True Value of Green Infrastructure on Urban Communities

Jennifer Johnson, Kate England, Pallavi Mande, Matthew Davis, Neil Angus

Session 9.1: Designing for Maintenance

Moderator: Bill Lord

10:30 a.m. - 12:00 p.m | Belle Meade I & II

Forensic Investigation of Two Underperforming Raingardens and Recommendations for Rehabilitation

Victoria Reis, Rebecca Connolly, Richard Ampomah, Kristin Sample-Lord, Virginia Smith

Exploring Maintenance-friendly Planting Design for Green Stormwater Infrastructure

Hong Wu, John Hall

Why Do Some Urban Green Infrastructure Features Thrive Over Time and Others Not So Much?

Nancy Ellwood, Keerthi Palanisamy, Kate Moran

Report from the Field: Resolving Common Failures of LID Filter Practices

Theodore Edward Scott

Design for Reduced Maintenance: Design Considerations to Reduce the Maintenance Burden

Merrill Mark Taylor, Jason Wright, Troy Dorman

GI/LID Landscape Maintenance: Design for Function

Don Green

Session 9.2: International Perspectives

Moderator: Mike Clar

10:30 a.m. - 12:00 p.m | Arlington

China's Sponge City Program: The Good, the Bad, the Ugly

Mark Merkelbach, John Lenth

Stormwater drainage management in Freetown, Sierra Leone with Application of Varying Scale Low Impact Development (LID) Schemes

Mehedi Hasan Tarek, Adil Hassan, Sayedul H. Choudhury

Evaluation of Effectiveness of Low Impact Development (LID) Options in Mitigating Water Logging and Drainage Problems of Dhaka

Mehedi Hasan Tarek, Adil Hassan, Sayedul Choudhury

LID Practices for Reservoir Water Quality Management: Case Studies in Taiwan

Jen-Yang Lin, Shyh-Fang Kang, Shaw Lei Yu

Water Energy Nexus in the United States and Saudi Arabia Low Impact Development

Tony Rizk

Towards Dual Thinking of Ecology: Raingardens Design In Northern China

Xiaoying Meng

Session 9.3: LID Under Challenging Planning, Policies, and Regulations

Moderator: Jonathan Smith

10:30 a.m. - 12:00 p.m | Brentwood

Meeting Georgia's New Recommended Runoff Reduction Performance Standard: One Metro-Atlanta City's Approach
Brian Watson, Julie Kaplan, Eric Byrne, Jill Bazinet

Thinking Big, Acting Small: Case Studies on Planning and Implementing Green Infrastructure in the Greater Boston Area
Jennifer Relstab

Beyond the Streets - Urban Green Infrastructure Solutions
Michael Moscariello, Michael DeVuono

Washing 110 Buses a Day with Rainwater: Overcoming Regulatory Obstacles
Michele Adams, Marc Henderson

Low Impact Development from the Ground up - Planning a New Ontario town with Low Impact Development as the Basis
Ian Roul

Less Is More: Minimizing Your Footprint within Challenging Contexts
Matt Gurrad, Grace Manzano, Jonathan Brown

Session 9.4: Big Data and Sensor Based Monitoring, Control, and Operation

Moderator: Jon Hathaway

10:30 a.m. - 12:00 p.m | Emory

Reducing Costs of Green Stormwater Infrastructure Monitoring Data Collection to Inform Site Maintenance Decisions With Real-time Soil Moisture Sensing Technologies and the Internet of Things

Karly Soldner, Babak Roodsari, Ziwen Yu, Matthew Fritch, Stephen White, Franco Montalto

A Simple Model of Green Infrastructure Soil Moisture Patterns as a Function of Hydrologic Loading, Surface Treatment, and Urban Climate

Bitá Alizadehtazi, Patrick Gurian, Franco Montalto

Performance of a “Next Generation” Green Roof with Irrigation and Smart Detention

Nandan H. Shetty, Mark K. Wang, Robert Elliott, Mark Wang, Matthew Palmer, Patricia Culligan

Automated Detection of Unusual Soil Moisture Probe Response Patterns with Association Rule Learning

Ziwen Yu, Alex Bedig, Franco Montalto, Marcus Quigley

Integrating Artificial Neural Networks and Reinforcement Learning With Real-Time Control of Green Infrastructure Systems

Michael John Ryan, Bridget Wadzuk, Gerald Zaremba

In-situ Measurement of Evapotranspiration from LID Facilities Based on Infrared Thermal Imaging and the 3T Model

Yuanyan Zhang, Huapeng Qin

Session 9.5: Out of Site, Out of Mind? Infiltration and Groundwater Impacts

Moderator: Robert Traver

10:30 a.m. - 12:00 p.m | Harpeth I & II

Factors Affecting Exfiltration Rate from a Subsurface Infiltration Stormwater Control Measure

Jiayu Liu, Michael Borst

Impact to Groundwater Quality Due to Infiltration of Urban Runoff: Results of Long-Term Monitoring Studies

Marty Spongberg

Groundwater Table Fluctuation from Water Infiltration of Green Infrastructure Sidewalk Planters in Philadelphia, Pennsylvania

Min-Cheng Tu, Robert Traver

Geotechnical Risks of Infiltration BMPs: Estimating Groundwater Mounding and Soil Moisture Effects of Stormwater Infiltration

Myles Gray, Aaron Poresky, Eric Strecker

Variation of Flow and its Impact on the Performance of an Infiltration Stormwater Treatment System

Heidi Bantilan Guerra, Youngchul Kim

Long Term Hydraulic Conductivity of Bioretention Cells

Troy Piripi Brockbank, John Cheah, Ruben Roelofs, Robyn Simcock

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