FINAL PROGRAM

WORLD ENVIRONMENTAL & WATER RESOURCES CONGRESS

West Palm Beach, Florida | May 22-26, 2016

Critical Infrastructure Needs: Water and the Environment

Palm Beach County Convention Center

www.ewricongress.org

On behalf of the Environmental and Water Resources Institute (EWRI) of ASCE, Congress Organizing Committee, sponsors, authors and presenters, welcome to the World Environmental and Water Resources Congress 2016! You've come to the right place…at the right time!

Schedule at a Glance *(Subject to Change)*

CUSTOMIZE your Congress experience now at **www.eventscribe.com/2016/ASCE-EWRI**.

Sunday, May 22, 2016

7:00 a.m. – 6:00 p.m.	REGISTRATION *(Closed for Lunch From 11:30 a.m. to 1:45 p.m.)*
7:30 a.m. – 5:00 p.m.	Committee Meetings *(See page 8 for Committee Meeting Schedule)*
8:00 a.m. – 5:00 p.m.	Short Courses
8:30 a.m. – 5:00 p.m.	AAWRE Panel Exams, *Room IJK*
12:00 - 1:00 p.m	Leadership Workshop, *Room* 2C
4:45 – 5:45 p.m.	Business Meeting, *Room* 2C
6:00 – 7:30 p.m.	Ice Breaker Reception, *Ballroom* Prefunction

Monday, May 23, 2016

7:00 a.m. – 6:30 p.m.	REGISTRATION *(Closed for Lunch From 12:30 to 1:45 p.m.)*
7:00 – 8:30 a.m.	Local Activities Breakfast, *Room 1IL*
8:30 – 10:00 a.m.	Welcome and Keynote Lectures, *Grand* Ballroom
10:00 – 10:30 a.m.	Networking Break
10:30 a.m. – 12:00 p.m.	AAWRE Ethic Session, *Room 1GH*
10:30 a.m. – 12:00 p.m.	CONCURRENT TECHNICAL SESSION I
12:15 – 1:45 p.m.	Welcome Luncheon Featuring Marc Edwards, *Grand Ballroom*
2:00 – 3:30 p.m.	CONCURRENT TECHNICAL SESSION II
3:30 – 4:00 p.m.	Networking Break
4:00 – 5:30 p.m.	CONCURRENT TECHNICAL SESSION III
5:30 – 7:30 p.m.	Sponsorship Reception, *Ballroom* Prefunction
5:45 – 6:30 p.m.	2016 AAWRE & EWRI Fellows Induction Ceremony, *Room 1GH*
6:00 – 10:00 p.m.	Committee Meetings *(See page 8 for Committee Meeting Schedule)*

Tuesday, May 24, 2016

7:00 a.m. – 6:30 p.m.	REGISTRATION *(Closed for Lunch From 12:30 to 1:45 p.m.)*
8:30 – 10:00 a.m.	CONCURRENT TECHNICAL SESSION IV
8:30 – 10:00 a.m.	AAWRE Expert Witness Session, *Room* 1JK
10:00 – 10:30 a.m.	Networking Break
10:30 a.m. – 12:00 p.m.	CONCURRENT TECHNICAL SESSION V
12:15 – 1:45 p.m.	Environmental Council/Water, Wastewater & Stormwater Council Award Lecture and Luncheon, *Grand Ballroom*
12:15 – 1:45 p.m.	Hydraulics & Waterways Council Award Lecture and Luncheon, *Ballroom* A-C
2:00 – 3:30 p.m.	CONCURRENT TECHNICAL SESSION VI
3:30 – 4:00 p.m.	Networking Break
4:00 – 5:30 p.m.	CONCURRENT TECHNICAL SESSION VII
6:00 – 10:00 p.m.	Committee Meetings *(See page 8 for Committee Meeting Schedule)*

Schedule at a Glance *(continued)*

(Subject to Change)

Wednesday, May 25, 2016 – Students' Day

7:00 a.m. – 5:30 p.m.	REGISTRATION *(Closed for Lunch From 12:30 to 1:45 p.m.)*
7:30 – 8:30 a.m.	Mentoring Breakfast, *Ballroom* A-B
7:30 a.m. – 5:00 p.m.	Students' Day and Activities
8:30 – 10:00 a.m.	CONCURRENT TECHNICAL SESSION VIII
8:30 – 10:00 a.m.	WSP Parsons Brinckerhoff Student Design Competition
8:30 – 10:00 a.m.	AAWRE Expert Witness Session, *Room* 1JK
10:00 – 10:30 a.m.	Networking Break
10:30 a.m. – 12:00 p.m.	CONCURRENT TECHNICAL SESSION IX
12:15 – 1:45 p.m.	Watershed Council Award Lecture and Luncheon, *Grand* Ballroom
12:15 – 1:45 p.m.	Irrigation & Drainage Council Award Lecture and Luncheon, *Ballroom* A-B
2:00 – 3:30 p.m.	CONCURRENT TECHNICAL SESSION X
12:15 - 1:45 p.m.	Student Luncheon, *Ballroom* C
3:30 – 4:00 p.m.	Networking Break
4:00 – 5:30 p.m.	CONCURRENT TECHNICAL SESSION XI
6:00 – 9:00 p.m.	Key Social Dinner Cruise (Offsite)
6:00 – 10:00 p.m.	Committee Meetings *(See page 8 for Committee Meeting Schedule)*

Thursday, May 26, 2016

7:00 a.m. – 4:30 p.m.	REGISTRATION *(Closed for Lunch from 12:45 to 1:45 p.m.)*
8:30 – 10:00 a.m.	CONCURRENT TECHNICAL SESSION XII
8:30 a.m. – 5:00 p.m.	Tour
10:00 – 10:30 a.m.	Networking Break
10:30 a.m. – 12:00 p.m.	CONCURRENT TECHNICAL SESSION XIII
12:15 – 1:45 p.m.	Planning and Management Council Award Lecture and Luncheon, *Grand* Ballroom
12:15 – 1:45 p.m.	Groundwater Council Lecture and Luncheon, *Ballroom* A-C
2:00 – 5:30 p.m.	Technical Workshops
2:30 – 5:00 p.m.	Tours

Committee Members

General Chair
Bijay K. Panigrahi, Ph.D., P.E., P.G., D.WRE, BCEE

Technical Program Co-Chair
Chandra S. Pathak, Ph.D., P.E., D.WRE, BCEE, F.ASCE

Technical Program Co-Chair
Debra Reinhart, Ph.D., P.E., BCEE, F.ASCE

Technical Tour Chair
Scott Huebner, Ph.D.

Sponsorship Chair
Majid Tavakoli

Short Course Chair
Christopher N. Dunn, P.E., D.WRE

Social Activities Coordinator
Ceyda Polatel, Ph.D., P.E.

Orlando Chapter
Rolando Raymundo, P.E., CFM

Tampa Chapter
Ellie Araj, P.E., D.WRE, M.ASCE

EWRI Staff

Brian Parsons, M.ASCE, Director

Barbara Whitten, Technical Manager

Gabrielle Dunkley, Manager

Veronique Nguyen, Senior Project Coordinator

Maureen Maldonado, Administrator

ASCE Conference Staff

Lucy King, CMP, Senior Manager, Conferences & Meetings

Brandi Steeves, Coordinator, Conferences & Meetings

Drew Caracciolo, Sponsorship & Exhibit Sales Manager

Conference Highlights

SUNDAY, May 22

Short Courses

Intro to the Modeling River Flow, Sediment, Transport & Morphodynamics within the Iris Interface	1L
Quantifying the Hydrologic Risk of Extreme Events in a Changing Climate & Environment	2A
Use of River 2D Modeling for Stream Restoration Design	2B

Leadership Workshop

12:00 - 1:00 p.m., *Room 2C*

Business Meeting

4:45 - 5:45 p.m., *Room 2C*

Ice Breaker Reception

6:00 – 7:30 p.m., *Ballroom Prefunction*

MONDAY, May 23

Local Activities Breakfast *(Ticketed Event)*

7:00 – 830 a.m., *Room 1IL*

Opening Plenary Session

8:30 – 10:00 a.m., *Grand Ballroom*

Keynote:
Major General Donald E. (Ed) Jackson Jr.,
U.S. Army Corps of Engineers

Keynote:
Peter Antonacci,
Executive Director, South Florida Water District

Welcome Luncheon Featuring Marc Edwards,

Professor of Civil and Environmental Engineering at Virginia Polytechnic Institute and State University

12:15 – 1:45 p.m., *Grand Ballroom*

AAWRE & EWRI Fellows Induction Ceremony

5:45 – 6:30 p.m., *Room 1GH*

Reception

5:30 – 7:00 p.m., *Ballroom Prefunction*

Conference Highlights *(Continued)*

TUESDAY, May 24

Environmental Council/Water, Wastewater & Stormwater Council Award Lecture and Luncheon

12:15 – 1:45 p.m., *Grand Ballroom*

Hydraulics & Waterways Council Award Lecture and Luncheon

12:15 – 1:45 p.m., *Ballroom A-C*

WEDNESDAY, May 25 – Students' Day

Mentoring Breakfast

7:30 – 8:30 a.m., *Ballroom A-B*

WSP | Parsons Brinckerhoff Student Competition

8:30 – 10:00 a.m., *Room 2AB*

Watershed Council Award Lecture and Luncheon

12:15 – 1:45 p.m., *Grand Ballroom*

Irrigation & Drainage Council Award Lecture and Luncheon

12:15 – 1:45 p.m., *Ballroom A-B*

Student Luncheon

12:30 – 1:30 p.m., *Ballroom C*

Student Technical Paper Competition Presentations

2:00 – 3:30 p.m., *Room 2AB*

Key Social – Dinner Cruise *(Ticketed Event)*

6:00 – 9:00 p.m.

Conference Highlights *(Continued)*

Thursday, May 26

Planning and Management Council Awards and Luncheon

12:15 – 1:45 p.m., *Grand Ballroom*

Groundwater Council Lecture and Luncheon

12:15 – 1:45 p.m., *Ballroom A-C*

Technical Tours *(Purchase your ticket today at the registration desk)*

Tour 1 – Kissimmee River Restoration at Riverwoods Field Lab
8:00 a.m. – 5:00 p.m.

Tour 2 – Lake Okeechobee and Herbert Hoover Dike – Critical Infrastructure Enhancements
1:30 – 5:00 p.m.

Tour 3 – Palm Beach County Southern Region Water Reclamation Facility
1:30 – 5:00 p.m.

Tour 4 – Efforts to Restore America's Everglades
1:30 – 5:00 p.m.

Thursday Technical Workshops *(Included with conference registration)*

2:00 – 5:30 p.m.

These technical workshop will be led by subject matter experts. The intent is to provide you with an introduction to ongoing development and products available for the professional community.

Introduction Watershed Analysis Tool, HEC-WAT, *Room 2C*

Riverbank Filtration for Water Supply in the United States , *Room 1A*

Bulletin 17C: Updated Federal Guidelines for Flood Frequency Analysis, *Room 1JK*

Outfall Design for Desalination Discharges Using Cormix, *Room 1D*

Introduction to Distributed Hydrologic Modeling with GSSHA with the WMS Hydrologic Modeling Wizard, *Room 2F*

Real-Time Hydrologic and Hydraulic Simulation with HEC-RTS 3.0, *Room 1F*

Introduction to the Hydrologic Modeling System (HEC-HMS), *Room 1L*

1D/2D Unsteady Flow Modeling and Output Visualization with HEC-RAS 5.0, *Room 1I*

Why and How to Switch to R from MS Excel for Your Data Analysis, *Room 1E*

Dam and Levee Breach Modeling Using DLBREACH, *Room 1B*

General Information

Cancellations/Refunds

Speaker/author registration fees are nonrefundable after **March 1, 2016** due to the necessary advance production of the proceedings and the program.

Registration cancellations must be sent in writing or via email. A refund will be issued, minus a $100 processing fee, if the cancellation notice is received by ASCE by, **April 16, 2016**. Event/course/tour tickets will be fully refunded if cancellation is received in writing by **April 20, 2016**. No refunds will be made for cancellations received after, **April 16, 2016**, unless the event/course/tour is cancelled by EWRI. Send cancellations to **registrations@asce.org** or fax to (703) 295-6144.

Registration Hours

Sunday	7:00 a.m. – 6:00 p.m. *(Closed for Lunch from 11:30 – 1:45 p.m.)*
Monday	7:00 a.m. – 6:30 p.m. *(Closed for Lunch from 12:30 – 1:45 p.m.)*
Tuesday	7:00 a.m. – 6:30 p.m. *(Closed for Lunch from 12:30 – 1:45 p.m.)*
Wednesday	7:00 a.m. – 5:30 p.m. *(Closed for Lunch from 12:30 – 1:45 p.m.)*
Thursday	7:00 a.m. – 4:30 p.m. *(Closed for Lunch from 12:30 – 1:45 p.m.)*

ASCE Bookstore

ASCE Bookstore ASCE will operate its popular bookstore at the Congress. The bookstore is a great opportunity to browse through the many new and classic titles on display covering all topics in civil engineering.

Bookstore Hours

Sunday	7:00 a.m. – 6:00 p.m.
Monday	7:00 a.m. – 6:30 p.m.
Tuesday	7:00 a.m. – 6:30 p.m.
Wednesday	7:00 a.m. – 5:30 p.m.
Thursday	7:00 a.m. – 12:30 p.m.

Badge Policy and Ribbons

Your Congress registration name badge is your admission to the educational sessions. Please wear your badge at all times while in the Palm Beach Convention Center. Tickets are required for the pre- and post-Congress events, meals, and special events. Where tickets are required, please be sure to bring your tickets with you to each event as you will not be admitted without a ticket. Ribbons will be available at the Registration Desk. ASCE recommends you remove your badge when leaving the convention center.

EWRI Sustainable Congress Policy Statement

ASCE-EWRI is committed to sustainable Congresses in accord with the ASCE policy on The Role of the Civil Engineer in Sustainable Development.

ASCE defines sustainability as a set of economic, environmental, and social conditions in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely, without degrading the quantity, quality, or availability of natural resources and ecosystems.

Sustainable development is the process of converting natural resources into products and services that are more profitable, productive, and useful, while maintaining or enhancing the quantity, quality, availability, and productivity of the remaining natural resource base and the ecological systems on which they depend.

To that end, ASCE-EWRI works with hotels and convention centers that strive to make our events green and include amenities such as reusable pitchers and water coolers rather than plastic bottles.

Meeting Room Overcrowding

ASCE will make every effort to schedule popular events in rooms large enough to accommodate anticipated attendance. Because many events are extremely popular, it is wise to select alternative events as you plan your Congress schedule. ASCE and the Palm Beach Convention Center are REQUIRED to follow local fire regulations and may ask participants in rooms filled to capacity to choose another event.

No Smoking Policy

ASCE supports a "No Smoking" policy. Smoking is prohibited in the Palm Beach Convention Center, and at all indoor venues hosting EWRI events.

Proceedings

As an exclusive benefit for all Conference registrants, online access to the complete Proceedings will be made available in the ASCE Library at **http://ascelibrary.org/page/2016ewriconferenceproceedings** for 60 days beginning on the first day of the Conference.

Program Changes

ASCE reserves the right to cancel programs and/or sessions because of low registration. In the unlikely event of a cancellation, all registrants will be notified and will receive a full refund, if applicable. Programs and sessions are subject to change and ASCE reserves the right to substitute a program, session, and/or speaker of equal caliber to fulfill educational requirements.

2016 EWRI Congress Committee Meeting Schedule

Saturday, May 21

	ROOM
1:00 pm - 5:00 pm	
Professional Practice Council	*1D*
Standards Development Council	*1E*
3:00 pm - 6:00 pm	
EWRI Governing Board	*1G*

Sunday, May 22

7:30 am - 9:30 am	
International Stormwater BMP Database Task Committee	*1C*
8:00 am - 12:00 pm	
Use of Recycled Water for Irrigation of Turf and Landscape Plants	*1A*
Groundwater Symposia & Continuing Education Committee	*1i*
Managed Aquifer Recharge Subcommittee	*1H*
Journal of Sustainable Water in the Built Environment Editorial Board Meeting	*1B*
Education Council	*1E*
Environmental and Water Resources Systems Committee	*2D*
Urban Drainage Standards Committee	*2E*
EWRI Governing Board	*1G*
12:00 pm - 1:00 pm	
EWRI Leadership Workshop	*2C*
1:00 pm - 5:00 pm	
History & Heritage	*1F*
World Water Council Activities	*1i*
Watershed Management Technical Committee	*1A*
Journal of Water Resources Planning & Management, Editorial Board Meeting	*1B*
Groundwater Hydrology	*2E*
Irrigation & Drainage Journal Editorial Board	*1C*
Groundwater Quality Committee	*2F*
Urban Water Resources Research Council	*1D*
Irrigation Delivery and Drainage Systems	*1E*
Technical Committee on Evapotranspiration in Irrigation and Hydrology	*2D*
International Participation Committee	*1G*
EWRI Awards Committee	*1H*

Monday, May 23

	ROOM
6:00 pm - 10:00 pm	
Surface Water Hydrology Technical Committee	*1A*
Journal of Hydraulic Engineering	*1i*
Standards Committee MPCES	*1B*
Environmental Health and Water Quality	*1C*
River Basin Planning, Policy and Operations Committee	*1D*
New Professionals Council	*1E*
Computational Hydraulics Committee	*2C*
Wastewater Engineering Technical Committee (WWETC)	*2F*
Hazardous and Toxic Waste Commiittee	*1L*
Desalination and Water Reuse	*1F*
Sedimentation Committee	*2AB*
Task Committee on Remote Sensing of Evapotranspiration	*2DE*

Tuesday, May 24

6:00 pm - 10:00 pm	
KSTAT Standards Committee	*1i*
Hydro-climate Technical Committee	*1A*
Joint Meeting - Congress Student Activities Task Committee & Students Council	*1E*
Water Supply, Treatment and Distribution Engineering Committee	*1C*
Using Hydroclimatic Prediction for Water Systems Operations and Management	*1D*
Hydraulic Fracturing	*1L*
River Restoration Technical Committee	*1JK*
Sustaining Commitments to Stormwater Infrastructure & Comprehensive Cost of Green Infrastructure	*1GH*
Sustainable Stormwater Infrastructure Committee	*1F*
Hydrologic Data Uncertainty TC	*2C*
Water Quality and Drainage	*2AB*
Groundwater Management Committee	*2F*
Communications Council	*2DE*

Recording of Sessions

Video or audio recording of any educational session is strictly prohibited without prior written permission from both ASCE and the session presenter(s).

Release/Waiver/Special Assistance

Photograph Release: By submitting the Registration form, I hereby release any photographs that may be incidentally taken of me during these events by ASCE to be used for any purpose.

Liability Waiver: I agree and acknowledge that I am undertaking participation in ASCE events and activities at my own free and intentional act, and 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 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.

Professional Development Hours (PDH)

You can earn Professional Development Hours (PDHs) by attending preconference short courses, most technical sessions and the three lectures.

★ NEW THIS YEAR! ★

You will be able to track your ASCE approved PDHs by scanning your bar code badge at the beginning of each session.

A Special Thank You to Our Sponsors

SILVER

Michael Baker INTERNATIONAL

BRONZE

Contech Engineered Solutions
Gannett Fleming, Inc.
Propex GeoSolutions
YSI and SonTek, Xylem Brands

COPPER

Engineering Ministries International

STUDENT SPONSOR

WSP PARSONS BRINCKERHOFF

CORPORATE

Bank of America
GEICO
PEARL INSURANCE
UPS
KELLER North America