

2010 American Water Resources Association Specialty Conference

INTERNATIONAL SPECIALTY
CONFERENCE AND 8TH CARIBBEAN
ISLANDS WATER RESOURCES
CONGRESS ON TROPICAL HYDROLOGY
AND SUSTAINABLE WATER RESOURCES
IN A CHANGING CLIMATE



AWRA

Community, Conversation, Connections

***Forty-Six Years of
Community, Conversation, and Connections***

FINAL PROGRAM

***San Juan, Puerto Rico
August 30-September 1, 2010***

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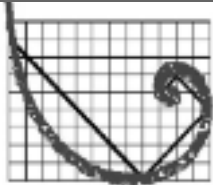
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EXHIBITORS ARE LOCATED IN THE
PUERTO RICO I BALLROOM

EXHIBIT HOURS:
MON, AUG 30

8:00am to 6:30pm

The Opening Reception takes
place in the Exhibit Area.

TUES, AUG 31

8:00am to 3:30pm

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BIENVENIDOS A PUERTO RICO!

AND WELCOME TO THE 2010 AWRA INTERNATIONAL SPECIALTY CONFERENCE AND 8TH CARIBBEAN ISLANDS WATER RESOURCES CONGRESS ON TROPICAL HYDROLOGY AND SUSTAINABLE WATER RESOURCES IN A CHANGING CLIMATE



RAFAEL E. FRIAS III
BLACK & VEATCH CORP.
SUNRISE, FLORIDA

The last AWRA Specialty Conference on tropical hydrology was held in Puerto Rico in 1998 and now, 12 years later, it's time to focus our attention on this important issue and on the need for sustainable water resources in light of a changing climate.

The continued interest in tropical hydrology has improved data acquisition and availability, allowing us to make better management decisions; yet the management of water resources continues to suffer as a result of weather extremes, population growth and urban development. This conference brings together water resources professionals, scientists, regulators, stakeholders, and special interest groups to exchange information, discuss solutions to common problems, and provide guidance on the future management of water resources.

The overall goal of this conference is to pick up where we left off in 1998 and encourage continued communications in a forum where we can gain a better perspective about national, regional, and local directions on tropical hydrology and sustainable water resources management. As part of the conference, we will look at possible future opportunities and challenges and discuss how to best manage them for the benefit of generations to come.

The Call for Abstracts produced a great response from the international community, which will provide us with an outside perspective of the hydrologic impacts experienced in the United States and internationally from climate variations and the respective solutions currently being considered and implemented. In addition, the conference is well balanced with the local perspective of water resources professionals, who will provide us with a discussion of the predominant hydrologic issues in Puerto Rico, including the need for conjunctive use of water resources to augment supply, stormwater management under extreme weather conditions, water distribution management, hydrometeorology evaluations, and groundwater quality management among others.

In keeping with AWRA's brand of "community, conversation, and connections," we encourage you to spend time networking with your peers, as well as making new connections while in Puerto Rico. We also hope that you'll bring your family to spend some quality time and enjoy the tropical paradise of Puerto Rico. Whether it is with a visit to El Yunque, the only tropical rain forest in the United States National Forest system, or kayaking along the bioluminescent bay in Fajardo, Puerto Rico has many opportunities to spend time with your family and reconnect with the environment.

On behalf of the AWRA Summer Specialty Conference Committee, we welcome you to Puerto Rico. We hope you enjoy your stay, the tropical climate, and the great things the island has to offer. We welcome you to beautiful Puerto Rico!

Rafael E. Frias III
 AWRA Conference Chair

Jorge Rivera-Santos
 8th Caribbean Islands Water
 Resources Congress Conference Chair

Pedro M. Garcia
 AWRA Conference
 Technical Program Co-Chair

Walter F. Silva
 AWRA Conference
 Technical Program Co-Chair

MEETING REGISTRATION INFORMATION

REGISTRATION – ALL ATTENDEES, INCLUDING PRESENTERS, ARE REQUIRED TO REGISTER FOR THIS MEETING AND MUST PAY THE APPROPRIATE REGISTRATION FEE.

REGISTRATION DESK HOURS OF OPERATION

- SUNDAY • AUGUST 29 • 4:00 P.M. TO 6:00 P.M.**
- MONDAY • AUGUST 30 • 7:30 A.M. TO 6:00 P.M.**
- TUESDAY • AUGUST 31 • 7:30 A.M. TO 5:00 P.M.**
- WEDNESDAY • SEPTEMBER 1 • 8:00 A.M. TO 3:00 P.M.**

CONFERENCE ORGANIZATION COMMITTEE

AWRA CONFERENCE CHAIR

RAFAEL E. FRIAS III

Black & Veatch Corporation ~ Sunrise, Florida
E-Mail: FriasRE@bv.com

CONGRESS CONFERENCE CHAIR

JORGE RIVERA-SANTOS

P.R. Water Resources & Environmental Research Inst.
University of Puerto Rico ~ Mayaguez, Puerto Rico

AWRA CONFERENCE TECHNICAL PROGRAM CO-CHAIR

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PMG & Associates ~ Gurabo, Puerto Rico
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AMERICAN WATER RESOURCES ASSOCIATION

FINAL PROGRAM ... TABLE OF CONTENTS YOUR GUIDE TO WHAT'S HAPPENING AND WHERE

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PLEASE NOTE ... TRAVELING TO TROPICAL CLIMATES

When traveling to tropical climates you will always need to use bug repellents and sun screen. You can go to www.cdc.gov and check out their "Travelers Health" page for more specific information on the best strength for bug repellents, etc.

PLEASE NOTE ... CONFERENCE PROCEEDINGS

The Conference Proceedings will be available free of charge on the AWRA website until October 31, 2010, at the following website address: <http://www.awra.org/PR2010>. After that date it will be moved to the AWRA Members Only section of the AWRA website and also available for purchase in a CD ROM format from AWRA.



TECHNICAL SESSIONS-AT-A-GLANCE

• MONDAY ~ AUGUST 30 •

8:30 AM-10:00 AM	10:30 AM-12:00 NOON	1:30 PM-3:00 PM	3:30 PM-5:00 PM
OPENING PLENARY SESSION KEYNOTE SPEAKER MATTHEW C. LARSEN ASSOCIATE DIRECTOR FOR WATER U.S. GEOLOGICAL SURVEY RESTON, VIRGINIA	AGENCY PANEL DISCUSSION 40 Years of Environmental Regulation: Past, Present, and Future	CONCURRENT SESSIONS 1 & 2 1 Groundwater Quality 2 Computer Modeling	CONCURRENT SESSIONS 3 & 4 3 Hydrometeorology 4 Water Management

LUNCH BREAK (ON YOUR OWN) ~ 12:00 NOON-1:15 PM

OPENING NETWORKING RECEPTION ~ 5:00 PM-6:30 PM

• TUESDAY ~ AUGUST 31 •

8:30 AM-10:00 AM	10:30 AM-12:00 NOON	1:30 PM-3:00 PM	3:30 PM-5:00 PM
CONCURRENT SESSIONS 5 & 6 5 Flood Warning Systems 6 Surface Water Runoff Modeling	CONCURRENT SESSIONS 7 & 8 7 Managing the Environment 8 Flooding and Stormwater Management	CONCURRENT SESSIONS 9 & 10 9 Rio de la Plata Flood Control Project 10 Hydrologic Processes	CONCURRENT SESSIONS 11 & 12 11 Water Resources in a Changing Climate 12 Watershed Modeling

LUNCH BREAK (ON YOUR OWN) ~ 12:00 NOON-1:15 PM

• WEDNESDAY ~ SEPTEMBER 1 •

8:30 AM-10:00 AM	10:30 AM-12:00 NOON	1:30 PM-3:00 PM
CONCURRENT SESSIONS 13 & 14 13 Sustainable Water Resources 14 Water Distribution Management	SESSION 15 SPECIAL SESSION ~ Economies of Water, Water and Energy Nexus, and Innovative Solutions for Water Resources Management	CONCURRENT SESSIONS 16 & 17 16 Water Supply Planning 17 Coastal Impacts From Development

SPECIAL EVENT ~ CONFERENCE LUNCHEON ~ 12:00 NOON-1:30 PM
GUEST SPEAKER ~ FERDINAND QUIÑONES
 CONSULTING ENVIRONMENTAL ENGINEER ~ SAN JUAN, PUERTO RICO
 "WATER RESOURCES OF PUERTO RICO AND POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGES ON THESE RESOURCES AND THE LIFE ZONES OF THE ISLAND"

DAY-AT-A-GLANCE / MONDAY / AUGUST 30, 2010

SPEAKERS' PREPARATION ROOM OPEN
7:00 A.M.-7:00 P.M. / CEIBA ROOM

REGISTRATION DESK OPEN
7:30 A.M.-6:00 P.M. / PUERTO RICO BALLROOM FOYER

MORNING NETWORKING BREAK
8:00 A.M.-10:30 A.M. / PUERTO RICO BALLROOM 1

COMMERCIAL AND EDUCATIONAL EXHIBITS OPEN
8:00 A.M.-6:30 P.M. / PUERTO RICO BALLROOM 1

CONFERENCE OPENING PLENARY SESSION
8:30 A.M.-10:00 A.M. / PUERTO RICO BALLROOM 2
"GLOBAL CHANGE AND WATER RESOURCES IN THE NEXT 100 YEARS"
KEYNOTE SPEAKER ~ MATTHEW C. LARSEN
ASSOCIATE DIRECTOR FOR WATER ~ U.S. GEOLOGICAL SURVEY ~ RESTON, VIRGINIA

MORNING NETWORKING BREAK (CONT'D.)
10:00 A.M.-10:30 A.M. / PUERTO RICO BALLROOM 1

CONFERENCE OPENING PLENARY SESSION (CONT'D.)
AGENCY PANEL DISCUSSION
10:30 A.M.-12:00 NOON / PUERTO RICO BALLROOM 2
"40 YEARS OF ENVIRONMENTAL REGULATION: PAST, PRESENT, AND FUTURE"
MODERATOR ~ JORGE RIVERA SANTOS
ACTING CHANCELLOR OF THE UNIVERSITY OF PUERTO RICO IN MAYAGUEZ ~ SAN JUAN, PUERTO RICO

LUNCH BREAK (ON YOUR OWN)
12:00 NOON-1:15 P.M.

CONCURRENT SESSIONS 1 AND 2 / 1:30 P.M.-3:00 P.M.

SESSION 1
GROUNDWATER QUALITY

PUERTO RICO BALLROOM 2

SESSION 2
COMPUTER MODELING

PUERTO RICO BALLROOM 3

AFTERNOON NETWORKING BREAK
3:00 PM-3:30 P.M. / PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 3 AND 4 / 3:30 P.M.-5:00 P.M.

SESSION 3
HYDROMETEOROLOGY

PUERTO RICO BALLROOM 2

SESSION 4
WATER MANAGEMENT

PUERTO RICO BALLROOM 3

OPENING NETWORKING RECEPTION
5:00 P.M.-6:30 P.M. / PUERTO RICO BALLROOM 1
(COMMERCIAL & EDUCATIONAL EXHIBITS OPEN - SEE "SPECIAL EVENTS" ON PG. 14)

CONFERENCE OPENING PLENARY SESSION

MONDAY ~ AUGUST 30 ~ 8:30 A.M.-10:00 A.M. ~ PUERTO RICO BALLROOM 2

WELCOME AND OPENING REMARKS

ARI M. MICHELSEN

President, American Water Resources Association
Texas AgriLife Research ~ Texas A&M University ~ El Paso, Texas

RAFAEL E. FRIAS III

AWRA Conference Chair
Black & Veatch Corporation ~ Sunrise, Florida

KEYNOTE SPEAKER

“GLOBAL CHANGE AND WATER RESOURCES IN THE NEXT 100 YEARS”

MATTHEW C. LARSEN

Associate Director for Water ~ U.S. Geological Survey ~ Reston, Virginia

Matthew Larsen’s presentation will provide us with the USGS perspective of the status of our water resources and how they may be impacted by global climate change. The discussion will center on the efforts being performed by the USGS in the United States and the Caribbean to better comprehend the impacts from global change in the future.

10:00 A.M.-10:30 A.M. • MORNING NETWORKING BREAK (CONT’D). • PUERTO RICO BALLROOM 1

AGENCY PANEL DISCUSSION

MONDAY ~ AUGUST 30 ~ 10:30 A.M.-12:00 NOON ~ PUERTO RICO BALLROOM 2

40 YEARS OF ENVIRONMENTAL REGULATION: PAST, PRESENT, AND FUTURE

MODERATOR

JORGE RIVERA SANTOS

Acting Chancellor of the University of Puerto Rico in Mayaguez, Puerto Rico, and
Director of the Puerto Rico Water Resources and Environmental Research Institute, Mayaguez, Puerto Rico

PANELISTS

PEDRO J. NIEVES, ESQ.

President of the Puerto Rico Environmental Quality Board ~ San Juan, Puerto Rico

CARL SODERBERG

Director, Caribbean Environmental Protection Division, EPA Region II ~ San Juan, Puerto Rico

ANTONIO SANTIAGO “CHAGO” VAZQUEZ

Ex-Secretary of Public Works and Ex-Chairman of the Board of Directors for the Environmental
Quality Board and the Puerto Rico Aqueduct and Sewer Authority ~ San Juan, Puerto Rico

This special panel session will provide an overview of the last 40 years of environmental regulation in Puerto Rico and discuss the improvements to the environment that have been realized in Puerto Rico. The moderated session will include the local perspective of current and previous agency directors from the Puerto Rico Environmental Quality Board, EPA-Caribbean Division and the Department of Public Works.

12:00 NOON TO 1:15 P.M. • LUNCHEON BREAK (ON YOUR OWN)

PLEASE NOTE

Throughout the Technical Program the **PRESENTER** of each paper is in **BOLD** type immediately following the paper title. The affiliation given is that of the Presenter – co-authors are then listed in parentheses.

PLEASE TURN OFF YOUR CELL PHONES WHEN ENTERING THE SESSION ROOMS!

CONCURRENT SESSIONS 1 AND 2

1:30 P.M. - 3:00 P.M.

MONDAY ~ AUGUST 30

SESSION 1 • PUERTO RICO BALLROOM 2 **GROUNDWATER QUALITY**

MODERATOR • JUAN AMADOR • GREGORY L. MORRIS ENGINEERING • SAN JUAN, PUERTO RICO

- 1:30 P.M. **The In-Situ Measurement of Temperature and Specific Conductance of Ground Water in Puerto Rico – Ronald T. Richards,** Turabo University, Trujillo Alto, PR
- 1:50 P.M. **Effects of Changes in Irrigation Practices and Aquifer Development on the South Coast Aquifer, Puerto Rico - Eve Kuniansky,** U.S. Geological Survey, Norcross, GA (co-authors: Fernando Gomez-Gomez, Jose M. Rodriguez, Sigfredo Torres-Gonzalez)
- 2:10 P.M. **Spatial and Temporal Variation in Isotopic Composition of Precipitation and Groundwater in Contrasting Precipitation Regions in Puerto Rico, an Island Located in Northeastern Caribbean - Yogani Govender,** University of Puerto Rico, San Juan, PR (co-authors: E. Cuevas, L. Sternberg)
- 2:30 P.M. **Groundwater Quality Conditions and Trends in the South Coast Aquifer of Puerto Rico - Jose M. Rodriguez,** U.S. Geological Survey, Guaynabo, PR

SESSION 2 • PUERTO RICO BALLROOM 3 **COMPUTER MODELING**

MODERATOR • FELIX LOPEZ • SALO ENGINEERING, PSC • SAN JUAN, PUERTO RICO

- 1:30 P.M. **Development of Decision Support Systems for Estimating Salinity Intrusion Effects Due to Climate Change on the South Carolina and Georgia Coast - Paul Conrads,** USGS-SCWSC, Columbia, SC (co-authors: Edwin Roehl, Daniel Tufford, Greg Carbone, Kirstin Dow)
- 1:50 P.M. **Evaluation of Upscaling Parameters and Their Influence on Hydrologic Predictability in Upland Tropical Areas - Alejandra Rojas Gonzalez,** University of Puerto Rico, Mayaguez, PR (co-authors: Eric W. Harmsen, Sandra Cruz Pol, Yaritza De Jesus Arce)
- 2:10 P.M. **Simulations of Variations in $\delta^{18}\text{O}$ and Net Export of Major Ions From the Rio Blanco Using Several Climate Change Scenarios - Richard Webb,** U.S. Geological Survey, Denver, CO (co-authors: Martha Scholl, Heather Buss)
- 2:30 P.M. **Two Dimensional Hydraulic Model for Rio Grande de Anasco River in Puerto Rico – Alejandra Rojas Gonzalez,** University of Puerto Rico, Mayaguez, PR (co-authors: Walter F. Silva Araya, Jorge Rivera Santos)

3:00 P.M. TO 3:30 P.M. • AFTERNOON NETWORKING BREAK • PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 3 AND 4

3:30 P.M. - 5:00 P.M.

MONDAY ~ AUGUST 30

SESSION 3 • PUERTO RICO BALLROOM 2 **HYDROMETEROROLOGY**

MODERATOR • PEDRO GARCIA • PMG AND ASSOCIATES • SAN JUAN, PUERTO RICO

- 3:30 P.M. **Calibration and Validation of CASA Radar Rainfall Estimation - Ariel Mercado-Vargas,** University of Puerto Rico, Mayaguez, PR (co-authors: Sionel Arocho Meaux, Gianni A. Pablos-Vega, Eric W. Harmsen, Sandra Cruz-Pol, Jose Colom Ustariz)
- 3:50 P.M. **Rainfall Estimation Over Puerto Rico Using a Classification System and Artificial Neural Networks - Melvin J. Cardona-Soto,** University of Puerto Rico, Mayaguez, PR (co-authors: Nazario D. Ramirez-Beltran, Eric W. Harmsen)
- 4:10 P.M. **Estimating Evapotranspiration in the Caribbean Region Using Satellite Remote Sensing - Eric Harmsen,** University of Puerto Rico, Mayaguez, PR (co-authors: John Mecikalski, Ariel Mercado, Pedro Tosado Cruz)
- 4:30 P.M. **Cloud Seeding Technology, a Feasible Alternative Water Source for the Caribbean? - Don A. Griffith,** North American Weather Consultants, Sandy, UT

SESSION 4 • PUERTO RICO BALLROOM 3 **WATER MANAGEMENT**

MODERATOR • DAVID WATT • ST. JOHNS RIVER WATER MANAGEMENT DISTRICT • PALATKA, FLORIDA

- 3:30 P.M. **Tropical Hydrology Under a Changing Land Use Dynamics: Development of Sustainable Watershed Conservation Scenarios in the Reo Cobre Watershed, Jamaica - Shimelis Setegn,** Florida International University (FIU), Miami, FL (co-authors: Assefa M. Melesse, Michael E. McClain, Xixi Wang)
- 3:50 P.M. **Sustainable Financial Planning for Water Quality Improvement and Management - Stacey Isaac Berahzer,** UNC Environmental Finance Center, Marietta, GA (co-author: Lauren Patterson)
- 4:10 P.M. **Heritage Rivers of Puerto Rico – Marianela Torres-Rodríguez,** Department of Natural and Environmental Resources, San Juan, PR (co-author: Eliot Hernández-González)
- 4:30 P.M. **Water Resource Management Challenges in Wet-Dry Tropical Savannas: A Century of Lessons Learned in Peninsular Florida - Darina Palacio,** University of Florida, Gainesville, FL (co-authors: John H. Kiefer, William R. Wise, Joann Mossa)

5:00 P.M. TO 6:30 P.M. • SPECIAL EVENT • OPENING NETWORKING RECEPTION • PUERTO RICO BALLROOM 1

SEE “SPECIAL EVENTS” ON PG. 14 FOR DETAILS

DAY-AT-A-GLANCE / TUESDAY / AUGUST 31, 2010

SPEAKERS' PREPARATION ROOM OPEN
7:00 A.M. - 7:00 P.M. / CEIBA ROOM

REGISTRATION DESK OPEN
7:30 A.M. - 5:00 P.M. / PUERTO RICO BALLROOM FOYER

MORNING NETWORKING BREAK
8:00 A.M. - 10:30 A.M. / PUERTO RICO BALLROOM 1

COMMERCIAL AND EDUCATIONAL EXHIBITS OPEN
8:00 A.M. - 3:30 P.M. / PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 5 AND 6 / 8:30 A.M. - 10:00 A.M.

SESSION 5
FLOOD WARNING SYSTEMS

PUERTO RICO BALLROOM 2

SESSION 6
SURFACE WATER RUNOFF MODELING

PUERTO RICO BALLROOM 3

MORNING NETWORKING BREAK (CONT'D.)
10:00 A.M. - 10:30 A.M. / PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 7 AND 8 / 10:30 A.M. - 12:00 NOON

SESSION 7
MANAGING THE ENVIRONMENT

PUERTO RICO BALLROOM 2

SESSION 8
**FLOODING AND STORMWATER
MANAGEMENT**

PUERTO RICO BALLROOM 3

LUNCH BREAK (ON YOUR OWN)
12:00 NOON - 1:15 P.M.

CONCURRENT SESSIONS 9 AND 10 / 1:30 P.M. - 3:00 P.M.

SESSION 9
**RIO DE LA PLATA FLOOD
CONTROL PROJECT**

PUERTO RICO BALLROOM 2

SESSION 10
HYDROLOGIC PROCESSES

PUERTO RICO BALLROOM 3

AFTERNOON NETWORKING BREAK
3:00 PM - 3:30 P.M. / PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 11 AND 12 / 3:30 P.M. - 5:00 P.M.

SESSION 11
**WATER RESOURCES IN A
CHANGING CLIMATE**

PUERTO RICO BALLROOM 2

SESSION 12
WATERSHED MODELING

PUERTO RICO BALLROOM 3

CONCURRENT SESSIONS 5 AND 6

8:30 A.M. - 10:00 A.M.

TUESDAY ~ AUGUST 31

SESSION 5 • PUERTO RICO BALLROOM 2 **FLOOD WARNING SYSTEMS**

MODERATOR • FELIX LOPEZ • SALO ENGINEERING, PSC • SAN JUAN, PUERTO RICO

- 8:30 A.M. **Flood Forecast Alarm System for Western PR** – Luz Estela Torres Molina, University of Puerto Rico, Mayaguez, PR
(co-authors: Eric W. Harmsen, Nazario Ramirez, Alejandra M. Rojas Gonzalez, Sandra Cruz-Pol)
- 8:50 A.M. **Real Time Flood Alert System (RTFAS) for Puerto Rico** - Dianne Lopez, U.S. Geological Survey, Guaynabo, PR
- 9:10 A.M. **Flashiness Indices for Urban and Rural Streams in Puerto Rico** - Colin Phillips, University of Pennsylvania, Philadelphia, PA
(co-author: Fred Scatena)
- 9:30 A.M. **Tropical Flooding Disasters: FEMA's Response to American Samoa** - Mary Theresa Flynn, FEMA, Washington, DC

SESSION 6 • PUERTO RICO BALLROOM 3 **SURFACE WATER RUNOFF MODELING**

MODERATOR • PATRICK VICTOR • CDM • JACKSONVILLE, FLORIDA

- 8:30 A.M. **Modeling Tropical Cyclone Induced Inland Flooding at Tar Pamlico River Basin of North Carolina** - Qianhong Tang, North Carolina State University, Raleigh, NC (co-author: Lian Xie)
- 8:50 A.M. **Modeling Stormwater Conveyance in Barbados to Support Marine Water Quality** – Mark S. Riedel, W.F. Baird & Associates, Madison, WI (co-authors: Amanda G. Stone, Kevin J. MacIntosh)
- 9:10 A.M. **Verification of the Duval County Master Plan Models During Tropical Storm Fay** – Jose M. Guzman, CDM, Jacksonville, FL
(co-authors: Bill Joyce, Patrick Victor)

10:00 A.M. TO 10:30 A.M. • MORNING NETWORKING BREAK • PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 7 AND 8

10:30 A.M. - 12:00 NOON

TUESDAY ~ AUGUST 31

SESSION 7 • PUERTO RICO BALLROOM 2 **MANAGING THE ENVIRONMENT**

MODERATOR • JUAN AMADOR • GREGORY L. MORRIS ENGINEERING • SAN JUAN, PUERTO RICO

- 10:30 A.M. **Animal Waste Management and Water Quality Protection in Puerto Rico** - Rafael F. Davila, University of Puerto Rico, Aguas Buenas, PR
- 10:50 A.M. **Partnering to Restore Guanica Bay/Rio Loco Watershed by Addressing Nutrient and Sediment Sources and Restoring Ecosystem Services** - Paul Sturm, Center for Watershed Protection, Ellicott City, MD (co-authors: Roberto Viquiera, Tom Moore)
- 11:10 A.M. **Predicting Erosion From Unpaved Roads in Tropical Watersheds: Comparison of Models** - Conrad Heatwole, Virginia Tech, Blacksburg, VA (co-authors: Marissa J. Duff, Marco Auralio C. Caiado)
- 11:30 A.M. **The Hydrologic Prescription of the Environmental Flow Regime for the Conservation of Riparian Ecosystems: An Example for a Sub-Tropical River of Northern Mexico** - Jose Navar, CIIDIR-IPN Unidad Durango, Durango, Mexico

SESSION 8 • PUERTO RICO BALLROOM 3 **FLOODING AND STORMWATER MANAGEMENT**

MODERATOR • JOSE MIRANDA • GREGORY L. MORRIS ENGINEERING • SAN JUAN, PUERTO RICO

- 10:30 A.M. **Inventory of Urban Sinkholes on the North Coast of Puerto Rico** – Luan M. Esteban, Gregory L. Morris Engineering, San Juan, PR (co-authors: Gregory L. Morris, Jose D. Miranda)
- 10:50 A.M. **A Statistical Model for the Reliability Analysis of Stormwater Detention Systems** - Rafael Segarra, University of Puerto Rico, Mayaguez, PR
- 11:10 A.M. **Stormwater Management System Improvement Project** – Noel Maerrero, Environmental Resources Management, San Juan, PR
- 11:30 A.M. **Adapting Stormwater BMPs for Tropical Watersheds and Coral Reef Protection** – Paul Sturm for David Hirschman, Center for Watershed Protection, Charlottesville, VA (co-author: Kelly Collins)

12:00 NOON TO 1:15 P.M. • LUNCHEON BREAK (ON YOUR OWN)

CONCURRENT SESSIONS 9 AND 10

1:30 P.M. - 3:00 P.M.

TUESDAY ~ AUGUST 31

SESSION 9 • PUERTO RICO BALLROOM 2

RIO DE LA PLATA FLOOD CONTROL PROJECT

MODERATOR • JOHN HASHTAK • TAYLOR ENGINEERING, INC. • JACKSONVILLE, FLORIDA

- 1:30 P.M. **Rainfall-Runoff Modeling for Rio de la Plata Flood Protection Project - Maurice Vaughan**, Taylor Engineering Inc., Jacksonville, FL (co-author: Hyun-Min Shin)
- 1:50 P.M. **Hydraulic Modeling for Design of Flood Control Features for Rio de la Plata Flood Protection Project - Eric Holand**, Taylor Engineering Inc, Jacksonville, FL (co-authors: David Weston, John Hashtak, Thomas Spencer)
- 2:10 P.M. **2D Hydrodynamic Model of Rio De La Plata Drainage Basin - Ashley Naimaster**, Taylor Engineering, Inc., Jacksonville, FL (co-author: Michael Kabiling)
- 2:30 P.M. **Impact of and Mitigation for a Coastal Plain Flood Control Project on Rio de la Plata - David Stites**, Taylor Engineering, Inc., Jacksonville, FL (co-authors: Javier Ruiz Bunker, Chris Ellis)

SESSION 10 • PUERTO RICO BALLROOM 3

HYDROLOGIC PROCESSES

MODERATOR • JOSE GUZMAN • CDM • JACKSONVILLE, FLORIDA

- 1:30 P.M. **Selected Hydrologic, Water Quality, Biological, and Sedimentation Characteristics of Laguna Grande- Luis Soler-Lopez**, U.S. Geological Survey, Guaynabo, PR
- 1:50 P.M. **Hydrological Response of Watershed Systems to Combined Land Use and Climate Changes in the Rio Haina Basin, Dominican Republic - Shimelis Setegn**, Florida International University (FIU), Miami, FL (co-authors: Assefa M. Melesse, Michael E. McClain, Xixi Wang)
- 2:10 P.M. **The Hydrogeology and Hydrology of Punta Cabullon in Southern Puerto Rico: a Saline to Hypersaline Setting in a Highly Dynamic Coast - Jesus Rodriguez**, U.S. Geological Survey, Guaynabo, PR
- 2:30 P.M. **Linking Watersheds' Hydrologic Response to Sediment Delivery: A Conceptual Framework- Nekesha Williams**, University of South Florida-College of Marine Science, St. Petersburg, FL (co-authors: Barnali Dixon; Ashanti Johnson)

3:00 P.M. TO 3:30 P.M. • AFTERNOON NETWORKING BREAK • PUERTO RICO BALLROOM 1

CONCURRENT SESSIONS 11 AND 12

3:30 P.M. - 5:00 P.M.

TUESDAY ~ AUGUST 31

SESSION 11 • PUERTO RICO BALLROOM 2

WATER RESOURCES IN A CHANGING CLIMATE

MODERATOR • JUAN AMADOR • GREGORY L. MORRIS ENGINEERING • SAN JUAN, PUERTO RICO

- 3:30 P.M. **Impact of Climate Changes on the Water Recourses Variability in Rio Grande De Manati and Plata River Basins, Puerto Rico, USA - Shimelis Setegn**, Florida International University (FIU), Miami, FL (co-author: Assefa M. Melesse)
- 3:50 P.M. **Long Term Sustainable Mosquito Vector Management Plan for Haiti - Marcia L. Anderson**, Montclair State University, Montclair, NJ
- 4:10 P.M. **Losing Connections: Wetland Characteristics in a Sub-Tropical, Sub-Sea Level, Hurricane-Impacted, Ditched, Pumped and Levee'd Pasture, and Implications for the Future - Jane O. Rowan**, Bioengineering Group, Inc., Newtown Square, PA (co-author: Yure' Agaha Brass)

SESSION 12 • PUERTO RICO BALLROOM 3

WATERSHED MODELING

MODERATOR • JOSE MIRANDA • GREGORY L. MORRIS ENGINEERING • SAN JUAN, PUERTO RICO

- 3:30 P.M. **Runoff and Soil Loss Estimation Using N-SPECT in the Rio Grande de Anasco Watershed, PR - Matilde Duque**, Florida International University, Miami, FL (co-author: Assefa M. Melesse)
- 3:50 P.M. **Panama Canal Watershed Experiment- Agua Salud Project - Fred L. Ogden**, University of Wyoming, Laramie, WY (co-authors: Robert F. Stallard, Helmut Elsenbeer, Jefferson Hall)
- 4:10 P.M. **Using WARMF for Water Resources Management and Adaption to Change in Island Watersheds: A Case Study in the Waimanalo Watershed, Oahu, Hawaii - Kathryn van Werkhoven**, Systech Water Resources, State College, PA (co-authors: Joel Herr, Scott Sheeder, Randall Wakumoto)
- 4:30 P.M. **Modeling Annual Discharge for Eleven Sub-Tropical Rivers of Northern Mexico - Jose Navar**, CIIDIR-IPN Unidad Durango, Durango, Mexico

DAY-AT-A-GLANCE / WEDNESDAY / SEPTEMBER 1, 2010

SPEAKERS' PREPARATION ROOM OPEN
7:00 A.M.-1:00 P.M. / CEIBA ROOM

REGISTRATION DESK OPEN
7:30 A.M.-3:30 P.M. / PUERTO RICO BALLROOM FOYER

MORNING NETWORKING BREAK
8:00 A.M.-10:30 A.M. / PUERTO RICO BALLROOM FOYER

CONCURRENT SESSIONS 13 AND 14 / 8:30 A.M.-10:00 A.M.

SESSION 13

SUSTAINABLE WATER RESOURCES

PUERTO RICO BALLROOM 2

SESSION 14

WATER DISTRIBUTION MANAGEMENT

PUERTO RICO BALLROOM 3

MORNING NETWORKING BREAK (CONT'D.)
10:00 A.M.-10:30 A.M. / PUERTO RICO BALLROOM FOYER

SESSION 15 / 10:30 A.M.-12:00 NOON

SPECIAL SESSION 15

**ECONOMIES OF WATER, WATER AND ENERGY
NEXUS, AND INNOVATIVE SOLUTIONS FOR
WATER RESOURCES MANAGEMENT**

PUERTO RICO BALLROOM 2

SPECIAL EVENT ~ CONFERENCE LUNCHEON
12:00 NOON.-1:30 P.M. / PUERTO RICO BALLROOM 1

**"WATER RESOURCES OF PUERTO RICO AND POTENTIAL EFFECTS OF GLOBAL CLIMATE CHANGES
ON THESE RESOURCES AND THE LIFE ZONES OF THE ISLAND"**
GUEST SPEAKER ~ FERDINAND QUIÑONES
CONSULTING ENVIRONMENTAL ENGINEER AND EX-DIRECTOR OF USGS IN PUERTO RICO ~ SAN JUAN, PUERTO RICO

CONCURRENT SESSIONS 16 AND 17 / 1:30 P.M.-3:00 P.M.

SESSION 16

WATER SUPPLY PLANNING

PUERTO RICO BALLROOM 2

SESSION 17

**COASTAL IMPACTS FROM
DEVELOPMENT**

PUERTO RICO BALLROOM 3

**DON'T MISS AWRA'S 2010 ANNUAL WATER RESOURCES CONFERENCE
NOVEMBER 1-4, 2010 ~ PHILADELPHIA, PENNSLVANIA**
A SCIENTIFIC PROGRAM AS RICH AND DIVERSE AS A HEALTHY ECOSYSTEM
MAKE YOUR PLANS TO ATTEND!

CONCURRENT SESSIONS 13 AND 14

8:30 A.M. - 10:00 A.M.

WEDNESDAY ~ SEPTEMBER 1

SESSION 13 • PUERTO RICO BALLROOM 2 **SUSTAINABLE WATER RESOURCES**

MODERATOR • LES LAMPE • BLACK & VEATCH CORPORATION • KANSAS CITY, MISSOURI

- 8:30 A.M. **Applying the Thornthwaite Water Budget in Tropical Climates - William Rense**, Shippensburg University, Estes Park, CO
8:50 A.M. **Puerto Rico River Management Guidelines - Gregory L. Morris**, Gregory L. Morris Engineering, San Juan, PR
(co-author: Juan Portalatin)
9:10 A.M. **Parameters for Regional Analysis of Minimum Flow in Tropical Watersheds - Jose Antonio Reis**, Federal Institute of Espirito Santo, Vitoria, Brazil (co-authors: Micheli Moscon, Jessica Ferreira Barbosa, Marco Aurelio Costa Caiado, Conrad Heatwole)
9:30 A.M. **"Green Means Go" – Using Sustainability Approaches to Facilitate Project Support – Les Lampe**, Black & Veatch Corporation, Kansas City, MO (co-author: Peter Binney)

SESSION 14 • PUERTO RICO BALLROOM 3 **WATER DISTRIBUTION MANAGEMENT**

MODERATOR • ADAMARIS QUIÑONES • PUERTO RICO AQUEDUCT AND SEWER AUTHORITY • CAGUAS, PUERTO RICO

- 8:30 A.M. **Situation of Water Resources in Puerto Rico – Carl Soderberg**, Caribbean Environmental Protection Division, EPA Region II, San Juan, PR
8:50 A.M. **PRASA Automation Program: Putting Theory Into Practice – Godofredo Canino**, CDM, San Juan, PR
9:10 A.M. **Waterhammer Analysis of the Puerto Rico North Coast Superaqueduct Before September 1999 - Walter F. Silva**, University of Puerto Rico at Mayaguez, Mayaguez, PR
9:30 A.M. **District Metered Areas Challenges in a Complex Water Distribution System – Mauricio Olaya**, PRASA, San Juan, PR

10:00 A.M. TO 10:30 A.M. • MORNING NETWORKING BREAK • HOTEL FOYER

SPECIAL SESSION 15

10:30 A.M. - 12:00 NOON

WEDNESDAY ~ SEPTEMBER 1

SESSION 15 • PUERTO RICO BALLROOM 2 **ECONOMIES OF WATER, WATER AND ENERGY NEXUS, AND INNOVATIVE SOLUTIONS FOR WATER RESOURCES MANAGEMENT**

MODERATOR

MATTHEW C. LARSEN

ASSOCIATE DIRECTOR FOR WATER ~ U.S. GEOLOGICAL SURVEY ~ RESTON, VIRGINIA

PRESENTERS

ARI M. MICHELSEN

Director and Professor, AgriLife Research Center ~ Texas A&M University ~ El Paso, Texas
President ~ American Water Resources Association ~ Middleburg, Virginia

LES LAMPE

Vice President ~ Black & Veatch Corporation ~ Kansas City, Missouri

JOSE F. ORTIZ VAZQUEZ

Executive President of the Puerto Rico Aqueduct and Sewer Authority ~ San Juan, Puerto Rico

This special session will provide an overview of three important aspects that should be considered for the management of water as a resource. These include economics, connection with other resources and implementation of technologies. The discussions will center on the economic considerations surrounding water, the connection of water and energy as one resource, and innovative technologies implemented locally for water resources management by the Puerto Rico Aqueduct and Sewer Authority.

SPECIAL EVENT

CONFERENCE LUNCHEON

WEDNESDAY • SEPTEMBER 1 • 12:00 NOON-1:30 P.M. • SAN JUAN BALLROOM 1

See "Special Events" on pg. 14 for details

CONCURRENT SESSIONS 16 AND 17

1:30 P.M. - 3:00 P.M.

WEDNESDAY ~ SEPTEMBER 1

SESSION 16 · PUERTO RICO BALLROOM 2 **WATER SUPPLY PLANNING**

MODERATOR · ADAMARIS QUIÑONES · PUERTO RICO AQUEDUCT AND SEWER AUTHORITY · CAGUAS, PUERTO RICO

- 1:30 P.M. **Offstream Reservoirs for Sustainable Water Supply in Puerto Rico - Gregory L. Morris**, Gregory L. Morris Engineering, San Juan, PR
- 1:50 P.M. **New Strategies for the Design of Raw Water River Intakes for Potable Water in Puerto Rico – Pully Torres**, CIAPR, San Juan, PR (co-authors: Gregory L. Morris, Rafael Rosa)
- 2:10 P.M. **Conjunctive Use to Augment Water Supply From a Small Caribbean Aquifer: Yauco, Puerto Rico - Juan Portalatin**, Gregory L. Morris Engineering, San Juan, PR (co-author: Gregory L. Morris)
- 2:30 P.M. **Groundwater Supply and Empowerment for the Embera Indians, Southern Darién Province, Panama - Michael E. Campana**, Ann Campana Judge Fdn., Corvallis, OR

SESSION 17 · PUERTO RICO BALLROOM 3 **COASTAL IMPACTS FROM DEVELOPMENT**

MODERATOR · JUAN AMADOR · GREGORY L. MORRIS ENGINEERING · SAN JUAN, PUERTO RICO

- 1:30 P.M. **Minimizing Development Impacts on Coastal and Marine Resources in U.S. Caribbean- Lisamarie Carrubba**, National Marine Fisheries Service, Caribbean Field Office, Boqueron, PR (co-author: Aitza Pabon)
- 1:50 P.M. **Background Fluorescence in Groundwater From a Tropical Karst Island Aquifer - S. Michelle Hoffman**, University of Guam, Riverview, FL (co-authors: John W. Jenson, David C. Moran, Gary R.W. Denton)
- 2:10 P.M. **Reducing Dock Construction Impacts in Shallow Water Seagrass Beds - Lisamarie Carrubba**, National Marine Fisheries Service, Caribbean Field Office, Boqueron, PR (co-author: Jocelyn Karazsia)

CONTINUING EDUCATION UNITS (CEUs)



AWRA is pleased to offer the opportunity for attendees of concurrent sessions to earn Continuing Education Units (CEUs). In addition, CIAPR Continuing Education Credits will be provided. Attendees interested in receiving these should see the CIAPR representative on-site in the hotel lobby.

CONFERENCE SESSIONS: The conference includes 16 sessions in eight time slots from 10:30 AM, Monday, August 30, 2010, through 10:00 AM, Wednesday, September 1, 2010. Two sessions will run concurrently in each of the eight time slots.

CEUs AVAILABLE: 0.9 CEUs will be awarded for attendance at concurrent sessions in six time slots of your choice.

Please note that CEUs are not available for the Plenary Sessions or any other scheduled events. Note also that CEUs are not available for one-day attendees.

SIGN UP AND COSTS: You may sign up for CEU credit using the registration form in this Preliminary Program. **The cost is \$22.00 for AWRA members and \$26.00 for non-members.**

PROCEDURE AND IACET REQUIREMENTS: AWRA is required by the International Association of Continuing Education and Training (IACET) to maintain very specific records for the awarding of CEUs. **Your conference registration packet will include an attendance sheet on which you must enter the Session Number of each concurrent session that you attended. You also must have the sheet signed by the moderator of each concurrent session that you attend.**

The sheet MUST be turned in to the AWRA Registration Desk upon its completion or faxed or mailed to AWRA within one week after the close of the Conference. This is an IACET requirement and AWRA cannot award CEUs without this completed form on file.

CEU AWARDS PROCEDURE: AWRA will award a total of 0.9 CEUs representing nine hours of attendance of concurrent sessions. Earned CEUs will be entered into your permanent AWRA record within two weeks following the Conference. Letters signifying the award will be provided within one month following the conference. Please note that 0.1 CEU is the same as 1.0 Professional Development Hour (PDH).

SPECIAL EVENTS

MONDAY • AUGUST 30 • 5:00 P.M. TO 6:30 P.M. • PUERTO RICO BALLROOM 1
OPENING NETWORKING RECEPTION

This event is included in the Registration Fee. All registered conference participants are invited to attend the Opening Networking Reception. Come greet old colleagues and make new acquaintances. Additional tickets for accompanying guests may be purchased on site at the AWRA Registration Desk. **The cost for each additional ticket is \$35.00.**

WEDNESDAY • SEPTEMBER 1 • 12:00 NOON TO 1:30 P.M. • PUERTO RICO BALLROOM 1
AWRA SUMMER SPECIALTY CONFERENCE LUNCHEON

Luncheon Speaker ~ FERDINAND QUIÑONES

CONSULTING ENVIRONMENTAL ENGINEER AND EX-DIRECTOR OF USGS IN PUERTO RICO ~ SAN JUAN, PUERTO RICO

"Water Resources of Puerto Rico and Potential Effects of Global Climate Changes on These Resources and the Life Zones of the Island"

This event is included in the registration fee. Community, conversation, and connections are the hallmark of AWRA conferences. Come join your colleagues at the conference luncheon where we will hear Ferdinand Quiñones, PE, give a talk on "Water Resources of Puerto Rico and Potential Effects of Global Climate Changes on these Resources and the Life Zones of the Island." Mr. Quiñones is currently an Independent Consulting Environmental Engineer who has gained over 42 years of experience in water resources and environmental issues, water infrastructure, and environmental regulations in Puerto Rico and the Federal sector. This special Conference Luncheon presentation will provide a local perspective of the impacts of global climate change on the water resources of Puerto Rico. This will be an interesting presentation that will bring together the main theme of the Conference of Tropical Hydrology and Sustainable Water Resources in a Changing Climate. Join us for what is sure to be an enjoyable and informative experience. **Additional tickets for this event may be purchased on-site at the AWRA registration desk. The cost for each additional ticket is \$35.**

GENERAL CONFERENCE INFORMATION

REFUNDS – Cancellations must have been received in writing at the AWRA HQ by Monday, August 16, 2010. No refunds will be issued after August 16, 2010. All cancellations received prior to August 16, 2010, are subject to an administrative fee of 25% of the total registration fees. No refunds will be given for ticketed events purchased after August 16, 2010.

BADGES – It is important that the official badge supplied at the time of registration be worn at all times. This practice is a courtesy to your fellow registrants. It also indicates that you have completed registration and may participate in the scheduled events. **Admission to all technical sessions and breaks will be by badge only.**

INFORMATION DESK – Please consult the staff at the AWRA Registration Desk if you have any questions regarding the events at the meeting.

SESSION PARTICIPANTS – **Authors, panelists, and moderators are requested to meet in their respective meeting rooms 10 minutes prior to the start of their session. All participants are required to register PRIOR to their sessions.**

SPEAKERS' PREPARATION ROOM – The **Ceiba Room** will be available for presenters to review their presentations during the conference. **Monday, August 30, and Tuesday, August 31,** the room will be open from 7:00 a.m. to 7:00 p.m.; on **Wednesday, September 1,** it will be open from 7:00 a.m. to 1:00 p.m.

AWRA'S FUTURE MEETINGS

AWRA'S 2010 ANNUAL WATER RESOURCES CONFERENCE

NOVEMBER 1-4, 2010

LOEWS PHILADELPHIA HOTEL ~ PHILADELPHIA, PENNSYLVANIA

CHECK OUT AWRA'S WEBSITE FOR ADDITIONAL INFORMATION ON ANY AWRA MEETING!

www.awra.org

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FIRE EMERGENCY INFORMATION ~ PREPAREDNESS IN HOTELS

PLAN AHEAD – When you check into your room, check the location of exits. Walk to the nearest exit, learn the route, obstacles, etc. Keep your room key on the night stand when you are in your room. Examine your room. Check the windows to see if they open and how. Examine the area outside your window.

IN CASE OF A FIRE ... EVACUATION PROCEDURES – Immediately investigate all odors, smoke, and/or disturbances. If you smell smoke, grab your key, roll out of bed, and crawl to the door. Feel the door. If the door facing or knob is hot, don't open it. If the hall is clear of fire, crawl toward the exit after closing your door. Stay against the exit side of the wall. Keep as close to the floor as possible. When you reach the exit, walk down the stairs holding the handrail.

SURVIVAL TECHNIQUES IN THE ROOM – If the door is warm or hot, or if the hallway is filled with smoke, you can still defend yourself effectively in your room. Call the front desk to report the fire and let someone know your location. Vent the room. Use the bathroom vent fan or open the window if there is smoke in your room. Don't open the window if there is smoke outside. Fill the bathtub with water for firefighting. Don't get in the tub! Use wet sheets or towels to stuff the cracks around the door. Use the ice bucket to drench the walls, mattresses, rugs, drapes, etc. While waiting to be rescued, do not hide from the fire. Stay out of closets and out from under the bed. Keep fighting until help arrives. Place a towel, sheet, or other items in the window to let firemen know that someone is in the room.

OTHER TIPS – JUMPING ... If you jump from higher than the third floor, chances are you won't survive the fall. **Elevators ...** Never enter an elevator during a fire alert. **Don't Panic ...** It is contagious and almost irreversible once it sets in. If you understand what is happening, what to do, where to go and how to get there, you are unlikely to panic.

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MEETING ROOMS LAYOUT ~ GRAN MELIA RESORT

