The National Capital Region Water Resources Symposium

The Past, Present, and Future of Water Resources

FRIDAY, APRIL 5, 2013
8:30 A.M. – 5:00 P.M.
UNIVERSITY OF THE DISTRICT OF COLUMBIA
4200 CONNECTICUT AVE NW, WASHINGTON D.C.

Opening and Welcome
Nathan Beil, AWRA-NCR Section President
Tolessa Deksissa, Ph.D, Symposium Co-Chair, Director, UDC Water Resources Research Institute
Sabine O’Hara, Ph.D, Dean of the College of Agriculture, Urban Sustainability, and Environmental Science (CAUSES), UDC

KEYNOTE SPEAKER: John R. Wennersten, Ph.D, Professor Emeritus of American History, University of Maryland, Eastern Shore

Speakers and Panelists:
- Carlton Haywood, Executive Director, Interstate Commission on the Potomac River Basin
- Doug Bellomo, Director, Federal Emergency Management Agency Risk Analysis Division
- Gerry Galloway, Professor of Civil & Environmental Engineering, University of Maryland, College Park
- Shawn Komlos, Physical Scientist and Risk Communication, USACE

Afternoon Concurrent Sessions
- Frequency Analyses and Statistics
- Stormwater Management
- Urban Challenges in Water Resources
- Developing and Managing Data

Symposium Co-chairs: Dr. Tamim Younos, Associate Director for Research, Virginia Tech Water Resources Research Center and Dr. Tolessa Deksissa, Director DC WRRI.
Greetings to all.

I am honored to lead the DC Water Resources Research Institute as the new Director under the changes instituted by Dean Sabine O’Hara, and to build on the foundation laid by William Hare, WRRI Director for 10 years and now Associate Dean for Land-Grant Programs in CAUSES. This is an exciting moment to serve as the WRRI director, but the challenge is tremendous. I am writing to both introduce myself and to thank all DC WRRI Advisory Board members, partners, staff and researchers for their contributions towards the improvement of our precious freshwater resources.

My academic and research background has helped me contribute to the Institute’s mission. After graduating from Alameya University in 1992 with a B.S. in arid land crop sciences, I joined Ghent University in 1996, where I received an M.S. in Environmental Sanitation and Ph.D. in Environmental Technology. I joined the Institute in spring 2006 as a Research Associate and managed to successfully build a foundation for research, training and collaboration needed to protect and manage water resources in the DC area. Key research areas I have initiated include: modeling integrated urban wastewater systems, investigating endocrine disruptors, GIS analysis of green infrastructure, and pesticide analysis in environmental samples. While working on various collaborative research and assisting in curriculum development for the new CAUSES college, I spearheaded the establishment of two new state-of-the-art laboratories, the Environmental Quality Testing Laboratory (2012) and the Environmental Modeling and Simulation Laboratory (2010).

In 2010, based on the cutting-edge research laboratories of the Institute, new undergraduate and graduate environmental and water resources programs were established, including the BS in Water Quality concentration in Environmental Sciences and the Professional Science Master’s (PSM) in Water Resources Management. Since then, I have been serving as a founding director of the PSM program. Consistent with the mission of the Institute, other new environmental and water-related courses have also been developed to train students and faculty in the new high-end analytical technologies. On behalf of the Institute, I extend special thanks to our Advisory Board members, who contributed to the curriculum design of the PSM program.

Changes in the organization of our new College allow us to formally integrate the Institute with the new graduate and undergraduate water resources programs. As we work with our stakeholders to address DC area water issues, including managing stormwater and protecting drinking sources, we improve the quality of life for all the citizens of the District of Columbia.

Our research, academic, and community service engage and inform our community at large, and DC residents in particular. I am grateful for this opportunity and look forward to working with the water research communities and DC residents as we strive to address water issues in the DC area. I deeply appreciate your continued support and collaboration with the DC WRRI.

Established in 1973, the mission of Water Resources Research Institute (WRRI) is to provide the District of Columbia with interdisciplinary research support to identify DC water resources problems and contribute to their solution. Areas of focus include drinking water source protection, stormwater management and planning, water safety, and watershed stewardship. The Institute coordinates, facilitates, and disseminates water resources-related research projects through seed grants to faculty members from the consortium of universities in the greater Metropolitan Washington area. The Institute supports collaborative training and research that engages not only faculty members and students, but also a broad array of stakeholders to address regional water issues in a holistic way.

Director’s Message

New Director for WRRI

DR. TOLESSA DEKSISSA
Director of the D.C. Water Resources Research Institute
Founded in 1964, the American Water Resources Association is a nonprofit professional association dedicated to the advancement of men and women in water resources management, research, and education. AWRA's membership is multidisciplinary; its diversity is its hallmark. It is the professional home of a wide variety of water resources experts including engineers, educators, foresters, biologists, ecologists, geographers, managers, regulators, hydrologists and attorneys.

The National Capital Region (NCR), encompassing the District of Columbia, and parts of Maryland, Virginia and West Virginia, has unique and challenging opportunities for sustainable management of water resources and water infrastructures. The region is the gateway to the Chesapeake Bay, the largest estuary in the U.S; provides water for six million people; but also hosts many agencies that consider water resources at a national or international scale. This one-day symposium at the University of the District of Columbia will bring together experts from governmental agencies, academia, the private sector, and nonprofits to present and discuss challenges and opportunities for sustainable management of water resources and infrastructure in the region, as well as nationally and internationally.

**Program Features**

An invited panel on Flooding & Hurricane Sandy, Roundtable Discussion and Poster Presentations

Dr. C. Mark Dunning, American Water Resources Association president-elect (left) joined Tolessa Deksissa, WRRI Director, and CAUSES Dean Sabine O’Hara in the television studios of UDC TV to tape the latest episode of “CAUSES TV,” a monthly series devoted to the College’s sustainability courses and community outreach. In this program topic, “Water Quality in the Urban Environment,” the participants explored advances in water resources management, research, and education. View the entire program at www.youtube.com/watch?v=y387CckYo94. The CAUSES TV broadcast schedule for each month can be found at www.udc.edu/docs/causes/schedule.pdf.

The AWRA symposium offers great opportunities for undergraduate and graduate students in water-related disciplines to present their research findings and network with professional colleagues. The following UDC young scholars will discuss their findings at the symposium:

- **Yonas Gadissa**, Engineering and Applied Sciences, University of the District of Columbia (co-authors: Mir Ali and Asteway Ribbiso) - “Flow Duration Curve-based Stream Flow Analysis in the Potomac Watershed.”
- **Ololu Dawodu**, CAUSES, University of the District of Columbia, (co-authors: Ivelina Lambova and Tolessa Deksissa) - “Effect of Hurricane Sandy on Nutrients and Micro-Pollutant Level in Rock Creek.”
- **Asteway Ribbiso**, co-author, with Pradeep K. Behera, Civil Engineering, University of the District of Columbia - “Analysis of Storm Event Characteristics for the Metropolitan Washington DC Region.”

The Water Community’s Other Natural Resource: Young Researchers
CAUSES Laboratory Promises Research and Service

It was a festive opening, with streamers and balloons. Amid cheers from dozens of well-wishers, UDC administrators wielded oversized gold scissors to cut the ribbon festooning the entrance to the CAUSES Environmental Quality Testing Laboratory. But behind the festivities were years of effort and expectation that culminated in the May 3, 2012 opening.

Acquiring appropriate water quality testing laboratory to conduct basic research on emerging water quality issues, together with training students on the new technologies, had been the vision of the WRRI for some time. By 2007, the water quality testing laboratory at UDC was equipped to measure basic water quality parameters such as coliforms, phosphate, ammonia, pH and chlorine residues. In 2009, UDC received funding from the DC Department of Environment to establish another environmental quality testing laboratory capable of testing emerging contaminants, including organic and trace metal in environmental samples. Perkin-Elmer, a 75-year-old technology company specializing in health and environmental monitoring and analysis instruments, manufactured much of the equipment and Perkin-Elmer technicians provided personalized assistance to the Lab’s development and equipment installation. After three years of hard work on renovation by CAUSES staff and the UDC Department of Facilities, the new UDC Environmental Quality Testing Laboratory, located in the Engineering Building on UDC’s Van Ness campus opened its doors.

Important Laboratory Benefits
Trace metals and organic contaminants occur widely in the environment. Selenium, chromium, arsenic lead and other trace metals may be concentrated in drinking water as well as foods in levels that may cause adverse effects to human health and the environment. Organic contaminants such as pesticides, pharmaceuticals and personal care products can cause a similar threat. Managing human and aquatic live exposure to these contaminants poses a great challenge to environmental regulators and researchers. The new laboratory, with state-of-the-art analytical equipment, has the capacity to quantify, at the nanolevel, changes in environmental health and sustainability, opening up new research opportunities. As such, the laboratory will serve as an interdisciplinary resource for members of the University community engaged in an array of research areas, including food safety, emerging contaminants, and the chemistry of trace elements. It also supports faculty and student access to innovative technology. “The capabilities of the laboratory significantly advance CAUSES’ mission of integrating research, training, and community engagement,” Dr. Tolessa Deksissa, WRRI director, states.

Certification on the Horizon
The purpose of the Environmental Quality Testing Lab is not only to serve as a research lab, but also to provide water quality monitoring for compliance with U.S. environmental regulations. To do so requires certification under the U.S. Environmental Protection Agency (EPA) guidelines. At WRRI, that process is well underway. WRRI has completed the necessary preparation, including instrument calibration, to apply for the certification. The procedures for submitting samples to the lab for evaluation and establishing service fees are in the final stages.
WRRI Research Reports

This report summarizes the activities of the District of Columbia (DC) Water Resources Research Institute for the period of March 2011 through February 2012.

Dr. Xueqing Song’s research project, “Monitoring of Glyphosate and its Degradation Residue by Phosphorus-31 Nuclear Magnetic Resonance Spectroscopy,” sought to develop analytical method able to provide rapid, sensitive, easy and reliable detection of glyphosate, an extensively used post-emergence nonselective organophosphorus (OP) herbicide, and its residues in soil and water samples collected in the DC metropolitan area. Using 31P NMR spectroscopy, the researcher successfully obtained 31P NMR spectra for all soil 8 samples tested. Preliminary data show that the degradation starts in Week 2 and the concentration of degraded species increased from Week 2 to Week 8. Because its effects on non-target organisms and overall environmental impact have not been fully investigated, and in light of its increasing use, it is essential to analyze the speciation of organophosphorus compounds such as glyphosate to gain a better understanding of their interaction in soil and aquatic environment.


The objective of the “Feasibility Assessment for a Metropolitan Washington Public Officials’ Water Leadership Program,” researched by Howard Ways (PI), University of the District of Columbia and Cat Shrier (Co-PI) of Watercat Consulting LLC, was to develop a training program for incoming public officials involved in water decisions. Previous DC WRRI studies had identified the need for water education outside of the standard university student population. Such a training program would include leadership and policy development, provide networking opportunities, and to form the basis for regional collaboration and understanding. The researchers reviewed water leadership development programs and discussed the potential training program at water association meetings. Although none of the major water leader organizations elected to commit to participation in a program during the research period, there was some interest in potential future coordination of joint events for water leaders to learn about water decision-making in the DC area and examples of water innovations in other areas, and to provide opportunities for greater interaction among water leaders in the region.


In “GIS-Based Ecosystem Service Analysis of Urban Green Infrastructure as a Tool for Attaining Water and Air Quality Objectives in the District of Columbia,” Dr. Tolessa Deksissa quantified the contribution of various green infrastructure methods, including tree canopies, green roofs and open grasslands in addressing the significant impact of combined sewer overflows in the District of Columbia. The quantitative method included GIS technologies with spatial analysis capability and CitiGreen® software. Using the orthophotography of 2010 with 16 cm resolution, the quantitative assessment of the stormwater benefit of green infrastructure was analyzed for the Anacostia and Rock Creek watersheds. To date, the analysis of Rock Creek watershed has been completed. The results show that green infrastructures store rain and consequently reduce stormwater runoff volumes and the peak flow rate. In addition, increased areas of green infrastructure can increase carbon sequestration and reduce energy use. The potential of such geo-referenced analysis of ecosystem service could provide valuable benefits to the District in assessing the city’s green infrastructure development plan and environmental/water quality objectives.


The effects of organic chemicals on fish in urban rivers has been of increasing concern, but the biogeochemical characteristics of tidal freshwater urban rivers, including the Anacostia, remain largely unstudied. In his project, “Hormone Disruption and Environmental Pollutants in Anacostia and Potomac River Fish, Washington DC,” Dr. Stephen MacAvoy examined base-flow geochemistry and nutrients dynamics over a 1.5 year period (April 2010- Sept 2011), concentrating on inorganics, organic hydrocarbons, sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks. 15N values of sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks. 15N values of sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks. 15N values of sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks. 15N values of sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks. 15N values of sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks. 15N values of sediment and water column particulate C and N stable isotopes and total organic carbon in the Anacostia River in Washington, D.C. The study also examined organic compounds in fish tissues from one site in the Anacostia. Water and sediment were sampled from three tidal freshwater sites along the Anacostia River approximately every eight weeks.
The Clean Water Act celebrated its 40th anniversary in the fall of 2012, but observations on the landmark legislation’s impact continue on the Environmental Protection Agency’s “Water is Worth It” webpage. Resources available for download include lesson plans, videos, and a timeline of the era’s most dramatic water events at http://water.epa.gov/action/cleanwater40/

Based on research by the Smithsonian’s Anacostia Community Museum on the history, public use, and attitudes toward the Anacostia River and its watershed and on review of global urban waterway developments, a new exhibit, “Reclaiming the Edge,” explores various issues regarding human interaction with natural resources in an urban setting. It considers densely populated watersheds and rivers both as barriers as a nexus for community integration. The exhibition also examines civic attempts to recover, clean up, re-imagine, or engineer urban rivers for community access and use. The exhibit continues through September 15, 2013.

http://anacostia.si.edu

“Every era has been shaped by its response to the great water challenges of its time. And so it is again today.” “Global Water Issues: A Compendium of Articles,” published by the Bureau of International Information Programs, U.S. State Department, covers the most critical water issues and offers examples of creative solutions gathered from Mexico to the Okavango Delta. Water and food security, health, politics, and even the history of waterworks in the ancient world round out the collection, which closes with a portrait of the new generation of water activists.


Calling all amateur filmmakers! Reel Water Film Festival, an area nonprofit organization, encourages submissions of short films on all aspects of water for its second annual event taking place on June 15 in Bethesda, MD. The Festival examines everything from local watershed stewardship, to stormwater management, healthy fisheries, the impact of climate change, new technologies to improve access to clean water, and more through the use of film, expert presentations and networking with environmental and humanitarian organizations. At least 50% of the money raised each year contributes to or sponsors various water projects that are needed locally and around the world. There is no fee to submit a film, and the submission period continues until May 10. Complete details are at http://www.reelwaterfilmfest.org/submit.

Dr. Kobina Atobrah
Kobina Atobrah, part of the original research team of the Water Resources Research Institute, has rejoined WRRI as a Research Associate. Working from 1989 to 1993 with Dr. Hame Watt (then the Director of WRRI), Dr. Atobrah and the team installed a total of 14 monitoring wells throughout the District to monitor groundwater quality.

As a hydrogeologist and a certified Master Well Driller, Dr. Atobrah has installed hundreds of boreholes for potable water supplies in sub-Saharan Africa and Ghana in particular, and several monitoring wells in the United States.

He is currently working to rehabilitate the monitoring wells in the District of Columbia in order to assess changes in groundwater pollution due to 20 years of urbanization. One of his goals is to determine District water quality and pollution as it relates to sustainable development. Much of this analysis will be carried out in the Environmental Quality Testing Laboratory at UDC.

Dr. Atobrah has pioneered the development of the Integrated Distributive Utilities Network (IDUN) as a system that integrates the essential utilities of electricity, water and sanitation, with information and communication technologies together under a single network. Such a system is being deployed to provide the necessary utilities at demonstration sites at the UDC Agricultural Experiment Station in Beltsville, Maryland and William V.S. Tubman University in Liberia.

He earned a Ph.D and MA in Water Resources and Geophysics from Princeton University, and MS in Earth Sciences and Hydrogeology from University of Waterloo, Canada. A native of Ghana, he received his BS (with Honors) in Geology from the University of Ghana, Legon.

Dr. Atobrah has consulted on international infrastructure projects for the World Bank in several sub-Saharan African countries and has worked with major companies such as SAIC, Americom Government Services, and ICS Partners.

“Kobina” means “born on Tuesday,” from the Akan ethnic group of Dr. Kobina’s native Ghana, where it is customary to bestow the first name according to the day of the week of one’s birth.
In their project, "Urban Stormwater Runoff Prediction Using Computational Intelligence Methods," researchers Dr. Pradeep K. Behera and Dr. Nian Zhang developed computational intelligence methods, including recurrent neural networks, particle swarm optimization, evolutionary algorithm, and the combination of these methods to predict stormwater runoff quantity and quality. The methodology was applied to renewable energy data collected from the Zero Energy House located at the University of the District of Columbia. The excellent experimental results demonstrated that the proposed method provides a suitable prediction tool for the stormwater runoff monitoring and solar radiation prediction. Additionally, a computational intelligence modeling tool utilized proved to be successful in training the recurrent neural network for the runoff prediction.


The research study by Dr. Royce A. Francis, "Integrated Water Use Impact Assessment for DC Urban Infrastructure," addresses tradeoffs with respect to expanding the physical capacity of infrastructure assets (e.g., pipes) against improving sequestration and containment measures (e.g., local stormwater containment or detention) by developing a methodology that may be used to evaluate infrastructure investments intended to reduce an organization’s stormwater loading. This methodology proceeds in two parts: First, decision analysis is undertaken to construct a sustainability definition for interested stakeholders. Second, life cycle analysis is used to evaluate the most important uncertainties remaining in the LID implementation portion of the District of Columbia Water and Sewer Authority’s long-term control plan (LTCP). The George Washington University was a testbed for Part One of this methodology, noting that efforts to reduce stormwater loading are part of the University’s comprehensive approach to the reduction of water-use impacts. In addition, this research has identified research priorities for system analysis evaluating the use of LID techniques for reducing combined sewer overflow (CSO) occurrence in the District of Columbia.

Read the full report at www.udc.edu/docs/wrri/Francis_FY2011_Final_Report.pdf

Identifying the major contributors of specific pollutants in stormwater, particularly in highly urbanized areas, is an important and at the same time a challenging task due to the large number of potential contributors to stormwater pollution. In their project “Pollution Source Identification in Washington DC Stormwater Using Bayesian Chemical Mass Balance modeling,” researchers Dr. Arash Massoudieh and Dr. Tolessa Dekissa collected multiple samples of traffic and non-traffic-related sources (e.g. street dust, wet deposition, and roof runoff) at the vicinity of the Anacostia River in northeast Washington, DC and analyzed the samples for their elemental profiles using mass spectrometry. The Bayesian CMB method was utilized to infer the contribution of various sources into the stormwater runoff. The results to date indicate the potential efficacy of applying the method at a larger scale and at a larger number of discharge points in the city where stormwater is released into the Anacostia and Potomac rivers.

Read the full report at www.udc.edu/docs/wrri/Massoudieh_&_Dekissa_FY2011_Final_Report.pdf

“National Capital Region Flood Risk Assessment: Inter-university Collaboration Initiative.” The vulnerability of the District and its neighboring region with respect to extreme storm events and hurricanes parallels that of New Orleans prior to Hurricane Katrina. The relatively flat areas of Potomac River floodplain and the inadequate capacity of the existing drainage system could exacerbate the flooding situation during such events, resulting in disastrous impacts, particularly to buildings and monuments in the Federal Triangle area. Because the National Capital Region (NCR) is comprised of many local jurisdictions, none of which are contained within a single state, a lack of coordination and information sharing could be a concern in dealing with extreme event vulnerability. In order to address the vulnerability of the District and its neighboring regions from the aforementioned natural hazards, a National Capital Region (NCR) Flood Risk Assessment Program has been initiated by three local universities that include University of Maryland (UMD), University of the District of Columbia (UDC) and George Mason University (GMU). Dr. Pradeep Behera (UDC), Dr. Gerald Galloway (Co-PI), and Dr. Michael J. Casey (Co-PI) undertook an preliminary NCR flood risk assessment to collect and analyze past flooding events and associated social, environmental and economic impacts; collect meteorological records of all available stations within the NCR; and create the appropriate digital file format to conduct the statistical analysis to obtain a complete understanding of the impact of extreme events. The seed grant that initiated this study found that, due to the lack of thorough coverage in some portions of the floodplain, it was not possible to obtain accurate elevations and, therefore there is need for a building survey to determine flood depths. In addition, information on building use was not readily available. Due to these factors, a numeric value for estimated damages has not been determined, although the scale of potential damages can be inferred from the number of buildings that would be flooded. Further research is needed to determine more accurate building flood depths and more reliable damage estimation methods for building types other than residential.

WATER RESOURCES RESEARCH INSTITUTE

STAKEHOLDERS
- Residents of the District of Columbia
- DC Local Government
- DC Bureau of Environmental Quality
- DC Water and Sewer Authority
- DC Local Schools and Universities
- DC Non-profit Environmental Organizations
- Water resources management private industries
- US Environmental Protection Agency (EPA)
- US Geological Survey
- US Department of Interior
- US Department of Agriculture
- Interstate Commission on the Potomac River Basin
- Anacostia Watershed Restoration Committee
- Chesapeake Bay Foundation
- Chesapeake Bay Program Scientific and Technical Advisory Committee
- The National Institute for Water Resources

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- Mel Tesema, Washington Aqueduct
- Beth Mullin, Friends of Rock Creek’s Environment

STAFF
- Tolessa Dekissa, Ph.D., Director, D.C. WRRI
- Kobina Atobrah, Ph.d, Research Associate
- Gerri L. Williams, Editor

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