44th Annual WMAO Conference
MOVING THE NEEDLE: Policies, Programs, and People that Drive Change
November 17 - 18, 2015
Doubletree by Hilton, Worthington/Columbus, Ohio

Conference Proceedings

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Key Note

8:45 am – 10:00 am

Title: *Ohio State's Collaborative Effort to Solve Water Issues at the Regional and International Level*

Biography: Marty Kress currently serves as the Assistant Vice President for Research Business Development in the Office of Research at The Ohio State University. In this position, he focuses on new and innovative collaborative interdisciplinary projects and activities with non-traditional funding. One of those key projects is the Global Water Initiative at Ohio State.

Prior to joining OSU in May 2013, Marty was the Executive Director of the Von Braun Center for Science & Innovation – a not for profit that was established in Huntsville in 2006 to foster and promote collaborative R for D – the integration of university and industry research to provide new and innovative applications.

Prior to coming to Huntsville, Marty worked for the U.S. Senate (Senior Energy Analyst on the Senate Budget Committee and Senior Majority Staff of the Subcommittee on Science, Technology and Space) , NASA (Associate Administrator for Legislative Affairs and Deputy Center Director of NASA Glenn), and Battelle (Vice President/General Manager of the NASA Sector).

He has degrees from Notre Dame, Northeastern, and MIT, and was a PhD candidate in political science at Georgetown.

Abstract: Over the course of the last two years, Ohio State has worked to frame a new Global Water Initiative that addresses water related issues that impact the regional and international landscape. In particular, Ohio State has framed three key thrusts:

1. Field to Faucet is an integrated set of research activities funded by the State of Ohio and Ohio State to address systems focused issues in the Western Lake Erie Basin. In collaboration with UT, Ohio State has taken a lead on this initiative for the Chancellor and key State agencies.
2. Coastal Resilience is a proposed set of activities that would address three key aspects of coastal resilience – prevention, mitigation and adaption. With potential funding provided by the UN, Ohio State is part of the UNESCO Leadership Team for this initiative.
3. Wells to Wellness is a sustainable systems model for rural areas in developing countries. Most recently, Ohio State signed letters of intent with the Tanzanian Ministry of Water and the University of Dodoma to frame, fund and execute a new Water-Energy Initiative that focuses on access to safe drinking water, renewable energy, sanitation and hygiene, workforce development and education, and economic development linked to accessible water.

Tuesday, November 17, 2015
Concurrent 1 - Ohio Dam Safety Organization
10:15 am – 11:45 am

Title: *Closing a Pond but not the Dam: The Challenges of Closing an Impoundment that Remains a Regulated Dam.*

Biography: Brian Palmer, AEP

Abstract: This presentation will provide a brief history of why ash from coal fired power plants has historically been stored in impoundments, and how changes in environmental regulations are requiring these ponds to close as the generating facilities close and as rules specifically governing the storage and handling of coal combustion residuals (CCRs) require modification or closure of the ponds. Clean air regulations are requiring AEP to retire 5,520 Megawatts (MW) of generation capacity (1,925 MW in Ohio) effective May 31, 2015 resulting in the eventual closure of 14 ash ponds at 7 facilities (5 ash ponds at 2 facilities in Ohio). An additional 15 ponds at 12 plants (5 ponds at 3 plants in Ohio) are subject to closure or modification as result of changes in regulations regarding disposal of CCRs. These ponds range in size from several acres to nearly 200 acres and each presents a unique set of design challenges. The presentation will outline the Dam Safety regulatory drivers and requirements that impact the design of the closure of these ponds. This will include a discussion on how recent incidents at coal ash ponds have resulted in dam safety officials providing guidance for closure of these facilities. These closures present engineering and long-term challenges, as these facilities will remain regulated dams even though they will no longer have a large surface of impounded water. This presents challenges in how to handle a PMF event when the storage area is changed. Additional long-term challenges are still to be worked out once staff is no longer on site to handle EAP/OMI issues.

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Title: *Selecting and Accommodating Inflow Design Floods for Dams: Beyond the Guidelines.*

Biography: Amanda Hess is the Hydrology and Hydraulics Group Manager in Gannett Fleming's Dams and Hydraulics Section. She has over 15 years of experience working on dams, flood control projects and water supply systems. She received her Bachelor of Science and Master of Science degrees from Penn State University, but please don't hold that against her here in Buckeye country.

Abstract: The Federal Emergency Management Agency's National Dam Safety Program recently sponsored development of an updated guidance document entitled Selecting and Accommodating Inflow Design Floods for Dams which was recently finalized. The main objectives of this document are to recommend appropriate procedures for selecting and accommodating the Inflow Design Flood (IDF) for dams based on current and accepted practices and to promote a reasonable degree of consistency and uniformity among state and

federal agencies. Over the course of its development, the document was reviewed by an independent Steering Committee, a FEMA Research Work Group, state and federal dam safety agencies, and the National Dam Safety Review Board. The disparity of current IDF selection approaches and criteria used by state and federal agencies is significant, and the appropriateness and applicability of various approaches to IDF selection continue to be topics of fervent debate. Throughout the development and review of the guidance document, many viewpoints and insights from all sides of this debate were shared with the authors. All feedback was carefully considered in guiding the development of the document. Many of the comments provided insights into the current needs of dam safety agencies. This presentation will: 1. Provide a summary of the guidelines with an emphasis on changes from the previous guidelines; 2. Discuss how the guidelines should be used by state and federal agencies; and 3. Summarize the most significant review comments and how they were resolved. These insights into the development of the recently released Selecting and Accommodating Inflow Design Floods for Dams will benefit dam safety officials and practitioners as they strive to apply the updated guidance within their various jurisdictions. They will also provide a better understanding of current practices related to the hydrologic safety of dams and how they are evolving in response to changes in technology.

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Title: *Dam Safety Watershed Modeling, Implementing the New Ohio Statewide PMP.*

Biography: Matthew D. Gramza, P.E., CFM - Matt Gramza is a Water Resources Engineer and Certified Floodplain Manager with more than 18 years of experience. He currently serves Civil & Environmental Consultants, Inc. as a Project Manager. He is a professional engineer licensed in Ohio.

Abstract: Dam Safety is an often overlooked but critical infrastructure improvement need. Determining the appropriate design flood is essential to evaluating the Dam's hydraulic capacity and ability to safely pass the design flood. Implementation of Ohio's Statewide PMP is highlighted to demonstrate its more accurate results, leading to potential infrastructure improvement savings. This presentation will highlight the GIS-integrated hydrologic and hydraulic watershed modeling techniques used to analyze 20 Class I High-Hazard Dams in Ohio. The advanced model integration provides efficiencies that allow for a high level of calibration and sensitivity analysis, maximization of data output and overall model value. The hydrologic and hydraulic models utilized in this project include watershed rainfall runoff for probable maximum flood (PMF) determination, reservoir routing for spillway capacity analysis, PMF and Sunny Day Dam Breach Analysis, downstream breach river routing, and inundation mapping. The watershed scale stormwater management studies evaluate a wide range of dam drainage areas from 0.5 to 50 square miles. The reservoir routing and dam breach models include a wide range of structure geometry and maximum storage volumes from 120 to 25,000 acre-feet. The

un-steady flow downstream river reach hydraulic models range in length from 5-25 river miles. The resulting output provides for a large and varied sample data set.

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Tuesday, November 17, 2015

Concurrent 2- Ohio Lake Management Society - Case Studies

10:15 am – 11:45 am

Title: *Buckeye Lake, A Season of Change*

Biography: Mike Gallaway has worked in the Division of Surface Water at the Ohio EPA since 1984. He is currently the Manager of the Surface Water Program in the Central District Office, where he is responsible for implementing the Clean Water Act in 10 Central Ohio counties. Mike has a Bachelor's degree in Zoology from Miami University, and a Master's degree in Zoology from Ohio University.

Abstract: During 2015 the lake level of Buckeye Lake was maintained at a lower level. Monitoring results for 2015 are presented and contrasted with previous years of data to gain insight on the changes in the lake.

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Title: *Buckeye Lake for Tomorrow*

Biography: Merv Bartholow is the founding Director of Buckeye Lake for Tomorrow, a 501 [c][3] watershed management group, and Past President of Buckeye Lake Area Civic Association. Mr. Bartholow is retired from Nationwide Insurance as Agency Development Director, State of New York.

Abstract: The process of developing an all-volunteer watershed management group - the challenges and opportunities that developed over a 7 year period. The general concept and driving force behind the group. Specifically what has been done to better understand the workings of the watershed as well as the sources of nutrient loss, both point and non-point. The development of a formal Nutrient Reduction Plan and the follow-through with the lake area residents as well as those from the farming community for increased understanding. Presentation can be made with or without Power Point support.

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Title: *Breaking Down the Silver Bullet (Grand Lake)*

Biography: Abbey Tobe has been the watershed coordinator for the Grand Lake/Wabash Watershed Alliance since 2013.

Abstract: Water quality issues continue to plague local communities leaving everyone on the lookout for a practice or additive that could help solve the problems. At Grand Lake St. Marys, we've gone through our fair share of snake oil salesmen who promised silver bullets to fix our water quality problems in the "Mini Lake Erie." These silver bullets have included geotubes for shore stabilization and manure dewatering, Airy Gators, anaerobic digesters, sediment collectors, nutrient reducing farm practices, nutrient binding, rough fish removal, floating wetlands, treatment trains, grant programs, cost-share endeavors, dredging, and so much more! Join Grand Lake/Wabash Watershed Coordinator Abbey Tobe as she compares the process of crafting real silver bullets to the process of implementing the "silver bullets" addressing water quality issues plaguing Ohio's watercourses. Given from the perspective of a fledgling in the water world, this presentation discusses how to transform a box of materials with no recipe for success (i.e. the Watershed Action Plan) into a functional plan to implement the shrapnel that we consider silver bullets. The Lone Ranger and the Werewolf Hunters had a sure-fire method of producing silver bullets, but translating this process into water quality solutions is anything but easy.

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Tuesday, November 17, 2015

Concurrent 3 - Collaboration & Decision Making

10:15 am – 11:45 am

Title: *Decision Making for the Hoover Dam and Reservoir Using Weather Forecasting*

Biography: Eric Onderak is a project manager with AECOM in Columbus. He has worked for AECOM for over 10 years and specializes in all aspects of hydraulic modeling, ranging from collection systems to rivers. He is a professional engineer licensed in Ohio.

Abstract: : The City of Columbus, Division of Water (DOW) operates and maintains the Hoover Dam and Reservoir, located near Westerville, OH. The dam provides a long-term supply of raw water for the Hap Cremean Water Plant. It was constructed in the early 1950s and is equipped with level-control gates; the reservoir receives water supply from the Big Walnut Creek watershed. Over the decades both prior to and since construction, certain areas downstream have experienced varying degrees of flooding. The occurrences have led some in the public to perceive that the Hoover Dam can and should be operated in a manner to mitigate the frequency and extent of downstream flooding. DOW contracted AECOM for a third party independent review of its current standard operating procedure (SOP) for operation of the Hoover Dam in regard to gate level controls in both prior to and during weather events. While the DOW was confident in the general appropriateness of the SOP in regards to spillway operations; they wished to validate the exiting SOP while maximizing use of available data to

better anticipate and characterize events with potential to cause flooding. Using PC-SWMM software, AECOM developed a hydrologic model of the Big Walnut Creek spanning from Sunbury to Gahanna and including the Hoover Dam and Reservoir. The model incorporated wide ranging impacts such as snow melt considerations, groundwater fluctuations, and extreme rainfall scenarios. In coordination with the National Weather Service (NWS), AECOM formulated a Gate Operation Guidance Tool based on results from the calibrated model. The tool is recommended to be used in conjunction with NWS ensemble forecasts and real-time rain gauges in the Hoover Reservoir basin in order to evaluate potential scenarios both prior to and during an event. The project is expected to successfully aide DOW in decision making during future extreme weather events.

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Title: *Role of Collaborative Processes in Adoption of Agricultural Best Management Practices- Insights from a field experiment*

Biography Pranay Ranjan is a fourth year doctoral candidate in the school of environment & natural resources at The Ohio State University.

Abstract: Involvement of stakeholders in knowledge creation is a topic that has been examined by literature on collaborative environmental planning as well as civic science. Literature on collaborative planning highlights the benefit associated with stakeholder engagement, as it leads to a greater buy-in for implementation and a higher quality plan drawing on more sources of information Literature on civic science also promotes engagement of stakeholders in the scientific enterprise of identification of research questions and variables, as a way of making science more relevant for real-world problem solving. However, there is little empirical evidence to measure the degree to which such civic science and collaborative approaches actually improve adoption and implementation of agricultural best management practices (Ag. BMPs). Both the approaches argue that stakeholder participation improves adoption. However, is increased adoption due to the product being better or is it due to the collaborative process? Based on the literature gap identified above, in this study we isolate the effect of collaborative process on stakeholder adoption of two-stage drainage ditches, a scientifically identified Ag. BMP. This practice has been shown to reduce nutrient runoff, yet its adoption by farmers is uncertain. Specifically, our goal is to find out whether it is the collaborative process that yields a higher stakeholder adoption or it is just because the product, i.e. the BMP, is better. The data for this study is collected via organizing stakeholder meeting across 3 different counties in Ohio, data has been collected using pre and post-test survey methodology. Results are more broadly informative about the role of collaboration in adoption of Ag. BMPs, and is relevant for both academicians and practitioners.

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Title*:* *Adopt Your Waterway*

Biography: Zuzana Bohrerova (PI, OSU) is the Associate director of the Ohio Water Resources Center (Ohio WRC). She is trained in soil ecology, environmental engineering and public health. She is in charge of the Ohio WRC education and outreach activities

Abstract: Through a partnership with local groups, we focus on increasing citizens' knowledge and awareness of the three aspects of water quality; physical, chemical and biological in their neighborhood streams and enhance social capital and environmental stewardship in the lower Olentangy River watershed. Supporting individual volunteers by trained experts we envision long term stewardship and monitoring of small neighborhood streams, and inspiring grass roots interest in water quality. We will have summer and fall water quality data – chemical and macroinvertebrates – for four Olentangy River tributaries and will present the progress of this project and the pros and cons of the selected approach.

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Tuesday, November 17, 2015

Concurrent 1 - Mineral Resource Management

1:30 pm - 3:00 pm

Title: *Coal Mine Permitting- Water Issues and Water Protection*

Biography: Mike Dillman is a Geologist 4 at the Ohio Department of Natural Resources, Division of Mineral Resources Management (DMRM). Mike has been with DMRM for almost 30 years, working chiefly in the coal permitting section on water-related issues. Mr. Dillman has an MS in Geology from the Ohio State University; BS in Geology from the University of Dayton.

Abstract: The coal mine permitting process involves a multitude of layers in an application process designed in part to protect and/or restore water resources associated with mining areas. These layers include, but are not limited to, baseline data collection, site reviews, data analysis, formulation of hydrologic reclamation plans, detailed impact analyses, plan revisions, mining prohibitions, water monitoring, water supply replacement, coordination and consultation with other governmental agencies, and solicitation of public and landowner comment and input. The presentation will provide information related to these protective components of the permitting process.

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Title: *Regional Watershed Services: A New Model for Watershed Management*

Biography: Marissa Lautzenheiser, Rural Action

Abstract: Three regional watershed assistance areas have been developed around Ohio with funding support from OEPA's 319 program. With each headed by a lead agency, this program will expand and

grow the watershed management tools available to the communities and residents they serve. This will allow high-performing watershed organizations to partner with stakeholders and implementers to leverage more investments in watershed-improving programs and projects.

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Tuesday, November 17, 2015
Concurrent 2 - Ohio Lake Management Society - Monitoring
1:30 pm – 3:00 pm

Title: *Remote Sensing Survey of Cyanobacteria Blooms in Ohio Lakes*

Biography: Tyler Gorham is a doctoral student at The Ohio State University College of Public Health. Working with Dr. Jiyoung Lee. His current research investigates water quality and health in Far North, Cameroon and the impact of cyanobacteria harmful algal blooms on Ohio's inland lakes.

Abstract: Cyanobacteria harmful algal blooms are one of the most significant water contamination problems of our time; impacting water used for drinking, recreation, and agriculture across the globe. The blooms deteriorate water quality and affect human and ecological health through production of cyanotoxins. In Ohio, microcystin levels are monitored with an ELISA method during bloom seasons in three main categories of locations: Lake Erie, inland lakes used for drinking water supply, and state park beaches. In this study, satellite remote sensing was used in the estimation of phycocyanin, which has shown a significant correlation with microcystin levels in Ohio lakes. The Medium Resolution Imaging Spectrometer onboard the European Space Agency's Environmental Satellite was used to retrieve images for August and September (the peak of algal bloom season) from 2002-2010. After applying the Case-2 Regional processor within the Basic ERS & Envisat (A)ATSR and MERIS (BEAM) VISAT toolbox, we used a nested semi-empirical model to estimate phycocyanin concentrations. We then used a maximum value composite technique to create a cloud-free image with full coverage across Ohio to investigate inland lakes impacted by cyanobacteria blooms. Preliminary evidence 56 Ohio inland lakes impacted by high levels of cyanobacteria blooms using phycocyanin levels above 4.11 μg/L, a threshold that represents the potential for cyanonacteria cell concentrations above World Health Organization guidelines for recreational water quality. Only 29% (16/56) of the impacted lakes have any reported cyanotoxin data from the Ohio EPA (http://epa.ohio.gov/ddagw/HAB.aspx) suggesting the potential for human exposure to cyanotoxins in lakes that are not currently monitored. This satellite remote sensing approach is useful for monitoring water bodies used for recreation and other purposes that can affect human and animal health across Ohio, which were unmonitored by a conventional method.

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Title: *Use of Fluomieter to Watch for HABs in the Citizen Lake Awareness and Monitoring*

Biography: Susan James is Operations Coordinator at the Mohican School in the Out-of-Doors, Inc. Susan received a B.S. in Mechanical Engineering from The Ohio State University in 1986 and practiced engineering for 14 years. In the early 2000's, she made a career change to resident outdoor environmental education. As Operations Coordinator, her responsibilities include scheduling of staff and students, teaching environmental topics and outdoor skills to students of all ages, coordination and facilitation of educator professional development workshops, development of curricula, and other administrative tasks. She is a certified in Environmental Education through The Environmental Education Council of Ohio, and her career in environmental education has led to involvement in several citizen science programs, including the Citizen Lake Awareness and Monitoring (CLAM) Program of the Ohio Lake Management Society. In May 2015, Susan assumed the role of field manager of the CLAM program, providing training, oversight and general coordination of the volunteer network and data collection within the CLAM program.

Stephanie Smith- completed her doctoral training at The Ohio State University in the areas of carbon fixation and photosynthetic microbiology in 2002. In 2012 she became the Co-founder and Chief Scientific and Chief Operating Officer of Beagle Bioproducts, Inc. in Columbus, OH. Dr. Smith is the primary architect of Beagle's "HAB Marketplace," which encompasses products and services that help people to monitor and manage harmful algal blooms (HABs). Dr. Smith has also overseen the development of Beagle's technical operations, wherein we collect the blue-green algae in HABs and convert the biomass into products that are used by scientists studying HABs. Dr. Smith is a nationally recognized HAB expert, having presented at numerous conferences, belonging to HAB research consortia, and testifying before Congress regarding the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA) in 2011. Dr. Smith is an active blogger regarding about HABs, and has a personal goal of raising public awareness of HABs so that both public and private funds will be made available to support the development of measures to study, prevent and mitigate HABs.

Abstract: The Citizen Lake Awareness and Monitoring (CLAM) program of The Ohio Lake Management Society is a network of volunteers monitoring lakes throughout Ohio for turbidity, nutrient levels, chlorophyll *a* and harmful algal blooms. "Lakekeepers" monitor lakes owned by The Muskingum Watershed Conservancy District (MWCD), and collect water and chlorophyll a samples for laboratory testing. During the 2015 summer season, the use of an Amisicience Fluoro-Quick dual-channel fluorometer was tested at Pleasant Hill Lake (Ashland/Richland County) to determine the feasibility of larger scale use by volunteers throughout the MWCD system of lakes. Data will be presented demonstrating correlation of laboratory tested chlorophyll *a* and cyanobacteria levels, to measurements

obtained with the fluorometer. Insights to the usefulness and challenges of this technology in the CLAM program will be discussed.

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Title: *Intergenerational Volunteer Groups*

Biography: Emma Grace Matcham is the current Vice President of TerrAqua, an Affiliated Student Organization of WMAO. Having previously served as President and Networking Chair for TerrAqua, she has a unique perspective on student organizations and volunteerism. Emma Grace?s work on intergenerational teams began in 2010 when she volunteered with the Volunteer Income Tax Assistance program through the Internal Revenue Service. Since then she has expanded her volunteer efforts to include social dancing and water quality projects throughout Columbus. After finishing her degree in Forest Ecosystems Management, Emma Grace hopes to study biostatistics in graduate school.

Abstract: TerrAqua is a student organization at Ohio State focusing on water quality and conservation. In spring of 2014, TerrAqua partnered with Hidden Lake EcoGroup in Dublin, OH to moniter their lake for algal blooms. Students and community members completed the CLAM training through OLMS and collect data on lake temperature, clarity, and color. Citizen data collection is very useful and educational, but can be very challenging for college students to participate in because student organizations have fast turnover rates, limited transportation, and challenging schedules. Despite these challenges, college students have enthusiasm and technical skills that benefit volunteer effots. By creating an intergenerational volunteer team, you can overcome the challenges of working with college students and increase community involvement in long term projects. Our intergenerational team benefits from a diversity of talents, knowledge, and resources that neither TerrAqua nor Hidden Lake would have alone. Overall, this has been a very rewarding, educational experience for students and community members alike. By learning from the efforts of TerrAqua and Hidden Lake, you can find new ways to effectively manage volunteer efforts for your projects.

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Tuesday, November 17, 2015
Concurrent 3 - Education & Professional Development
1:30 pm- 3:00 pm

Title: *MS4 Credit and Project WET*

Biography: Dennis Clement is a 1994 Hocking College Graduate with Associates of Applied Sciences in Recreation and Wildlife Management and Interpretative Services. Dennis is currently employed with the Ohio EPA.

John Trujillo has more than 27 years of experience in environmental management. He has managed and coordinated projects including stormwater, water, wastewater, solid waste, permitting, management, design, and construction as well as other environmental projects. Mr. Trujillo has worked in over 16 states and three countries for federal, state, and municipal government, industrial and commercial clients. Mr. Trujillo has a Bachelor of Science Degree in Management.

Abstract: : Project Water Education for Teachers (or Project WET) is a water science curriculum that is both hands-on and interdisciplinary offering 60 plus educational activities correlated to the National Science Standards. Some of the widely used activities have been recently correlated to Ohio's New Learning Standards for Science. City of Newark educators, ranging from grades K-12 use this unique curriculum for both indoor and outdoor activities, on diverse water topics so that those educators can reach children with objective, experiential, science-based water education. The schools receive Stormwater Utility fee credits for having staff attend this training at a rate of 20% of staff per year for the 5 year MS4 permit cycle. This presentation will provide information on how other municipalities and their schools can get involved using Project WET while receiving educational materials and saving money at the same time.

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Title: *Building the Perfect Watershed Leader: A Review of Research and Education Programs from Around the Upper Midwest.*

Biography: Joe Bonnell is Program Director for Watershed Management with the School of Environment and Natural Resources at The Ohio State University

Abstract: Watershed leaders play a critical role in addressing non-point sources (NPS) of pollution. They often have multiple responsibilities, including coordinating watershed planning, education and outreach, building partnerships, directing NPS and stream restoration projects, and leading multi-stakeholder collaboratives and non-profit organizations. This presentation will provide an overview of current research on watershed leadership skills and educational programs aimed at building leadership capacity among watershed groups. Implications for policies and programs affecting Ohio's watershed groups and leaders will be discussed.

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Title: *Recruiting the Next Generation of Drinking and Wastewater Treatment Operators*

Biography: Carolyn Watkins oversees Ohio EPA programs awarding $12 million annually in grants for environmental education; an environmental science and engineering scholarship program; and clean diesel projects.

Abstract: Efforts to introduce Ohio middle and high school students to these careers received a big boost recently when the career pathway to a water treatment plant operator was designated an "Ohio In-Demand Job" and posted on the Ohio Means Jobs website. Career pathways show students and their parents what classes to take in grades 7-12 to enter the workforce or pursue two-year technical or four-year baccalaureate degrees in the water career cluster. The Environmental Education Council of Ohio, OSU School of Environment and Natural Resources and Ohio EPA are recruiting Certified Operators willing to volunteer as Environmental Career Ambassadors, to make classroom presentations, host field trips, or provide internship and shadowing opportunities for high school and college students.

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Tuesday, November 17, 2015

Concurrent 1 - Ohio Floodplain Management Association

3:30 pm – 5:00 pm

Title: *Assessing Flood Risk Beyond the Digital Floodplain*

Biography: Bradford Hartley's technical knowledge and experience in FEMA's Risk MAP program comes from a decade of exposure to floodplain mapping. His current responsibilities with the STARR II Joint Venture supports multiple FEMA Regions and program areas on matters ranging from database development, program metrics and standards, community outreach, and quality assurance to Flood Insurance Rate Maps.

His attention to detail leads him tracking the quality of over 137,000 miles of floodplain studies, 2,807 miles of levee alignments regarding levee certification status with owner information, and had lead efforts creating a national dataset tracking Jurisdictional, Tribal, and Special Land Use Authority areas for FEMA and National Flood Insurance Program business needs. He worked closely with FEMA Region V developing a system that looks at a community's quantitative risk to past flood hazards for over 6,000 communities. Mr. Hartley's work experience under Stantec Consulting was creating Digital Flood Insurance Rate Maps during FEMA's Map Modernization Program. He holds a B.A. degree in Urban Regional Systems and a Business minor from The Ohio State University.

Abstract: How can communities assess their flood risk? Typically, it starts by obtaining a FEMA Flood Insurance Rate Map but advancements in technology and data provide many new resources. Most of this is contributed to the widespread availability of public data and GIS

processes. Communities that leverage a "GIS Toolbox" can have a greater understanding of their own flood risk in a holistic approach to floodplain management.
Understanding the potential flood risk is the first step in mitigating the risk. The ability to determine the depth of flooding over roads and to structures, performing FEMA HAZUS level 1 and 2 analysis, identifying critical facilities within flood hazards, site selection for emergency operations, and determining project cost benefits are critical in evaluating and mitigating flood risk.

This presentation will explore geospatial resources beyond the Flood Insurance Rate Map. Let us demonstrate and discuss enhanced GIS tools that take publically available Federal, State and local datasets aggregated to assess flood risk. This can ensure communities remain proactive and resilient into the future.

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Title: *Flood Protection System Asset Management*

Biography: Peter Soltys PE, PH is a senior project manager with Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) in their Cincinnati office. Peter has over 37 years of experience in water resources engineering specializing in surface water hydraulics and watershed hydrology. His experience encompasses a wide range of projects including:

- Flood analysis, floodplain management, flood protection design and flood protection asset management
- Levee analysis and certification
- Storm water drainage analysis and design
- Earth dam engineering including design, permitting, and development of dam failure emergency action plans and operations, maintenance, and inspection manuals
- Hydrologic/hydraulic analysis and modeling; and
- Hydroelectric project licensing

Peter has a Bachelor's Degree in Civil Engineering from the Pennsylvania State University, a Master's Degree in Civil Engineering from the University of Pittsburgh, and a Master's Degree in Geology from the University of Cincinnati. He is a licensed Professional Engineer in Ohio, Indiana, Kentucky, and Michigan and a licensed Professional Hydrologist with the American Institute of Hydrology.

Peter has been a two-time president of the Water Management Association of Ohio; the president of the Cincinnati Section, American Society of Civil Engineers; and president of the Cincinnati Post, Society of American Military Engineers. He was also a founding member and first chairman of the Ohio Dam Safety Organization.

Abstract: : Flood protection systems can consist of a variety of assets including structures and backflow prevention devices such as floodwalls, retaining walls, levees, dikes, flap gates, bolt-

down manhole lids, valves and gates, scour protection, diversions, and pump stations. The responsibility for the maintenance, repair/ rehabilitation, or replacement of these assets as well as their operations often falls upon persons working for municipal departments of public works or utilities, conservancy districts, and flood control districts. The variety of asset types and their different design and operational lives can be difficult to assess for long-term maintenance and capital improvement budgets.
This presentation focuses on the steps that comprise an asset management plan for flood protection systems administered through municipal public works and utility departments and conservancy and flood control districts. The course includes all aspects of a complete asset management program including:

- Goals and objectives
- Asset management plan components
- Identification of flood protection assets
- Asset condition inventories and condition assessments
- Asset inspection
- Asset residual life evaluation
- Level of service determination
- Asset criticality including redundancy, probability of failure, consequence of failure, and business risk exposure
- Asset renewal strategies
- Asset maintenance strategies
- Evaluating decision variables
- Evaluating maintenance, repair/rehabilitation, and replacement costs
- Presenting and using the flood protection system asset management plan

This presentation looks at flood protection system asset management and how it can be integrated into a comprehensive program that will allow a community, conservancy district, or flood control district, to get a better handle on future expenditures and evaluate potential cash flow that will aid in assessing the adequacy of their existing maintenance and capital improvement budgets.

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Title: *An Overview of the USGS Streamgaging Program*

Biography: Thomas Harris is with the U.S. Geological Survey in Columbus, Ohio, where he is currently serving as the Data Chief of the Michigan-Ohio Water Science Center. He started with the U.S. Geological Survey

Abstract: Streamflow gages are critical for flood prediction, flood frequency, low-flow characteristics, engineering design, recreational interests, and water management. The U.S. Geological Survey (USGS) operates and maintains approximately 8,380 streamflow gages nationwide. In Ohio, the USGS, in cooperation with over 50 Federal, state and local agencies, maintains about 200 streamflow gages and 23 lake gages. A typical streamflow gage setup

consists of a unit to maintain pressure through an orifice line, a pressure sensor, data collection platform, battery, solar panel and antenna. Some newer river gages employ noncontact radar-based stage sensors. River stage typically is measured and recorded at intervals ranging from 15 to 60 minutes and recorded data are telemetered to USGS offices every hour. Streamflow values that are displayed on the Internet are determined from river stage by the use of stage-discharge relations commonly referred to as rating curves. Rating curves are constructed and maintained based on periodic streamflow measurements and concurrent observations of stage. Streamflows primarily are measured using acoustic Doppler current profilers (ADCPs), however there still are times when measurements are made using the traditional Price AA meter.

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Tuesday, November 17, 2015

Concurrent 2 - Ohio Lake Management Society- Lake Erie

3:30 pm – 5:00 pm

Title: *Glyphosate-driven Dissolved Phosphorus Loading in the Maumee River*

Biography: Christopher Spiese is an Assistant Professor of chemistry at Ohio Northern University. His previous research has focused on marine sulfur cycling and human waste markers in tile drainage.

Abstract: The western Lake Erie basin has been experiencing increased SRP loads over the last ~20 years. The underlying causes are at best poorly defined and poorly understood. Because of the tight coupling of the land to the Lake, changing agricultural practices are almost certain to have a measurable effect on SRP loads in the tributaries and thus the Lake itself. These practices include some of the BMPs such as no-till agriculture and cover crops. With no-till practices, however, comes the need for alternative weed control, often in the form of glyphosate. Glyphosate is a phosphorus-containing amino acid derivative that is used widely for weed control in no-till farming. As a phosphonate, glyphosate is known to bind strongly to metal cations, as well as to soil surfaces. Previous studies have found that while phosphate binds more strongly, glyphosate is able to displace phosphate from various mineral surfaces to varying degrees. Using native soils in the Maumee River watershed, we demonstrate the capacity for glyphosate to displace sufficient SRP to account for approximately 75% of the observed increase. The underlying physical chemistry is also explored, pointing to a significant role for application of glyphosate in autumn as a potential exacerbating factor.

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Title*: Reducing Nutrient Flows to Lake Erie to Address Harmful Algal Blooms (HABs):*

Lessons from Policy Approaches Used in Other States

Biography: John Hoornbeek is an Associate Professor of Health Policy and Management at Kent State University, where he also serves as director of its Center for Public Policy and Health.

Abstract: Harmful algal blooms (HABs) are receiving increasing attention in Ohio in recent years due to the detection of microcystin contamination in the City of Toledo's water supply in 2014 and the identification of a massive HAB in Lake Erie in 2011. These events have made clear the need to reduce nutrient flows to Lake Erie. While Ohio currently seeks to reduce nutrient flows to Lake Erie through effluent limits in point source water pollution permits and through efforts to improve agricultural and other land management practices, recent events have made it clear that these efforts have not yet been sufficient to address the problem. This presentation will offer ideas on ways to reduce nutrient flows to Lake Erie to address the HAB problem. It will report preliminary results from a project we have underway to identify nutrient reduction efforts undertaken by the Chesapeake Bay Program and other watershed basin programs in other American states and regions. In so doing, we seek to improve our understanding of nutrient reduction policy tools that are being used elsewhere in the country, and to offer ideas for improving nutrient control policies Ohio. If accepted, our presentation would focus on sharing initial results from our project. It's three main purposes would be to: 1) provide an overview of Ohio's current suite of nutrient control policies; 2) highlight innovative policies and programs being implemented to reduce nutrient pollution in other states, and; 3) offer suggestions on how Ohio's nutrient control policies can be improved, based on lessons learned from nutrient control policies in other parts of the United States (US). Our project is supported by the United States Geological Survey (USGS) through the Ohio Water Resources Center at The Ohio State University.

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Title: *Wavelet Analysis to Characterize the Phosphorus Loading in the Western Lake Erie Basin*

Biography: Suresh Sharma is an Assistant Professor, Civil/Environmental and Chemical Engineering Program, Youngstown State University.

Abstract: The Lake Erie, a part of the Great Lakes, has a long history of eutrophication and algal bloom due to high nutrient concentration. The best management practices (BMPs) has been extensively adopted and intense monitoring is underway to meet the target load of total phosphorus and control the trophic status of the lake. However, the total dissolved phosphorus has been still increasing since early 1990s. Therefore, the characterization of phosphorus loading in terms of temporal and spatial pattern is essential to continue monitoring the excessive phosphorus in the future from the western Lake Erie Basin. For this, wavelet analysis has been conducted using the long term stream flow data, the total phosphorus loads and the total dissolved phosphorus of six stations of the Lake Erie site of Northern Ohio, which includes Cuyahoga, Grand, Maumee, Vermilion, Raisin and Sandusky Rivers. The long term continuous phosphorus loadings recorded and monitored in these stations since 1970, are utilized for the analysis. Our analysis indicates some similarities in the temporal patterns of phosphorus

loading from various stations. The streamflow and phosphorus loading pattern with Oceanic and Atmospheric Indices including El Niño Southern Oscillation (ENSO), North Atlantic Oscillation (NAO), and Pacific Decadal Oscillation (PDO) will be studied. In addition, the cross wavelet and wavelet coherence analysis will be conducted and the trend of climate indices with the phosphorus loading will be reported. The study will be helpful to effectively monitor the phosphorus loading from the western basin in future.

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Tuesday, November 17, 2015
Concurrent 3 - Monitoring & Assessment
3:30 pm – 5:00pm

Title: *Expanded U.S. Geological Survey Streamgage and Water-quality Network in the Western Lake Erie Basin*

Biography: Kimberly Shaffer has a degree in Civil Engineering from the Ohio State University and has worked for the U.S. Geological Survey for the past 18 years. As a hydrologist, she has collected and published streamflow, water-quality, and water-use data. Kimberly has published over 9 reports and fact sheets. She is the outreach coordinator, water-use specialist, and water-quality monitor project leader for the Ohio Water Science Center.

Abstract: Nitrogen and phosphorus are a concern in the Western Lake Erie Basin watersheds. Large inputs of nitrogen and phosphorus compounds into a stream or lake can cause excessive algal growth and taste and odor problems in water supplies. When algae die, dissolved oxygen concentrations are depleted, and can stress aquatic organisms. The U.S. Geological Survey in cooperation with Ohio Department of Natural Resources and Ohio Environmental Protection Agency has expanded the streamgage and water-quality network by adding 18 streamgages and nine water-quality stations. Water quality samples are collected using equal-width increment sampling (cross-section sampling across the entire width of the river) and automatic samplers. Equal-width increment samples are collected monthly to determine if the automatic sampler is collecting a representative sample of all the water in the river. Automatic sampler samples are collected on the rise and fall of the stream as well as during baseline conditions. The combined approach of collecting equal-width-increment samples and automatic sampler samples helps define the relationship between the mean concentrations in the stream and concentrations obtained in samples from the automatic sampler and changes in water quality during rainfall-runoff events. Nitrogen and phosphorus sample concentration data is available on the National Water Information System Web (http://waterdata.usgs.gov/oh/nwis/qw). Daily, monthly, and seasonal loads are computed

using the Graphical Constituent Loading Analysis System computer program. This presentation will review water-quality sampling concentration results from 2014 and 2015 and loading results from 2014

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Title: *High-frequency and Long-term Tributary Water quality monitoring to detect change, identify problems, and quantify success from the land to Lake Erie*

Biography: Laura Johnson is a research scientist at the National Center for Water Quality Research at Heidelberg University where she works on watershed sediment and nutrient export. Prior to joining the NCWQR in 2013, Laura received her Ph.D. from the University of Notre Dame in 2008 and was a postdoc at Indiana University in Bloomington. Aside from working with the long-term Heidelberg dataset, her recent research also focuses on examining the influence of 4R nutrient management on nutrient export, measuring variation in nutrient export at the subwatershed scale, and contributing to the seasonal HAB forecast for western Lake Erie.

Abstract: The National Center for Water Quality Research has been monitoring major tributaries to Lake Erie for up to 40 years as a part of its Heidelberg Tributary Loading Program (HTLP). A minimum of one sample and, during storm runoff, up to three samples a day are analyzed for all major nutrients and suspended sediments from five major tributaries to Lake Erie (Maumee, Sandusky Portage, Raisin and Cuyahoga). Long-term trends in loads and concentrations indicate that total phosphorus (TP) has decreased since the mid-1970s in the agricultural watersheds, whereas dissolved reactive P (DRP) has been increasing drastically since the mid-1990s corresponding to the recurrence of harmful algal blooms (HABs) in Lake Erie. Thus, increased DRP and HABs appear to be associated with recent patterns in agriculture such as surface broadcasting of fertilizers, build-up of P at the soil surface, excessive fertilizer application, increased soil compaction from large equipment, and increased tile drainage intensity. Nitrate-N loads and concentrations from these agricultural rivers have declined steadily since early 2000s, likely associated with increased nitrogen use efficiency of crops. High frequency water quality monitoring has allowed us to detect practices such as fertilizer application on frozen ground, changes in nutrient export by seasons, and loss of fertilizer applied shortly before precipitation. HTLP monitoring has also helped discern surface runoff versus tile drain delivery of nutrients, as well as point versus nonpoint sources of pollutants. This monitoring protocol has been immensely useful in detecting causes for reeutrophication of Lake Erie, setting new Lake Erie phosphorus target loads, and determining seasonal forecasts for western Lake Erie HABs. By continuing to monitor tributaries to Lake Erie, inland lakes, and the Ohio River, we should be able to adaptively manage our watersheds to ensure future conservation efforts and those already underway are successful.

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Title: *Ohio's Stream Nutrient Assessment Procedure (SNAP)*

Biography: Robert Miltner is an environmental scientist at Ohio EPA where he provides empirically-based technical support for environmental management by analyzing how environmental stressors are related to biological conditions in surface waters. His identification of biological thresholds over a gradient of urbanization have served as an impetus for storm water and development codes adopted by many states and municipalities, and his research linking nutrient concentrations to biological conditions in running waters is the basis for his presentation today.

Abstract: *Nutrient pollution is a leading cause of water quality impairment, yet water quality standards for phosphorus and some forms of nitrogen are lacking. The reason for this mismatch, especially with respect to phosphorus, is because nutrients are not directly toxic to aquatic life, and water quality standards have historically been predicated on well-defined, dose-response relationships identified in toxicity tests. The last two decades have yielded a collective body of work that effectively describes the relationships between nutrients, enrichment, and biological condition in running waters such that numeric endpoints can be identified for use in management. However, unlike a criterion derived from toxicity endpoints wherein the risk to aquatic life from exceeding the criterion value is fairly certain, the risk to aquatic life from exceeding a numeric endpoint for nutrients is far less certain. The uncertainty surrounding nutrient endpoints has a significant consequence for application in a water quality standard; specifically, additional information from a waterbody must be gathered and applied as weight-of-evidence to assess risk and inform management. The Stream Nutrient Assessment Procedure (SNAP) is being proposed to help manage nutrient pollution in Ohio streams. The SNAP is a novel approach to a water quality standard in that it combines information from water quality indicators and biological assessments to position a waterbody along a continuum of enrichment. The SNAP also includes a decision framework for identifying appropriate management actions based on where a given waterbody is positioned along the enrichment continuum. A brief summary of the technical basis for the SNAP is presented, followed by a more detailed walk-through of how water quality and biological data are combined in the SNAP, along with an overview of the decision framework*

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Tuesday, November 17, 2015

Poster Session
5:00 pm – 6:00 pm

Title: *Understanding membrane biofouling: pH effects on fouling layer composition*

Presenter: Rosi Anton, Ohio State University

Abstract: Biofouling has proven to be a primary challenge for membrane filtration. Biofouling occurs when microbes secrete proteins and polysaccharides known as extracellular polymeric sumbstances (EPS). EPS impede the flow of treated water through membrane pores, resulting in increased pressure demands and operation costs. Importantly, EPS with a low protein to polysaccharide ratio adhere more strongly to membrane surfaces. However, the effects of pH on adherence have not been investigated over a broad pH range. This study investigates how pH affects the protein to polysaccharide ratios of fouling layers that have been cleaned with ultrasound. This is significant because ceramic membrane technology now allows for filtration at previously unfeasible pH levels, and it is unknown how these pH values will affect the removal of EPS proteins and polysaccharides. In this study, EPS were extracted from the final clarifier of Jackson Pike Wastewater Treatment Plant. EPS were characterized through gravimetric analysis, protein assays, and polysaccharide assays. 0.2 micron Anodisc ceramic membranes were fouled using 16.0 mL of 67 mg/L EPS solution at a pressure of 25 bar. During each filtration, flux measurements were taken. Membranes were then placed in an ultrasound reactor, and underwent either timed sonication or no sonication. The pH was kept constant at a value of 3.5, 6.9, or 9.5 during filtration and sonication. Fluorescent protein and polysaccharide stains were applied to the membrane surfaces. Confocal laser scanning microscopy, in conjunction with MATLAB image analysis, compared protein to polysaccharide ratios for each membrane. It was shown that EPS solutions filtered at an average rate of 61 mg/(L*min) at pH 3.5, more than twice the rate observed at pH 6.9 and pH 9.5. If permeate quality is not shown to be impaired, this result suggests that low pH filtration could be very effective .The collection of imaging data is ongoing.

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Title: *Quantifying the influences of chronic Phosphorus loading on algal bloom variability in Lake Erie's Western Basin*

Presenter: Anna Apostel, Ohio State University

Abstract: The reappearance of algal blooms in Lake Erie, despite negligible changes in Phosphorus (P) loading, has called for a broader understanding of the governing processes of blooms in the region. Studies on the causes of the blooms have focused around large acute loading events associated with large spring runoff events. Recent studies have pointed to the potential role of the 'internal' reservoir, a coexisting supply of P from sources such as groundwater leaching and in-stream nutrient cycling , pointing to the potential influence of chronic P loading. The monitoring of non-point source pollutants has been generally controlled by the implementation of a Total Maximum Daily Load (TMDL), a regulation established under the clean water act. While the use of TMDLs has provided a clear metric for input regulation in

water quality, TMDLs underrepresent the impact of chronic loading of nutrients and other nonpoint source pollutants. In order to identify whether the chronic loading of P is an important component in the reemergence of algal blooms in Lake Erie's Western Basin, we used the USGS method for base flow separation of discharge for the separation of chronic and acute P loading. Through separating these P sources, we were able correlate chronic and acute loading with remote sensing data of chlorophyll a from the Aqua satellite as a proxy for bloom intensity. This study results in a better understanding of the influences of chronic and acute loading influences on bloom intensity as well as potential implications on the current structure of P monitoring in the region.

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Title: *Impact of High Salt Content in High Strength Wastewater Treatment*

Presenter: Feng Chen, Ohio State University

Abstract: Cured meat processing results in wastewater high in BOD5, FOG and salt. This wastewater is difficult to treat in conventional wastewater treatment plants. The objective of this study was to determine the impact of salt on the treatment of wastewater in a sand bioreactor system. In a laboratory study turkey processing wastewater was treated in duplicate, bench-scale bioreactors constructed with layers of sand and gravel. Salt (NaCl) was added to the wastewater for two treatments, 3000 mg/l and 6000 mg/l, and a low salt reference (no salt addition) was included for a total of 6 bioreactors. BOD5 removal was over 95% in all bioreactors. Initially, ammonia removal, while over ___% removal in the low-salt control, was only 20% at 6000 mg/l. However, the high salt concentration exerted selection pressure on the microbes in the bioreactors and by day 17 no significant difference in ammonia removal was found between the treatments. All bioreactors achieved over 99% ammonia removal. Treatment of high-salt content meat processing wastewater in sand bioreactor systems appears feasible.

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Title: *Physical and anthropogenic controls on nutrient concentrations across a mixed-use headwater catchment in North-Central Ohio*

Presenter: Dr. Ozeas Costa, Jr., The Ohio State University

Abstract: Streams and rivers are among the most important providers of goods and services (water for human use; habitat for economically-important species; regulation of flooding and soil erosion; recycling of pollutants; water quality control). Nutrient contamination of surface waters is a major concern worldwide. Nutrients (nitrogen and phosphorus) support the growth of algae and aquatic plants. In excess, they cause algae overgrowth, harming water quality, food resources, and habitats. Results from

this project will improve our understanding of the relationship between land use, stream discharge, and nutrient concentrations in the Mohican River Watershed, a mixed-use catchment in north-central Ohio. Historical precipitation data from NOAA's National Climatic Data Center was combined with nutrient analysis of stream water to evaluate the effects of discharge on nutrient transport. A GIS-based landscape model was used to examine relationships between streams and watersheds. Land use data from NLCD was used to select representative reach-catchment areas in one of four categories: forested, developed, cropland, and pasture. Nutrient concentrations were used for calculation of nutrient fluxes within the watershed. Sampling was undertaken during both baseflow and stormflow conditions. Results show that nutrient fluxes are highly controlled by land use and by precipitation events. In addition, there is a marked shift between local and external controls on biogeochemical processes under baseflow and stormflow conditions. During stormflow, nutrient input is primarily hydrologically controlled but during baseflow, biological processes dominate both the production and removal of nutrient ions from the stream. This short-term hydrological variability have a significant impact on the storage of nutrients in the study streams and on the amount of nutrients exported from the watershed to the Ohio River and the Gulf of Mexico. With Ohio becoming wetter, as a result of climate change, we should expect an increase in the supply of nutrients from similar headwater watersheds.

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Title: *Ohio Nutrient Water Quality Standards*

Presenter: Dan Dudley, Ohio EPA

Abstract: Developing nutrient loss reduction targets for Ohio's surface waters requires a two pronged approach; one to assess and manage nutrient impacts on flowing water and a second to address impacts occurring downstream. Ohio EPA and a Technical Advisory Group developed a Stream Nutrient Assessment Procedure (SNAP) to manage nutrient pollution in Ohio streams. A companion presentation made at this conference summarizes the technical basis for the SNAP and provides an overview of the framework for management and regulatory decision making. SNAP can effectively manage the near field impact of nutrient pollution on flowing water systems but is not designed to protect downstream locations. A second approach is under development to address the problem of nutrients transported during peak runoff events to lakes, reservoirs and Lake Erie. Ohio EPA is drafting nutrient water quality criteria for inland lakes and reservoirs. This suite of new criteria includes concentration values for total phosphorus, total nitrogen, and chlorophyll and secchi depth. The criteria would become the basis for placing an inland lake on the list of impaired waters and then calculating TMDLs based on the in-lake values. In 2013 Ohio's Lake Erie Phosphorus Task Force developed a report calling for a 40% reduction in TP and DIN loads to Lake Erie. More recently revised bi-national loading targets for Lake Erie are being finalized under the auspices of the Great Lake's Water Quality Agreement and those targets will require a similar degree of reduction. Once bi-national targets are finalized regulatory agencies throughout the Lake Erie basin will need to develop implementation plans to achieve revised Lake Erie loading targets. Ohio EPA will layer this analysis on top of watershed assessments using SNAP. This poster describes the two pronged strategy and will highlight some immediate steps Ohio has taken to reduce nutrient loads.

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Title: *Evaluating Oil Dispersant Systems via Emulsion Stability and Optical Microscopy*

Presenter: William Fagan, Ohio State University

Abstract: Though chemical dispersants are employed to minimize the deleterious effects of oil spills, their diverse composition of organic solvents, surfactants, and additives may bestow further detrimental effects on marine environments. This study is part of a larger effort to engineer a novel dispersant that replaces surfactant molecules with mineral particles, thus allowing surfactants and particles to work in tandem to optimize oil slick degradation and emulsion stabilization efficacy. By homogenizing various combinations of synthetic clay particles, surfactants, and salt, emulsion stabilization of oil-water mixtures was tested by employing two different Laponite preparation methods: the Dispersed Particle Method (DPM) and the Powdered Particle Method (PPM). Several conditions were tested such as mixing time, homogenization speed, clay concentration, salt concentration, and water-to-oil ratio. Optical microscopy was also employed to determine the size distribution of the stabilized oil droplets. The PPM resulted in more stable emulsions for both the clay-only system, and clay/NaCl system. However, the PPM didn't perform as expected when AOT surfactant is utilized. This research sets the stage for future emulsion stabilization work involving clays and surfactants.

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Title: *Effects of Ohio's Winter Conditions on Survival and Growth of Invasive Fish Species of Asian Carp*

Presenter: Kevin Fisher, Ohio State University

Abstract: Bighead carp, Hypophythalmichthys nobilis, are an invasive species of carp present in the Illinois and Ohio Rivers possibly threatening the native fish populations in the Great Lakes. A gap in scientific data exists about survival of young of year Asian carp in Great Lakes winter weather conditions. Therefore, present experiment examines the survival of juvenile bighead and koi carp of different sizes subjected to winter water temperatures in Lake Erie. Knowing the lower thermal threshold of juvenile bighead carp will tell us if this species is able to survive and grow in the Great Lakes in winter. The experiment was set up in six fiberglass tanks, three tanks simulating fed or fasted conditions, in triplicate. Fifteen of each of three categories of juvenile fish, small koi carp (0.18g), large koi carp (0.49g), small bighead carp (0.22g), and large bighead carp (1.89g) were randomly distributed to each tank. Data show that small koi carp experience lethal conditions to 50% (LC50) of the stock in fasted conditions at temperatures approaching

8°C in 47 days, while large koi experienced LC50 closer to 6°C at 64 days. Small bighead carp in fasted conditions experience LC50 at 108 days surviving temperatures approaching 4°C. Large bighead juveniles in both fasted and fed treatments experienced almost no mortality throughout the 130 day experiment. Lipid concentrations in fish body indicate a minimum threshold level for lipids in both carp species for survival signaling a switch from lipid to protein mobilization as a source of energy. Small koi exhibited a minimum lipid threshold of 2.2 ± 0.1% body weight (BW). Small bighead carp total lipid threshold is even lower at 1.8 ± 0.1% BW. Data indicate that bighead carp must be larger than 0.22g in order to survive the winter fasting season In Ohio.

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Title: *Sustainable Design for Efficient Water Supply in Buildings*

Presenter: Toritseju Omaghomi, University of Cincinnati

Abstract: In the US and around the globe, today's peak water demands in buildings are estimated based on a curve from the classic works of Roy Hunter. Hunter's curve is a theoretically rigorous and graphically convenient approach designed to estimate the 99th percentile of water demands in public facilities. However, experience has shown that Hunter's curve overestimates peak water demand for contemporary buildings. Hunter's underlying assumption is congested use (constant demand) of fixtures during periods of peak demand. Over estimation of water demand result in oversized pipes, which increases construction cost, poses health hazards from water stagnation in pipes and encourages excess water/energy consumption in hot water supply. There is a need to update the current design methods and replace the 1940 Hunter's curve with a system that incorporate conditions reflecting tomorrow's water usage pattern by end users (e.g., commercial, institutional, residential, etc.). The updated design should be flexible, benefit a broad range of end users and address the aforementioned issues from over estimating peak water demands. This research aims at improving the methods of estimating water demands in buildings. It involves a probability model that utilizes the Monte Carlo simulation to develop a cumulative distribution of water demand for possible water use scenarios in a building. The expected number of simultaneously busy fixtures and weighted demand flow can be determined, and the peak water demand can be estimated from a dimensionless plot. This peak demand can be used to improve selection of water meters and many other water system features.

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Title: *Timing may be everything: possible constraints on invasion by Daphnia lumholtzi in lakes connected by flooding*

Presenter: Patricia Saunders, Ashland University

Abstract: Sites Lake (SL) is a kettle lake adjacent to Charles Mill Lake (CML), a flood-control reservoir in Richland & Ashland Co. The invasive zooplankton species Daphnia lumholtzi is a strong competitor that can alter plankton communities. It has been observed in early fall samples from CML since 2002. However, despite frequent floods (2.4 yr-1) connecting these two basins, samples from SL have not indicated the presence of D. lumholtzi. SL observations include September 2013 net tows taken when surface water temperatures were at their yearly maximum (ca. 25-27 oC) and conditions were expected to be optimal for D.lumholtzi population growth. AU limnology students have considered alternative hypotheses to explain this apparent non-invasion. The mechanism tested here is that flood events may occur in months when D. lumholtzi are not active in CML. Daily water level data from the CML dam were evaluated to determine the timing and frequency of floods into SL over an 11-year period (2003-2013). A flood was defined as one or more sequential days when water height was >SL surface height (1000 feet/304.8 m). Flooding of SL was most frequent in winter/spring (81% of total floods) and infrequent in fall (4%). Seasonal floods were more likely in periods when precipitation was more intense, but there was also a trend to lower flood elevations during the growing season vs. input. Results support the hypothesis that the timing of floods and lake connectivity is relevant to the likelihood of invasion by D. lumholtzi. However, as these animals still could have been introduced, there remains a need to test other mechanisms that may be discouraging establishment of this large daphnid in SL (e.g. fish predation). Changes in the pattern of water management (e.g. holding back more water more often) or precipitation intensity could facilitate future invasion by this species.

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Title: *Monitoring River Ice Jam and Developing an Ice jam Prediction Model for the Improvement of the Conventional Flood Warning System in the Lake Erie Region*

Presenter: Dr. Suresh Sharma, Youngstown State University

Abstract: Every winter, the coastal cities of the Lake Erie are threatened by winter flooding due to river ice jam conditions. One of such highly affected regions is the city of Painesville, which is inundated almost every year due to Grand River flooding. Therefore, the development of a flood warning system and preparation of a flood inundation maps simulating ice jam condition is needed for the protection of lives and property against flood hazards. Since the Grand River flooding is not only due to ice jam condition, the major objective of this study is to develop an early flood warning system for accurate and timely evacuation of people in the City of Painesville for entire seasons including winter and summer. In addition, the specific objectives of this study are: 1) to develop hydrologic and hydraulic models for use by the National Weather Service (NWS) for flood forecasting, 2) to collect and monitor ice jam data to develop a conceptual model for the improvement of the conventional flood forecasting system, and 3) to update Federal Emergency Management Agency (FEMA) flood inundation maps based on the recent data. As an exploratory research, we will develop flood forecasting in two steps; i) flood forecast by

fuzzy logic model using ice jams, snowfall and rainfall characteristics; ii) modify the conventional hydrologic forecast using the fuzzy logic model. We will develop flood inundation maps based on the different ranges of precipitation corresponding to the various climate modes including the El Niño Southern Oscillation (ENSO), North Atlantic Oscillation (NAO) and Pacific Decadal Oscillation (PDO) information.

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Title: *Integrated Impact of Hydraulic Fracking and Climate Change on Stream Low-Flow of the Muskingum Watershed*

Presenter: Suresh Sharma, Youngstown State University

Abstract: Water resources scientists and community are extremely concerned about the impact of fresh water withdrawal for hydraulic fracking in streamflows availability. The low-flow conditions in those watersheds may be further reduced due to global climate change as it has a potential to reduce the streamflow. As the earlier study found only a modest impact of fracking in water availability due to the current rate of fracking, this study was conducted in order to ascertain whether or not the current fracking trend in future will have impact in stream low-flow. The study was conducted on a Muskingum watershed using the Soil and Water Assessment Tool (SWAT). Three Representative Concentration Pathways (RCP): RCP 2.6; RCP 4.5; and RCP 8.5 for three future periods namely, 2035s (2021-2050), 2055s (2051-2070) and 2085s (2070-2099) were set against the baseline condition (1995-2009). Low-flow and mean-flow were projected to decrease across the watershed during 2021-2050 period under the scenario RCP 8.5. The streamflow was simulated using the current trend of fracking scenario and 2035s climate output. The modest effect on stream low-flow was detected, only when extreme scenario (RCP 8.5) was considered, especially in the head water streams. While 14 subbasins out of 32 were affected with maximum difference up to 55% in 7 days minimum low-flow, negligible impact was detected on mean monthly and annual streamflows. Even though localized effect of hydraulic fracking on environmental flows was detected on the higher order streams with RCP 8.5, the analysis indicated that streamflows would not be affected and water withdrawal for fracking might not have any significant impact in higher order streams under RCP 2.6 and RCP 4.5 scenario.

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Wednesday, November 18, 2015
Concurrent 1 - Agriculture
8:30 am – 10:00 am

Title: Rapid Direct Testing of the Hydraulic Performance of Earthen Manure Impoundments

Biography: Michael A. Olson, P.E. is a founder and president of Abletech Technologies LLC, specializing in environmental and meteorological instrumentation and control systems.

Abstract: : The Michigan Agricultural Environmental Assurance Program (MAEAP) Comprehensive Nutrient Management Plan (CNMP) Committee has recently approved a Standard Procedure for Rapid Direct Testing of Animal Waste Storage Ponds. Emerging technology developed to meet these new requirements provides significant improvement in evaluating the overall performance of ponds that store agricultural and non-agricultural liquid byproducts. Specifically, the system measures water level changes attributed to evaporation and seepage on the order of.0.01 millimeter, allowing for rapid structure performance assessment, usually over a single night. The device provides a reliable method to demonstrate compliance with USDA-NRCS 313 standard (for assessment of manure storage pond liners) within an 8-hour period, minimizing disruption of dairy and swine operations that would be associated with conventional, invasive testing procedures. The system is also useful to assess infiltration of various pond soil liners or in soil matrices at sites under evaluation for installation of low-impact development (LID) best management practices (BMPs), such as bioretention. This presentation will summarize previous research and documentation, highlighting instrument capabilities, end results of field demonstrations, and the MAEAP-approved testing procedure.

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Title: *Ohio Western Lake Erie Basin Initiative*

Biography: Kip Studer is a graduate of Bowling Green State University. He has worked with the ODNR-Division of Forestry, several local Soil & Water Conservation Districts and the IPM Institute of North America. Kip currently is a Nutrient Management Specialist in the Western Lake Erie Basin for the Ohio Department of Natural Resources – Division of Soil & Water Resources. He is a Certified Crop Adviser and Certified Conservation Planner. He currently works on the Great Lakes Restoration Initiative Nutrient Reduction Program grant for four targeted watersheds in the Western Lake Erie Basin.

Abstract: Summary of all the recent projects and best management practices being implemented in the Western Lake Erie Basin of Ohio. Best Management Practices include drainage water management, cover crops, nutrient placement, precision soil testing as well as others

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Title: *Targeting Critical Source Areas or Hotspots: a New Paradigm for NW Ohio*

Biography: Remegio Confesor joined the National Center for Water Quality Research (NCWQR), Heidelberg University as a Research Scientist in 2008. Prior to joining Heidelberg, he was a post-doctoral researcher at Oregon State University in a joint project with USDA-ARS.

Abstract: Previous studies showed that 80% of phosphorus loss comes from 20% of the watershed area. These critical source areas or "hotspots" are characterized by their high vulnerability to nutrient and sediment loss as well as active hydrologic connectivity to streams. Limited funding prevents watershed-wide application of agricultural best management practices (BMPs) needed to reduce nutrient and sediment losses from agricultural lands. Thus, most BMP implementations focus on these "hotspots." A highly detailed Soil and Water Assessment Tool (SWAT) model setup that incorporated 4-year crop rotations and corresponding agricultural management practices for each crop was used to identify hotspots in the Sandusky and Maumee watersheds in northwest Ohio. Simulation results showed that the hotspots are not static but change both temporally and spatially. The planted crop and its associated management practices (e.g., tillage and fertilizer application methods) as well as the weather conditions (i.e., rainfall amount) greatly affect phosphorus exports. The results also indicate that targeting specific areas may not be effective and efficient in significantly reducing nutrient losses. A watershed-wide approach that focuses on cultural and management practices (e.g., 4R principle, conservation/no-tillage) is the most viable strategy in attaining sustainable nutrient export reduction.

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Wednesday, November 18, 2015

Concurrent 2 - Ohio Stormwater Association

8:30 am – 10:00 am

Title: *Green infrastructure modeling based on local land use and design practices toward the development of a community-based, cohesive strategy for stormwater reduction in Toledo, OH*

Biography: Cyndee Gruden is an Associate Professor of Engineering at the University of Toledo.

Abstract: In urban environments, valuable assets are being destroyed due to land development practices and extreme precipitation events attributed to climate change. Driven by watershed

characteristics (e.g., land use, imperviousness), stormwater runoff results in flooding and environmental degradation through the carriage of contaminants to recreational waters and drinking water sources. Given the recent "Do Not Drink" order issued in Toledo, OH, green infrastructure (GI) planning is a priority. To date, regional stormwater stakeholders have implemented GI demonstrations on a small scale in response to targeted opportunities. Large scale and strategic GI planning and implementation are required to realize the desired benefits. This community-based project generates transferable GI design specifications and stormwater data for typical land uses including multi-family housing, commercial sites, vacant properties, and right-of-way projects. GI performance metrics are being generated using EPA's stormwater management model (SWMM), land use data, and local site specifications. GI design, site selection, and project findings are being vetted during monthly meetings of the Green Stormwater Infrastructure (GSI) Task Force recently established by American Rivers, the City of Toledo, and the Toledo-Lucas County Sustainability Commission. The project outcomes are being used directly for the development, communication, and adaptation of a cohesive regional strategy for stormwater reduction.

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Title: *Retrofitting for Water Quality and Water Volume*

Biography: Kurt Keljo works for Franklin Soil and Water Conservation District.

Abstract: As the frequency of major rain events increases, the need to better address stormwater treatment than we have in the past becomes increasingly important and visible. In addition to installing better new stormwater BMPs, making these improvements will require retrofitting existing stormwater features. Funded by a 319 grant from the Ohio EPA, a stormwater treatment wetland was installed in a Columbus park in what had been a dry detention basin. The new wetland dramatically increases water quality treatment and reduces the volume of stormwater leaving the site. This presentation will cover the design of this wetland, data on its impact on stormwater volumes, and a discussion of the challenges facing stormwater retrofitting in urban developments.

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Title: *Optimizing Stormwater Management to Protect Streams from Erosian*

Biography: Dr. Robert Hawley is the Principal Scientist at Sustainable Streams, a company dedicated to stream and watershed science, service, and solutions. He is a licensed Professional Engineer with more than a dozen years of experience, including dozens of publications totaling over 100 citations. He serves as a member of WEF's Stormwater

Committee, an Affiliate of the Civil and Environmental Engineering Department at Colorado State University, and a Part-time Instructor for the Civil Engineering Department at the University of Kentucky.

Abstract: Conventional stormwater management typically does little to protect streams from erosion. Excess erosion of streambeds and banks can destabilize aquatic habitat, contribute to poor biological integrity, and degrade the quality of our water resources. It can also destroy streamside property and impact adjacent infrastructure such as roadways, water/sewer lines, and gas/electric lines. This management paradigm is the definition of unsustainable, with clear social, environmental, and financial losses. However, small changes in how we design our stormwater investments can actually reverse this trend. This presentation will provide an overview of the mechanisms that link stormwater design to geomorphic and ecologic function, including step-by-step guidance on how stormwater BMPs can be optimized to protect streams from excess erosion. This will include several case studies where different BMPs were optimized to achieve simple design targets that protect stream integrity. The case studies will demonstrate that numerous BMPs can be optimized to achieve flood control, water quality, and channel protection, with minimal impacts to overall costs. The approach, recently accepted for publication in the journal Freshwater Science, enables water professionals to change the paradigm in stormwater management such that our investments can become truly protective of both our natural and built environments.

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Wednesday, November 18, 2015

Concurrent 3 - Wastewater

8:30 am – 10:00 am

Title: *Reducing Phosphorus Runoff Risk by Co-Blending Aluminum Drinking Water Treatment Residuals with Liquid Swine Manure to Bind Excess Phosphorus*

Biography: Dr. Elizabeth Dayton is a Soil Scientist in the School of Environment and Natural Resources at The Ohio State University. Dr. Dayton received a B.S. in Environmental Science from the University of Massachusetts.

Abstract: Predicting reductions in manure phosphorus (P) solubility through co-blending with aluminum (Al) drinking water treatment residuals (Al-WTR) is an important part of an ongoing Ohio EPA funded project focused on establishing a General Use Permit framework for Al-WTR. Ohio Al-WTR have been characterized to establish a “co-blending recipe” to achieve target P solubility reductions. Results of co-blending with liquid swine manure will be presented. With increased degradation of surface water, Ohio agriculture and especially Ohio animal agriculture is being targeted. Co-blending Al-WTR with manure could benefit Ohio animal agriculture and Ohio surface water quality through substantial reductions in P runoff risk. Additionally, reuse of Al-WTR could benefit Ohio municipalities through reduced disposal (landfilling) costs.

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Title: *UV Disinfection of Wastewater for Onsite Reuse*

Biography: Kun Liu is a Graduate Research Associate in Environmental Science Graduate Program at Ohio State University, with research focusing on advanced wastewater treatment and nutrient management.

Abstract: The objective of this project was to investigate the performance of an onsite batch UV disinfection system for wastewater reuse in sprayer irrigation. UV light units are approved for use in Ohio for on-site wastewater disinfection. Treated domestic wastewater generated in 24 h was circulated through a UV disinfection unit (average UV intensity 2.0•10^3±6.0•10^2 µw/cm2 at 25°C) for predetermined periods of time. In laboratory tests, Escherichia coli counts (geometric mean) of 4.3•10^3 CFU/100 ml in wastewater were reduced to 2 CFU/100 ml after 20 min circulation through the UV unit, equaling a 3.2 mean log reduction. Counts of F-specific coliphages and Clostridium perfringens were reduced in 20 min of disinfection from geometric mean of 1.2•10^3 PFU/100 ml and 5.1•10^3 CFU/100 ml to 7 PFU/100 ml and 90 CFU/100 ml, respectively (2.2 and 1.8 mean log reduction). Field tests were also conducted with domestic wastewater after treatment with a peat biofilter. Peat biofilter effluent with 3.5•10^3 CFU/100 ml geometric mean of E. coli was reduced to 3.7•10^2 CFU/100 ml with 2.5 h of circulation through the UV unit. Circulation flow rates of 10, 35 and 50 gal/min were tested in the field study. Recirculation flow rates had no significant effect on overall performance. The results showed that UV batch disinfection has potential for pathogen reduction within hours of operation in a daily wastewater treatment cycle.

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Title*: Rising Above Construction Challenges on the Springfield, Ohio High Rate Treatment*

Biography: Doug Jackson, Kokosing.

Abstract: The City of Springfield, Ohio was mandated to upgrade their existing wastewater treatment plant to store and treat Combined Sewer Overflows (CSOs) or face fines for each gallon of untreated overflow to the Mad River. The largest part of the $50M wet weather plant upgrade was a 100 MGD High Rate Treatment (HRT) facility that uses compressible media filtration. There were a number of challenges that arose during the HRT construction: heavy rock excavation, deep/large diameter piping, dewatering, and a deep tank excavation that included portions of an abandoned landfill. With the very high water table, crews quickly

learned how Springfield got its name! Dewatering became necessary process for completing much of the work. One particularly challenging construction activity involved the installation of a bypass vault over an existing 102-inch semicircular plant effluent line that was constructed in the 1930s.

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Wednesday, November 18, 2015
Concurrent 1 - Technology & Water
10:15 am – 11:45 pm

Title*: Utilizing Field Data and GIS to Characterize Runoff in a Combined Sewer System.*

Biography: Ms. Afaf Musa is a water resources engineer with 8 years of experience in analyzing urban sewerage and drainage system planning and analysis including wastewater, combined and Stormwater and performing RDII analysis, RTK calibration as well as applying GIS for data gathering of hydraulic and hydrologic systems for SWMM 5 model development. She also worked on several GI planning and design projects to capture Stormwater and mitigate CSOs. Ms. Afaf Musa is a licensed Professional Engineer in the State of Ohio.

Mike Edwards is a GIS Specialist with over 13 years of experience creating GIS datasets, performing QA/QC of existing data, managing field work collection, and integrating GIS data with hydrologic and hydraulic models.

Abstract: : East Franklinton, a blighted industrial/residential area in Columbus, Ohio is slated for a large urban revitalization project that includes capturing stormwater runoff using green infrastructure (GI) and other stormwater management solutions. The sewer system serves around 175 acres of tributary runoff area to the Dodge Park Pump Station, which is then pumped to Columbus' downtown interceptor sewer. Accurate estimates of stormwater runoff to a combined sewer system are essential to proper estimates of combined sewer overflow (CSO) activations and the cost-effective, sustainable design of controls to reduce these activations. One of the East Franklinton Improvements project objectives includes capturing stormwater runoff from public right-of-way (ROW). To accurately size GI facilities and other stormwater management solution, runoff is estimated using SWMM (Storm Water Management Model) software. The modeled runoff is highly dependent on accurately representing field conditions and land cover. Initial estimates of percent imperviousness derived from the NLCD land use dataset, produced storm runoff approximately 63% higher by volume than monitored flows (flow meter located upstream of the Pump Station). A thorough assessment of surface conditions was performed to better understand the drainage patterns throughout the study area. The study area was analyzed through GIS

using quarter-foot LiDAR dataset and one-foot topography dataset. The field reconnaissance examined all properties within the project area on block by block basis and included: surface conditions and depressed areas, downspout conditions and connections, curb outlets and outlet types, and storm inlet conditions. Further analyses of the study area showed significant infiltration caused by poor roadway/pavement conditions and lack of property maintenance such as disconnected and/or clogged downspouts.

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Title*: Watershed Scale Integrated Plan to Mitigate Drought Conditions and Conserve Water Resources*

Biography: Dr. Eric Mbonimpa is currently an assistant professor from Air Force Institute of Technology, he obtained his PhD in Environmental Engineering from Purdue University.

Abstract: Extreme dry conditions have become a common occurrence in many parts of the United States, especially in the southwest. In 2012 a drought covered over 65% of the continental US, including some great lakes states, such as Ohio, that are historically wet. Therefore, there is a need for a collaborative effort from researchers, farmers, policy makers, insurers, and the public to develop strategies to respond to droughts. These strategies should be focused on a watershed-level scale since every watershed is unique, in terms of water resources and water use. Some areas may have plenty of underground or above ground water resources, some may be accustomed to mild dry conditions and may have irrigation infrastructure, and some may have limited water resources and are entirely reliant on precipitations. This analysis prescribes an approach that integrates technology and response procedures for a watershed. First, dry condition triggers are developed based on weather data and soil moisture sensors. Then, hydrologic models that budget the watershed's water availability with respect to use and demand are developed. These models also assess the sensitivity of watershed to dry weather conditions. Lastly, based on the vulnerability of a watershed, specific drought management measures are put in place. Those measures may include informing farmers, drought resistant crops, water rationing, water reuse, water rights applications, crop insurance, smart irrigation, soil water conservation, rain harvesting and storage, and many other water conservation techniques. The remaining question to study further is the size of the watershed that should be considered for this integrated plan to mitigate or minimize the consequences of droughts.

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Title*: Man or Machine: Who Do You Prefer to Construct Your Stream Restoration Project?*

Biography: Joshua White is a geomorphologist based in Columbus, Ohio for Civil & Environmental Consultants, Inc. (CEC). He received a M.S. in Geomorphology from West Virginia University and a B.S. in Geology from Northern Kentucky University. Josh worked in ecological restoration for a decade in North Carolina before moving back closer to home. Josh fell in love with rocks and streams at an early age on his parent's farm in Kentucky. Josh's first experience with stream design; as a child; was stacking stones in the creeks. His education continued as he rode his horse around his home state – noticing differences within the landscapes and wondering about the types of processes that had sculpted them. Josh later found out that he could make a career out of restoring streams. He is a professionally licensed geologist, professionally licensed engineer, certified floodplain manager, and certified professional of erosion and sediment control and for the past twelve years has worked in all aspects of ecological restoration.

Abstract: This CEC project was an onsite stream restoration project used to offset stream impacts associated with the construction and operation of a natural gas plant. A couple landslides occurred during construction of the plant causing unconsolidated soil, rock, and woody debris to flow several hundred feet into the East and West stream valleys. A majority of the material was contained on-site; however, some of the material flowed into the receiving mainstem. These landslides completely covered both stream valleys which resulted in loss of stream function and habitat for terrestrial and aquatic species. Immediately, the natural gas plant started removing the overburden from the landslides on the West stream valley but the Regulatory officials determined that the East stream valley was too confined and steep to use mechanical equipment for the removal. So the natural gas plant had to remove and restore the East valley with shovels and wheelbarrows, while the West valley was reconstructed with traditional mechanical equipment used for stream restoration practices. This presentation will evaluate each valley and their construction technique based on cost, time, quality of work, current condition, and also discusses the advantages and disadvantages of each technique.

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Wednesday, November 18, 2015
Concurrent 2 - Point/Nonpoint Source
10:15 am – 11:45 pm

Title*: Watershed Management Strategies That Cost-Effectively Reduce Drinking Water Risks*

Biography: Lorraine W. Krzyzewski is a Water Protection Coordinator with the Columbus Division of Water where she works to protect the city's source water supplies. With 19 years of experience in the city's Watershed Management Section her responsibilities include reservoir security and operations, and programs partnering with the agricultural community. Lorraine holds graduate and undergraduate degrees from The Ohio State University in Environmental Science and Integrated Science Education.

Abstract: : The City of Columbus, Ohio is preparing a Watershed Master Plan to identify effective strategies that will reduce operational costs and minimize critical risks to providing safe drinking water to over 1.1 million residents of the Greater Columbus Area. These strategies are targeted at priority areas of concern throughout the 1,000-square mile Scioto River and 195-square mile Big Walnut Creek watersheds. Known and emerging pollutant risks — agriculture, algal blooms, urbanization, home sewage treatment systems, spills and other concerns — are inventoried, characterized, and prioritized for management using GIS and a numeric source load model. This risk-based approach considers the likelihood of contaminant discharge, distribution of potential sources within the watershed, and potential consequences of the contaminants that together identify high-priority areas and activities of concern. To address these concerns, Columbus is taking a critical look at its current Watershed Management Program that includes construction of major projects, partnering with watershed stakeholders and reservoir neighbors, education, and spill prevention and response. Implementing management strategies within the 96 percent of the watershed that is outside of Columbus is a major barrier and is overcome through multi-objective strategies beneficial to a broad range of stakeholders and concerns. By engaging these stakeholders in evaluating the current program and proposed enhancements, Columbus is gaining valuable insight on what programs and practices are effective within the watersheds and anticipated obstacles to improvements. The enhanced watershed protection strategies align with the high-priority areas and activities of concern, resulting in a prioritized and phased strategic plan to cost-effectively mitigate risks. This presentation features a case study of source water assessment and multi-objective protection strategies for surface water sources that face risks from both urbanization and agriculture. Learning objectives include tools, approaches, challenges and strategies for characterizing, prioritizing, and managing critical risks that are applicable to diverse watersheds and concerns.

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Title*: Permeable Pavement and Bioretention Performance on Poorly Draining Soils*

Biography: Keely Davidson-Bennett is a Project Manager with Chagrin River Watershed Partners, Inc (CRWP). Ms. Davidson-Bennett earned a M.S. in environmental science from Ohio State University and a B.A. in biology from Hiram College.

Abstract: Chagrin River Watershed Partners, Inc. (CRWP), Old Woman Creek National Estuarine Research Reserve (OWC NERR), North Carolina State University (NCSU), Ohio Department of Natural Resources Division of Soil and Water Resources (ODNR-DSWR), Erie Soil and Water Conservation District (Erie SWCD), and the Consensus Building Institute (CBI) and assessed the hydrologic performance of bioretention and permeable pavement on poorly draining soils by collecting and analyzing data from three bioretention cells and four permeable pavement applications. The length of monitoring periods varied among sites, but 50 storms were observed at the site with the shortest monitoring period. We used weirs and pressure transducers to measure outflow from the SCMs, water table wells and pressure transducers to measure exfiltration, and weather stations, rain gauges, and standard engineering methods to estimate inflow to and evapotranspiration from the SCMs. The bioretention cells we

monitored reduced outflow by 36 - 60% through exfiltration and evapotranspiration. The monitored permeable pavement applications reduced outflow by 17 - 98%. The permeable pavement application with the smallest reduction in outflow drained an impervious area much larger than what is recommended by Ohio's stormwater manual, Rainwater and Land Development. The permeable pavement application with the greatest reduction in outflow had no run-on from impervious surfaces, areas of well draining fill within the subgrade soil beneath the permeable pavement, and a subdrain beneath the permeable pavement system designed to dewater the groundwater table.

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Title*: Upper Maumee Tributary Monitoring*

Biography: Stephanie Singer is the Watershed Coordinator at Defiance Soil & Water Conservation District. She has been there for two years working on the Watershed Action Plan with a steering committee of local stakeholders.

Abstract: The 'Upper Maumee Watershed Volunteer Water Monitoring' project measured stream quality of tributaries on a monthly basis from May 2014- May 2015. Data was collected stream side for dissolved oxygen, pH, temperature, and total suspended solids along with general observations. Water samples were analyzed by Heidelberg Laboratory for soluble nutrients (including N & P) and total phosphorus. This first year of data along with visual assessments and macroinvertebrate collections has allowed observation of general trends. Each tributary watershed received a 'grade' based on the percentage of monthly samples that met the water quality standard for TSS, nitrate, SRP and total P. One watershed received a B, three received a C, two received a D, and two received a F. These grades were used to create a visual report card to educate the public on current conditions and suggestions for improvements. This data is essential to understand the difference between the pollutant load on the main stem of the Maumee River coming from Ft. Wayne and the large watershed upstream and the pollutant load coming from the local watersheds. Quantifying the nutrient levels on these small streams makes it possible to inform stakeholders, focus on projects in designated areas, and measure improvements. Before this study, a scarce amount of data had been collected on these tributaries. The data and leverage it provides is critical to improving water quality locally and in Lake Erie.

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Wednesday, November 18, 2015
Concurrent 3 - Innovative Practices
10:15 am – 11:45 pm

Title*: Enhancing Nutrient Removal from Treated Wastewater with Turf Grasses in a Hydroponic System*

Biography: Nimesha Gunarathna is a visiting Scientist at Ohio State University. She received B. Sc. degree in Zoology and M.Phil. degree in Sustainable Aquaculture Systems from Sri Lanka.

Abstract: Hydraulic retention time plays an important role in nutrient uptake and plant growth in hydroponic systems. Can plants growing hydroponically absorb nutrients from treated wastewater? The objective of this study was to produce grass biomass in a hydroponic system with wastewater as a nutrient source at one- and two-day hydraulic retention times. Four turf grasses, orchard (Dactylis glomerata), tall fescue (Lolium arundinaceum), Kentucky blue (Poa pratensis L.) and perennial rye (Lolium perenne) were cultured in a bench-scale plate/burlap/grass hydroponic system as individual units. Wastewater was replenished every day (one-day hydraulic retention time) or every other day (two-day hydraulic retention time) for 28 consecutive days from germination. Nutrient removal was monitored by analysis of the loss of nitrate, phosphate and ammonia in the wastewater in the hydroponic units after the each hydraulic retention time cycle. Effluent of treated turkey processing wastewater from a sand bioreactor facility with average nitrate concentration of 57 ± 14.7 mg/l, phosphate 5.1 ± 1.3 mg/l, and ammonia 9 ± 3.4 mg/l was used in this experiment. All plant species achieved their highest average nutrient removal of 75% nitrate, 66% phosphate and 99.9% ammonia (detection level 0.01 mg/l and n=104) with the 2-day hydraulic retention time. With the 1-day hydraulic retention time the average nutrient removal was 69% for nitrate, 22% for phosphate and 96% for ammonia (n=104). The removal of nitrate and ammonia was a function of plant species and retention time. Phosphate removal was only dependent on the hydraulic retention time, not on the plant species. Perennial rye grass showed the highest nutrient removal efficiency with both hydraulic retention times. In conclusion, the two-day hydraulic retention time for nutrient removal in this hydroponic system is recommended for all plant species.

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Title*: Urban SubH2Oshed Initiative: Stormwater Line Data to Storm Sewershed Delineations*

Biography: Ryan Pilewski is watershed implementation coordinator at Franklin Soil and Water Conservation District, where his responsibilities include promoting reasonable land use decisions using a geospatial analysis approach.

Abstract: Stormwater mitigation in an urban environment is a complex issue. Using lidar based data coupled with comprehensive drainage, impervious, and natural resource networks, Franklin Soil and Water Conservation District is partnering with local municipalities to provide accurate storm sewershed delineations and water quality indicators that efficiently interpret this issue. This process is in response to local municipalities' interests in better understanding the extents of the urban watershed, its stormwater and drainage networks, and predominate issues associated with sanitary sewer stormwater infiltration, stream stability and water quality, property damage, and the potential correlation with the developed landscape. The subsequent goal is to prioritize options that may alleviate or minimize these issues, including the possible implementation of green infrastructure practices.

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Title*: Beneficial use of Toledo Harbor Dredge Material as a Component in Manufactured Soil Blends*

Biography: Peter McDonough is a Research Associate, School of Environment & Natural Resources at The Ohio State University. Mr. McDonough possesses a B.S. in Agriculture with a minor in Entomology, and an M.S. in Environmental Science from The Ohio State University.

Abstract: Annual dredging in Lake Erie, near the mouth of the Maumee River results in close to 1 million yds3 of dredged material and even this amount of dredging is insufficient to maintain the shipping channel servicing Toledo Harbor. While it is acknowledged that dredging is necessary to maintain shipping, there is increasing concern about the water quality impacts associated with open-lake disposal of dredge material in shallow near-shore waters of the western Lake Erie Basin. Reuse of Toledo Harbor Dredge material (TDM) as a component in a manufactured soil blend, used in landscape/horticultural applications, may provide a beneficial alternative to open-lake disposal. For a residual material or byproduct to be considered for beneficial use as a soil amendment or component of manufactured soil it must exhibit soil-like attributes, such as plant nutrients, texture, or organic matter, which contribute to soil quality/fertility, or provide a functional benefit (e.g. acid neutralization, water retention or release). Characterization results of test blends will be shown.

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Wednesday, November 18, 2015
Concurrent 1- Groundwater
1:15 pm - 2:45 pm

Title*: Automated MicroGC Monitoring Solution for VOCs in Ground Water*

Biography: Dr.William Steinecker is a PhD analytical chemist and Founder/CTO of VGC Chromatography in Dayton, OH. He is also the Director of the IDCAST Chemical Sensor Division.

Abstract: VGC Chromatography, in collaboration with the City of Dayton, has developed the first automated remote monitoring solution for VOCs in ground water. The City of Dayton maintains a network of 300 early-warning monitoring wells for the ongoing protection of its source water. In an effort to enhance the effectiveness of groundwater quality and water level monitoring, the City identified improvements in the water quality aspect of the program. Those included the frequency of sampling and the characterization and behavior patterns of chlorinated hydrocarbon plumes in the Source Water Protection Area. Existing relic chlorinated solvent plumes are under hydraulic stresses associated with the well field and gradient control well pumping and an understanding of how various pumping schemes alter the horizontal and vertical geometry and affect smearing, concentration

gradients, and travel times to public supply wells was recommended. In response to these recommendations, the City has retained the services of VGC Chromatography to design and build an autonomous, field-deployable, real-time groundwater sampling and gas chromatograph unit housed in a "weatherized kit" with the capability to withstand temperature and moisture extremes. The system achieves similar performance to laboratory instrumentation, but is smaller and runs on less power. Further, the system is completely automated and includes a variety of web-based communication options (for remotely configuring the unit and acquiring data in real time). Short-chain chlorinated VOCs are the target compounds at this time (primarily vinyl chloride, the dichloroethylene isomers, and trichloroethylene), with detection limits less than 1 ppb (m/m water concentration), but all GC-amenable VOCs can be analyzed with minor adjustment of the GC parameters. Prototyping and outdoor testing from the past winter will be presented along with preliminary field testing data from this coming spring/summer.

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Title*: Strontium in Ohio's Ground Water*

Biography: Chris Kenan earned a BS from Cornell University and a MS and Ph.D. from Princeton University. He worked as a mineral exploration geologist before teaching at Denison University. At the Ohio EPA, he is focusing on characterizing Ohio's GW quality.

Abstract: In Ohio, the Silurian and Devonian carbonate aquifers exhibit regional areas of elevated strontium. The highest levels in ground water (>25,000 µg/L) occur within a north-south belt along and to the east of the crest of the Findlay Arch. The sandstone aquifers exhibit the lowest concentrations and the sand and gravel aquifers are intermediate. There is currently no MCL for strontium, but strontium exceeds the lifetime health advisory (4,000 µg/L) in raw water in over 75 percent of the carbonate wells and about 20 percent of the sand and gravel wells in the Ambient Ground Water Quality Monitoring Program. Strontium replaced calcium in marine carbonate and evaporite minerals during deposition. Diagenesis and late Paleozoic secondary mineralization remobilized strontium and/or added additional strontium and concentrated celestine along fractures and other open structures. Natural dissolution of carbonate and gypsum in the carbonate aquifers are certainly contributing strontium to the groundwater. Since the highest concentrations of strontium are not associated with the highest concentrations of calcium, magnesium, and sulfate, it appears celestine contributes strontium to generate the highest concentrations

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Title*: Quick Implementation of Long-Term Passive In-Situ Remediation of Contaminated Groundwater Seeps*

Biography: John Hull is the founder and chairman of Hull and Associates, Inc. with more than 35 years of experience with a wide variety of engineering and environmental issues. He is a registered Professional Engineer in 14 states, including Ohio, and is recognized as a Board Certified Environmental Engineer in solid waste management by the American Academy of Environmental Engineers. Also active in maintaining ties with the academic community, John has served as an adjunct professor at Ohio Northern University, the University of Toledo, and the University of Michigan, and regularly participates in environmental conferences, including authoring and presenting technical papers at venues in the United States, the United Kingdom, Italy, and Japan. John received a Master of Science in Civil Engineering degree from Stanford University and a Bachelor of Science in Civil Engineering from Ohio Northern University.

Abstract: Hull's specialty regarding groundwater is from a remediation / protection standpoint. Basically it is installation of barrier materials that stop migration of subsurface contamination and may also have properties of contaminant adsorption if needed.

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Wednesday, November 18, 2015
Concurrent 2 - Ecology
1:15 pm-2:45 pm

Title*: Working on a Watershed Scale in the Great Miami River Watershed for 100 Years*

Biography: Sarah Hippensteel Hall serves as Manager of Watershed Partnerships for the Miami Conservancy District. She coordinates and interacts with community members, federal, state, and local agencies, businesses, and agricultural producers throughout the Great Miami River Waters.

Abstract: In 2015, the Miami Conservancy District has worked to create meaningful change at a watershed scale for 100 years. Over those years, MCD helped communities deal with many water issues including flood protection, wastewater treatment, groundwater protection, stormwater regulations, and nutrient pollution. However, using a system-based approach is not simple or easy. Creating meaningful change Watershed work is complex and includes environmental, political, social, bureaucratic, and financial challenges. This session will highlight some of those challenges and discuss both failure and success. MCD pioneered regional flood protection that has protected cities along the Great Miami River over 1800 times since its completion in 1922. When untreated sewage needed to be stopped from flowing straight into rivers, MCD helped build several regional wastewater treatment plants. To help protect the region's sole source of drinking water, the Buried Valley Aquifer, MCD formed a region-wide groundwater protection program. MCD used a collaborative approach to assist 56 communities reduce compliance costs and jointly comply with Phase 2 stormwater requirements. Since 2005, MCD worked

with many partners to address excess nutrients in rivers and streams. Each of these efforts faced challenges to their design and implementation. This session will focus mainly on MCD's systems-based approaches to groundwater protection and nutrient pollution including the Water Quality Credit Trading Program.

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Title*: Big Darby Creek: A decade of protection and restoration of biodiversity*

Biography: Anthony Sasson is The Nature Conservancy in Ohio's Freshwater Conservation Manager, covering water policy and aquatic biodiversity protection.

Abstract: : Big Darby Creek is a National and State Scenic River because of its outstanding biological diversity, especially challenged because of development and agricultural stresses, and located on the western edge of the expanding metropolitan area of Columbus, Ohio. Over the past decade, it has been the subject of relatively advanced and focused local planning and state environmental policies and implementation. This is at least the third round of intensive, sometimes controversial, efforts to protect this outstanding stream. Both stream protection and restoration have seen extensive and renewed regulatory and voluntary efforts through a coalition of multiple government and conservation organizations. Big Darby Creek and its tributaries have been the target of 1) a unique stormwater permit based on ground water recharge goals; 2) millions of dollars' worth of stream restoration projects; 3) focused land conservation; 4) endangered species protection and augmentation; and 5) a 2014 Ohio EPA comprehensive TMDL assessment of over 100 biomonitoring sites and measurement of the watershed's aquatic biological community. The watershed has recorded: 100 species of fish, including 15 state or federal listed species: and 44 species of mussels, including 22 species that are state or federal listed, including five federal endangered and threatened species. This presentation summarizes the efforts to protect and restore this outstanding biodiversity and offers an initial review of success – and provides remarks on continuing challenges.

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Title*: Stream and Wetland Mitigation Solutions: The Nature Conservancy's In-Lieu Fee Program*

Biography: Devin Schenk is the Mitigation Program Manager for The Nature Conservancy (TNC), where he is responsible for running TNC's state-wide Stream and Wetland In-Lieu Fee Mitigation Program.

Abstract: The Nature Conservancy in Ohio began operating a stream and wetland mitigation program in the beginning of 2015. The overall goal of The Nature Conservancy's (TNC) In-Lieu-Fee mitigation program (ILF) is to provide an effective form of compensatory mitigation to applicants seeking permits for impacts to aquatic resources from the Army Corps of Engineers (Corps) and the Ohio Environmental Protection Agency (OEPA). Prior to the existence of ILF programs in Ohio, permit applicants outside of

mitigation bank service areas were required to perform their own compensatory mitigation, and monitor and maintain it for several years. The time and expense made the process difficult and the results were often less than desirable. Through the ILF program, developers are able to realize economic advantages over implementing their own mitigation projects, including reduced permitting time and costs, and the transfer of their mitigation obligations and accountability to TNC. Aggregating credit sales within the same watershed allows the ILF program to build larger restoration projects with a higher chance of success. In addition, TNC is working with partners (park districts, watershed groups, local land trusts, etc.) to identify projects that have a high potential to show positive results, improve aquatic resource function and attainment, and boost other watershed initiatives. This presentation will present details regarding TNC's ILF program and discuss ways in which the water resource community is being involved.

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Wednesday, November 18, 2015
Closing Panel
3:15 pm - 4:15 pm

Title: *Healthy Water Ohio: A Strategy for Water Resource Management*

Biography: Dr. Larry Antosch has been employed at the Ohio Farm Bureau Federation (OFBF) since July 1999. He is responsible for overseeing, planning, developing and implementing programs and projects addressing policy development and emerging environmental and energy policy issues. In his position, Dr. Antosch provides leadership to the OFBF policy development process and serves as the conduit of unbiased environmental information for the OFBF Board of Trustees, Cabinet and county FB members. He is responsible for reviewing and analyzing environmental data, reports, and proposed rules and legislation to determine its impact on Ohio agriculture and producers. In addition, Larry represents OFBF and county FB members on local, state, national and inter-national task forces, committees and work groups. He currently is providing technical oversight to the Healthy Water Ohio initiative.

John Stark is Director of Freshwater Conservation at The Nature Conservancy. He brings 20 plus years of aquatic conservation experience as part of the Ohio Program's increasing focus on the conservation of aquatic biodiversity. Previously, he was employed as the Eastern Ozarks Program Manager working on watershed conservation planning and implementation for The Nature Conservancy in Arkansas. Prior to his first stint with The Nature Conservancy, John was the coldwater leader for the state fish and game agency in Arkansas from 1992-2001. His past experience also includes warm water lake and river fisheries management in several regions of the country and lake trout and yellow perch assessment in the Indiana portion of Lake Michigan. Degrees held include a Bachelor's in Water Resources from the University of Wisconsin-Stevens Point and a Master's in Biology from Tennessee Tech.