Voices for Water

45th Annual WMAO Conference
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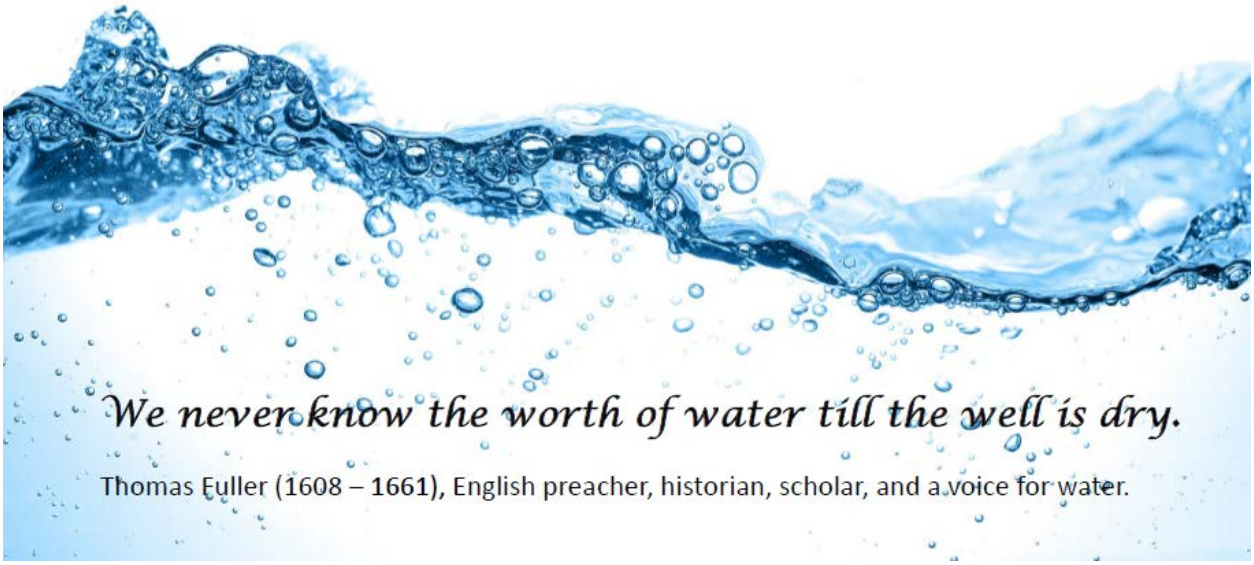

Conference Proceedings

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Wednesday November 9, 2016

Keynote Address

Title: A Slithering Success Story: Rapid Recovery and Delisting of the Lake Erie Watersnake Dr. Kristen Standford, The Ohio State University

Authors: Kristin Stanford, The Ohio State University F. T. Stone Laboratory, Put-in-Bay, OH 43456 and Richard B. King, Department of Biological Sciences, Northern Illinois University, DeKalb, IL 60115.

Biography: Dr. Kristin M. Stanford is the Education and Outreach Coordinator and a Senior Research Scientist at the Ohio State University's Franz Theodore Stone Laboratory and was the Recovery Plan Coordinator for the Lake Erie Watersnake from 2003 to 2013. Dr. Stanford holds a Ph.D. in Biology from Northern Illinois University; where her dissertation covered the "Spatial and Temporal Variation in Demographic Parameters of the Lake Erie Watersnake". She is a member of the American Society of Ichthyologists and Herpetologists, the Society for the Study of Amphibians and Reptiles, and the Midwest Partners in Amphibian and Reptile Conservation.

The Lake Erie watersnake is found nowhere else in the world. By 1999 the once abundant population had declined to the extent that the Ohio Department of Natural Resources recognized it as an endangered species in the state. Thanks in large part to Dr. Stanford's efforts, by 2008, the snake's population exceeded the number of individuals needed for recovery of the species. Dr. Stanford became an international celebrity because of her appearance on the Discovery Channel show "Dirty Jobs."

Abstract: Listed as threatened in 1999 and recovered in 2011, the Lake Erie watersnake (*Nerodia sipedon insularum*) represents one of the most rapid species recovery stories of the Endangered Species Act. But what can the recovery of a small population of endemic watersnakes teach us about conservation on a larger scale? Several factors in the success of the LEWS can translate to other species conservation programs. These include (1) timely listing, identification of quantitative recovery criteria, and immediate recovery plan implementation, (2) a recovery team that included participants from state and federal agencies, universities, non-governmental organizations, and citizen scientists, (3) intensive monitoring, facilitated largely by volunteers, designed to yield estimates of key recovery indicators, and (4) active outreach efforts led by a local, dedicated recovery coordinator. Other key factors to recovery that were species- and context-specific, included high reproductive potential, a shift in diet to an abundant new prey species, and land acquisitions. Here too, there are implications for other species, e.g., regarding the sometimes unexpected effects of invasive species. A five-year post-delisting monitoring plan, currently underway, further ensures watersnake populations remain stable and that conservation continues.

Concurrent 1 – Ohio Lake Management Society: Case Studies

Title: Buckeye Lake Update,

Author: Mike Gallaway, Ohio Environmental Protection Agency

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: In attempting to understand modern conditions in Buckeye Lake, we have looked at the past to provide clues to historical conditions. A complete limnological survey was conducted in 1930 on Buckeye Lake which can provide insight to data collected over the last 6 years. However, challenges in equipment and methodologies may distort the voices of the past as we try to use them to gain perspective.

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Title: Nutrient Removal by Constructed and Restored Wetlands in the Maumee River Watershed of Northwest Ohio

Authors: Douglas Kane, Defiance College; Christian Lenhart, University of Minnesota & Maumee River Basic Center for Ecological Restoration; Samantha McMonigal, Defiance College; and Peter Lenhart, Maumee River Basin Center for Ecological Restoration

Biography: Dr. Kane is a Professor of Biology in the Division of Natural Sciences, Applied Sciences, and Mathematics at Defiance College. His research interests lie in plankton and benthic invertebrate ecology, as well as effects of invasive species on communities

Abstract: There is a need to reduce nutrient (phosphorus (P) and nitrogen (N)) loading to Lake Erie to reduce Cyanabacterial Algal Blooms (CHABS) and their deleterious effects on the ecosystem. Wetlands can reduce nutrient loading from the watershed by storing water and filtering out nutrients. The majority of wetlands in the Maumee River watershed were drained over a century ago, including most of the Great Black Swamp which covered northwest Ohio. While large forested wetlands cannot be feasibly re-established in most cases, smaller wetlands that store and treat flow from farmland can contribute to nutrient load reductions to Lake Erie. To this end, we monitored created and restored wetlands adjacent to farm fields in the Maumee River watershed for water storage and nutrient retention during 2016. We compared inflow with outflow data and found that wetlands did a good job of storing water and removing nitrate. Although we found minimal reduction in phosphorus concentration of outflow water compared to inflow water, reduction of flow would still yield reductions in phosphorus loading from the wetlands. Data will also be presented on plant community composition, cover, and quality and inflow vs. outflow chlorophyll a and cyanobacteria concentrations at all three sites.

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Title: Charter Boat Captains Help to Monitor Lake Erie Water Quality

Author: Justin Chaffin, The Ohio State University

Biography: Justin Chaffin received his PhD from the University of Toledo in 2013 by researching the role of nitrogen in Lake Erie cyanobacterial blooms. Chaffin has been the research coordinator at Stone Lab of the Ohio State University since 2012. Chaffin continues

Abstract: Routine monitoring programs are necessary to determine the health of Lake Erie. Many of these monitoring programs focus on scientists doing the work, but programs that involve citizens can perform a dual function: collecting data on Lake Erie water quality as well as educating people on what they can do to keep the environment healthy. Charter fishing boats spend several days per week on the lake with citizens who already have an interest in Lake Erie's health. Training charter captains how to collect water samples can increase existing monitoring programs and provide a valuable learning experience to anglers. In 2012, charter boat captains began to collect water samples in the western basin of Lake Erie under Ohio EPA guidance. Stone Laboratory took over coordination of the sampling program the following year, with funding provided by Ohio EPA. Every week during fishing season, the captains collect a water sample and measure water temperature and water clarity at locations they visit during charter trips. Stone Laboratory staff retrieves the samples from the captains and returns to the laboratory for analysis. In total, over 400 water samples have been collected by the captains and analyzed for key water quality parameters such as concentrations of phosphorus, nitrogen, chlorophyll a, and the cyanobacterial toxin microcystin. Conclusions drawn from the captain data agreed with conclusions drawn by Lake Erie researchers who collect their own data. For example, 2015 had higher concentrations of algae than 2014 but microcystin concentrations were higher in 2014. Additionally, within a summer, highest concentrations of microcystin were recorded at the start of the cyanobacterial bloom. Agreement among the data sets indicates the captains were collecting scientifically meaningful data. Furthermore, the captains receive weekly updates about their data set and then they can share that information with their fisherman.

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Concurrent 2 – Education

Title: Project West- Ohio Update

Authors: Dennis Clement, Ohio Environmental Protection Agency

Biography: No biography provided.

Abstract: This presentation will involve updates to attendees of the Project WET - Ohio Program and future plans of how individuals can get involved becoming a facilitator or educator.

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Title: Panel: Who Works for Water

Authors: Carolyn Watkins, Ohio EPA; Ebony Hood, Northeast Ohio Regional Sewer District; and Karen Thomas, City of Dayton

Biography: *Carolyn Watkins*, Chief of Ohio EPA's Office of Environmental Education, oversees a grant program that provides $1 million annually to fund environmental education projects targeting pre-school to university students and teachers, the general public and the regulated community. She also administers Ohio EPA's environmental science and engineering scholarship program. Her office provides statewide coordination for Project WET (Water Education for Teachers) and its high school curriculum Healthy Water, Healthy People.

Ebony Hood is a Community Relations Specialist with the Northeast Ohio Regional Sewer District. NEORSD operates three wastewater treatment plants and related water pollution control facilities on Lake Erie and the Cuyahoga River NEORSD serving more than one million people in 61 suburban communities and the City of Cleveland to assure clean water for the region. Ebony Hood coordinates the District's communication efforts across the region including scholastic outreach to schools and community groups. She is also a board member of the Environmental Education Council of Ohio and she leads her own community based youth group. Ms. Hood graduated from Baldwin Wallace University with a Bachelor of Science degree in Biology/Sustainability. In the Spring, Ebony will begin graduate studies at Kent State University for Science Curriculum and Instruction.

Karen F. Thomas currently serves as the Marketing Account Management Representative with the City of Dayton, Department of Water. Karen has been with the City of Dayton for over 11 years. In her position, Karen is responsible for marketing the Department of Water, and its great tasting, high quality water, water services, and highly professional staff. Another aspect of Karen's positon, requires her to collaborate with Economic Development to market the Department's capacity for business expansion and relocation using Dayton's 1.5 trillion gallons of water as one of the economic drivers. In addition, Karen works in the community to develop collaborations and partnerships with Dayton's local businesses, communities, schools, colleges and universities to create value for the department, provide educational and outreach opportunities and to introduce the water industry to Dayton's youth.

Karen is a graduate of the University of Maryland in College Park, Maryland with a Bachelor of Arts in Business Administration. Additionally, she earned a Master of Urban Studies from the University of Akron in Akron, Ohio. Karen attended the Harvard University, Kennedy School of Government Executive Education 3 week program in the June 2009 and is currently a proud member of the Leadership Dayton's 2010 class.

Abstract: Panel Discussion: Ohio high school students and even teachers and career counselors are unaware of the career opportunities involved in supplying and treating drinking and waste water. This session will showcase three successful career exploration efforts: the City of Dayton's Water Career Conference; the Northeast Ohio Regional Sewer District's internship programs and teacher workshops; and a statewide network of Environmental Career Ambassadors. Water career resources from Project WET, Healthy Water, Healthy People and Ohio Means Jobs will also be shared.

Concurrent 3- Watersheds

Title: Implementation Planning for 319 Grants

Author: Gregory Nageotte, Ohio Department of Agriculture; and Rick Wilson, Ohio Environmental Protection Agency

Biography: *Mr. Nageotte* received a BA from University of Oklahoma and an MPA from Indiana University. He recently moved from Department of Natural Resources to Agriculture, but still in Division of Soil and Water. Lives and works in the Blacklick Creek Watershed (Reynoldsburg). Administers the Ohio Watershed Coordinator Grant Program and supports five (5) Soil and Water Conservation Districts. Initiated the Ohio Clean Marina Program, co-authored the 2004 Ohio Nonpoint Source Management Plan, and recently assisted Ohio EPA with development of new 319 program NPS Implementation Planning guidance.

Rick Wilson has 22 years of experience at the Ohio EPA. Rick has been the technical lead and agricultural expert in DSW's Surface Water Improvement/§319 Grants program since 2008 and has served as the technical contact for multiple §319, SWIF and GLRI funded projects (especially those associated with reducing agricultural nonpoint source pollution). Rick serves as the Division's liaison with agricultural stakeholders and related organizations throughout Ohio — and is filling-in as the technical lead in the Ohio EPA's Concentrated Animal Feeding Operation (CAFO) program.

Abstract: Ohio EPA Division of Surface Water and ODA Division of Soil and Water Conservation collaborated on development of guidance, which incorporates U.S. EPA "nine elements" required for 319 project funding eligibility. Participants will be introduced to a plan template, model, and guidance.

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Title: Breaking the Boundaries

Author: Jeff Thomas, Warren County Soil and Water Conservation District

Biography: Jeff Thomas is a graduate of the University of Kentucky College of Agriculture and has a degree in Natural Resource Management. He began his career with the Warren County Soil & Water Conservation District nearly twenty years ago. During that time, he spent 7 years with the ODNR – Division of Soil & Water Conservation providing assistance to Districts in agricultural pollution abatement, watershed planning, and nutrient credit trading. Jeff has worked in all phases of the District program from agriculture to urban streams & development and is currently the Director.

Abstract: The battle to achieve and maintain healthy rivers and streams is an ongoing effort in the world of natural resource advocates. Conservation projects aimed at promoting and protecting water quality are typically implemented on a political jurisdiction effort, such as a township, city or county, spreading out water quality projects opposed to allowing the projects to work together. Taking a watershed scale approach to restoration and protection allows for a more efficient approach to address water quality issues, improved collaboration and stakeholder involvement, and local support. To better address

impairments in the Great Miami River, fourteen Ohio counties have come together to form the Miami River Joint Board of Supervisors to serve as an instrument for watershed scale conservation planning in the Great Miami River Watershed. For the past three years, the Joint Board has been working with Miami Conservancy District and wastewater treatment plants to carry out nutrient credit trading in the Great Miami River Watershed, to help decrease nutrients in the Great Miami River. Recently, the Joint Board voted to expand upon their authorities to take watershed protection to a new level; working as a unified watershed protection and enhancement group to prioritize, plan and implement on a large watershed scale. With fierce momentum, the Joint Board is moving forward to build upon current initiatives in the Watershed, coalescing partnerships, and prioritizing project implementation to better plan and implement water quality projects and outreach while breaking through political jurisdiction boundaries.

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Title: Evolution of Watershed Land Use and Water Quality in Mill Creek, Youngstown, Ohio

Authors: Felicia Armstrong, Youngstown State University; Tayrn Hanna, Youngstown State University; Colleen McLean, Youngstown State University; and Steve Brown, Youngstown State University

Biography: Dr. Armstrong has been at Youngstown State University for 12 years in the Department of Geological & Environmental Sciences. Her research focus is soil and water quality and effects of pollutants on the soil-water-plant ecosystem.

Abstract: The Mill Creek Watershed (MCW) is located in Mahoning and Columbiana Counties, Ohio. It is a sub-watershed of the Mahoning River watershed and composed of 47,000 acres. The main surface stream in the sub-watershed is Mill Creek which starts in Fairfield Township, Columbiana County and continues until it reaches the Mahoning River just west of downtown Youngstown. Mill Creek is designated as General High Quality Water and runs through Mahoning County's largest metropolitan park, Mill Creek MetroPark (MCMP). The impact of land use practices and aging infrastructure in the Mill Creek Watershed have resulted in various water quality concerns related to human and ecological health. Local water quality issues include bacteria (and other pathogens) from animal waste, combined sewer overflows (CSOs) and failing septic systems; nutrients from urban and agricultural land uses; and sediment loading from erosion and construction. Mill Creek is approximately 24 miles long with a mixture of land use types ranging from heavily industrialized and residential to agriculture and mixed forests. Project objectives are to establish monitoring efforts for this urban watershed. Initial evaluation of MCW monitoring sites, based on specific watershed land uses and inputs (point and non-point) was identified. Twelve sites of concern were selected for water chemical, biological and macroinvertebrate analysis. To establish a baseline, samples were taken during dry periods of rainfall. Effects of land use in the watershed were determined from water samples taken 24-36 hours after a significant rainfall (0.75-1 inch). Results of the monitoring program will educate the public on water quality issues and the influence of watershed activity on water quality. Importantly, it will also provide data to Mill Creek MetroParks and the Mahoning County District Board of Health to improve its management of waters coming into and leaving the park.

Concurrent 1- Ohio Lake Management Society: Cyanotoxins

Title: q PCR Analysis for Cyanotoxin Screening

Author: Heather Raymond, Ohio Environmental Protection Agency

Biography: Heather Raymond has 20 years' experience in Ohio EPA's Division of Drinking and Ground Waters where she currently serves as the Public Water System HAB Coordinator. She was instrumental in developing Ohio EPA's PWS HAB Response Strategy and HAB Monitoring and Reporting Rules. She co-teaches a practical workshop on HABs at OSU's Stone Laboratory and has helped water systems effectively respond to HABs in both their raw and finished drinking water. She has been invited to speak on the topic of HABs at several national and international conferences and webinars. She enjoys collaborating with researchers in Ohio and across the country to advance our understanding of HABs. She has earned Masters' degrees in Science and Public Administration from Ohio University.

Abstract: No abstract provided.

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Title: Microcystin Dynamics in Western Lake Erie

Author: Darren Bade, Kent State University

Biography: Dr. Bade studies limnology, mainly focusing on nutrient dyamicis and biogeochemical cycling. He is the current president of the Ohio Lake Management Society.

Abstract: Microcystin toxicity has been a primary concern related to harmful algal blooms in Lake Erie. Conditions that promote microcystin production are not always clear. Generally the concentrations of microcystin increase with the abundance of particular cyanobacteria, mainly Microcystis, or in Sandusky Bay, Planktothrix. Using data collected by the Ohio Environmental Protection Agency at 25 sites in Western Lake Erie between 2011 and 2015, microcystin concentrations were compared with other environmental parameters to explore informative relationships. In addition, temporal trends in microcystin and environmental parameters were examined. This data set, which contains nearly 350 observations, confirmed the relationship between algal biomass (as Chlorophyll a) and microcystin concentration (Pearson's $r = 0.67$, $p < 0.001$). Genetic studies in the literature have suggested that microcystin production could be tied to aspects of the nitrogen status of cells. Microcystin was weakly correlated with total Kjeldahl nitrogen ($r = 0.26$, $p = 0.009$). While the correlation between microcystin and ammonium was not significant, the relationship seems to demonstrate a threshold response. Microcystin was only present when ammonium was below analytical detection levels, except in a very small subset of samples. The correlation between microcystin and nitrate was also not significant. The highest microcystin concentrations were observed when nitrate was detectable in the water. In examining temporal trends at several sites in Lake Erie a repeatable pattern emerged. A brief window between the drawdown of ammonium concentrations to undetectable levels and in the presence of detectable levels of nitrate generated the highest concentrations of microcystin. While microcystin

could still be found after nitrate was reduced to below detection, it was generally decreasing in concentration after the disappearance of nitrate. A return of ammonium to the water column often coincided with a concomitant reduction in microcystin.

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Title: The Effect of Aeration and Destratificatiion on Water Quality and Microcystin Concentrations in a Small Suburban Lake

Authors: Martin Hilovsky, EnviroScience Inc; and Nate Robinson, Aqua Doc Lake and pond Management

Biography: Martin Hilovsky is an environmental scientist with 30 years of experience in environmental control and monitoring, and holds a B.S. in Biology and an M.S. in Aquatic Ecology from Kent State University. He is founder and CEO of EnviroScience, Inc.

Abstract: Silver Lake is a 91 acre (37 ha), glacial lake located in the Village of Silver Lake in northern Summit County, Ohio. The lake has a maximum depth of approximately 30 feet, and the watershed is entirely residential in nature. Despite the lack of any agricultural or sanitary wastewater inputs, the lake is highly eutrophic with a history of worsening water quality and increasingly common cyanobacterial blooms. The lake became highly stratified each summer, and 2012 Trophic State Index values (Carlson, 1977) indicated that the lake was bordering on hypereutrophy. Microcystin values in 2013 and 2014 were considerably higher than applicable recreational standards, a particular problem due to the lake's heavy recreational usage. A whole-lake aeration system was designed and installed in August 2014 by Vertex Water Features, Pompano Beach, FL and Aqua Doc Lake and Pond Management, Chardon, OH. Dissolved oxygen profiles and water chemistry and algal community samples were collected and analyzed during the summer months in both 2015 and 2016. Data will be presented to demonstrate that dramatic improvement from baseline conditions in water quality, microcystin and algal/cyanobacterial community composition took place within two years of the start of the aeration system.

Concurrent 2 – Dam Safety

Title: Which Project Should We Work On? A Risk-Based Approach

Author: David Moore, Tetra Tech

Biography: Mr. Moore is a Senior Project Manager for Tetra Tech. He has over 20 years of experience in managing and planning, design, construction, and operation of water resource projects including multipurpose dams, levees, and flood risk reduction projects.

Abstract: Due to aging infrastructure, many agencies who are responsible for dams, levees and flood risk reduction projects are challenged with high operation and maintenance needs and a limited budget. We will present four such cases where we have supported agencies in adopting risk management to maximize their investments in dams, levees and other flood risk reduction infrastructure. We will discuss

customized decision support systems that combine risk, system condition, economic impacts and consequences to help identify the greatest opportunities for reduction of risk. The agencies include: Southeast Louisiana Flood Protection Authority-East (Surge Barriers and Closure Structures in New Orleans); Colorado Parks and Wildlife (Dam Portfolio Management); North Lafourche Levee District and Cameron Parish in Louisiana (levees, pump stations, coastal restoration and channels).

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Title: Fragility Analysis for Flood Protection of Berms

Authors: Ahmed "Jemie" Dabaneh, RIZZO Associates; Mark Schwartz, RIZZO Associates; and Erdem Tasyan, RIZZO Associates

Biography: Dr. Dababneh is the Senior Director for the Hydrologic/Hydraulic and External Risk Department. He has experience in the areas of project management, post Fukushima flooding reevaluations, civil, water resources, and coastal engineering.

Abstract: Fragility curves provide joint probabilities of failure that can be used in risk assessments. A fragility analysis generally includes consideration of a thoroughly vetted set of potential failure mechanisms. For this case study levee failure modes associated with flooding are considered. As part of the investigation a model is used to estimate the duration of overtopping and the resulting flood depths and velocities. Monte Carlo techniques are used to estimate failure probabilities with consideration to erosion protection, wave impacts, and undercutting of the berm.

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Title: Seepage Concerns at Lake White Prompts Emergency Response

Authors: Rob Kirkbride, Stantec; Jeremy Wenner, Ohio Department of Natural Resources

Biography: Rob Kirkbride

Abstract: Labor Day Weekend of 2014 included a frantic number of phone calls responding to developing seepage and potential stability concerns at Lake White Dam near Waverly, Ohio. Lake White Dam is a Class I (High Hazard) dam owned by the State of Ohio and includes a crest length of 4,200 feet and a maximum embankment height of 40 feet. The dam has overtopped in the past and modifications were in the process of being designed when the seepage concerns occurred.

Standard inspections by the Ohio Department of Natural Resources (ODNR) staff had identified an area of seepage at the downstream toe of the spillway that had not been observed in the past. If left uncontrolled, continued deterioration leading to catastrophic failure was possible.

A call to action to mobilize a number of organizations included ODNR (multiple divisions), Ohio Department of Transportation (ODOT), Ohio State Highway Patrol, Ohio Emergency Management Agency (OEMA), Stantec Consulting Services Inc. (Stantec), contractors, material and equipment suppliers and others was initiated. This included ODNR's Special Response Team which included a

mobile communication command center to provide coordination and communication between the organizations and the public.

Within a few hours, on-site observations were being performed and decisions were being made to stabilize the area and to make a determination of how to investigate the severity of the concerns. Stabilization included providing site access, construction of a filter berm, lake level lowering utilizing siphons and construction of sandbag barriers.

The investigation performed by the ODNR/Stantec team included 24-hour monitoring, existing data review, dye testing, engineering diving, geotechnical sampling, installation of monitoring wells, spillway coring, polymer injection, flow monitoring, ground penetrating radar and seepage /stability modeling. Results of the field investigation revealed an unanticipated seepage flow path. Findings of the investigation formed the basis for final design of remedial measures. Details and lessons learned of the response, investigation and future long-term remedial measures will be discussed in this presentation.

Concurrent 3 – Stream Restoration

Title: Stream Daylighting at Cottage Grove Park

Authors: Judith Mitchell, Davey Resource Group; and Ken Christensen, Davey Resource Group

Biography: Ms. Mitchell is a senior project manager at Davey Resource Group. She has 20 years of experience in the natural resource field including wetland delineations, permitting, and stream and wetland mitigation design.

Abstract: An Ohio Environmental Protection Agency Surface Water Improvement Fund (SWIF) grant was grant was obtained in 2014 to improve surface water quality and to mitigate flooding in Coventry Township, a community located in southern Summit County. The project provided for daylighting an enclosed stream by removing storm sewers and impervious areas through Cottage Grove Park, a park that included 3 softball fields, a basketball court, mowed lawn, and a parking area. The stream was piped in the 1970's to install the park. Coventry Township and Davey Resource Group worked together to remove the undersized storm sewers through the park, and to design and construct a stream and riparian corridor. Natural channel design was used and included meanders, in-stream habitat structures, access to a floodplain, and trees planted along the stream corridor. The stream channel was sized to allow for a 1-2 year storm, with the riparian corridor designed to handle storms up to a 100-year storm. Water quality was improved by providing for nutrient and sediment retention within the floodplain and riparian corridor. Students from local schools helped to plant the stream corridor with trees and shrubs and will be monitoring the water quality in the future. In total, 1,140 linear feet of stream was daylighted with an approximate 125-foot wide riparian corridor.

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Title: Stream Restoration Using Instream Bioreactors

Author: Kurt Keljo, Franklin Soil and Water Conservation District

Biography: Mr. Keljo has been a watershed coordinator at Franklin Soil and Water Conservation District since 2011. Prior to joining Franklin Soil and Water, Kurt was the watershed coordinator for Blacklick Creek at Mid-Ohio Regional Planning Commission. His educational background includes a BS in zoology from the University of Michigan, and an MS in environmental science from The Ohio State University where his studies focused on wetlands.

Abstract: Franklin Soil and Water Conservation District has been exploring the use of bioreactor technology to treat stormwater runoff and reduce its negative effects on streams. The presentation will focus on a low cost, stream restoration project, implemented on a small (0.12 mi2 watershed), intermittent stream that is heavily impacted by stormwater runoff. Data indicate that bioreactor installation has improved water quality in the stream and had a positive impact on stream geomorphology. An analysis will be presented of pre- and post-project surveying measurements, and three years of data regarding physical parameters (temperature, conductance, DO and pH), E. coli counts, nutrient levels, macroinvertebrates and fish in the stream.

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Title: Capturing the Entire Watershed through Stormwater Retrofits

Author: Joshua White, Civil & Environmental Consultants, Inc

Biography: Joshua White

Abstract: Southern School of Energy & Sustainability (Southern) has an environmental master plan for stormwater improvements/retrofits and stream restoration that can be used as a teaching experience. These phased efforts will consist of installing wet detention basins, stormwater treatment wetlands, cisterns, and bioretention rain gardens to collect and treat runoff from the school's roofs and parking lots. These BMPs will capture, treat, and/or reuse the first 1.0 inch of rainfall for approximately 19.2 acres of impervious areas from the school. Retrofitting stormwater BMPs at Southern will provide crucial water quality improvements through infiltration, waste treatment, nutrient cycling, erosion control (sediment and stormwater retention). Retrofitting will also help with water quantity benefits by reusing the water from the wet detention basin to irrigate the athletic fields while supplying unique educational opportunities for Durham County schools. This project is intended to function as an outdoor classroom for students, allowing them to further their understanding of water quality, agricultural engineering, landscape architecture, water quality monitoring, and environmental science.

Concurrent 1- Ohio Lake Management Society: Beneficial Reuse of Dredged Material

Title: Panel: Beneficial Reuse of Dredged Material Program Overview

Authors: Pam Allen, Ohio Environmental Protection Agency; Joe Cappel, Toledo- Lucas County Port Authority; John Hull, Hull & Associates; Jim White, Cleveland- Cuyahoga County Port Authority; Rui Liu, Kent State University

Biography: *Mr. Cappel* is responsible for working with the Port Authority's existing and potential business partners in developing and expanding business opportunities in the Toledo Region. Mr. Cappel is also involved in many other facets of Port Authority operations including grant writing and administration, terminal development, lease negotiations, marketing, social media, dredge material management, port security and public relations. Joseph joined the Port Authority in September 2004. A native of Cincinnati, Ohio, Mr. Cappel is a graduate of The Ohio State University in Columbus, Ohio where he earned a bachelor of science in business administration at the Fisher College of Business majoring in transportation & logistics and marketing. Joseph has also obtained his Master of Business Administration from Bowling Green State University. Joseph serves on the Toledo Metropolitan Area Council of Governments Board of Trustees, Transportation Council and several other committees and is on the Editorial Advisory Board of the Great Lakes/Seaway Review Magazine. Joseph is the 63rd candidate to receive the Professional Port Manager (PPM) certification through the American Association of Port Authorities.

Mr. Hull is a registered Professional Engineer in 14 states and has more than 30 years of experience with a wide variety of engineering and environmental issues. He serves on governor-appointed committees, advises clients on complicated challenges, and guides his employees to assist Hull's clients to achieve environmentally-protective and cost-effective solutions. John founded Hull & Associates in Toledo in 1980; this engineering and environmental consulting firm now employs over 170 scientists, engineers, planners, and support staff in eight offices. John is leading efforts to recommend and implement sustainable sediment management solutions for the Toledo and Cleveland Harbors.

He serves on the Petroleum Underground Storage Tank Release Compensation Board (PUSTRCB), a position he has held for four terms, having been appointed by Ohio Governor Kasich and former Governors Voinovich, Taft, and Strickland. He is also a Trustee of Ohio Northern University and recently completed his term as a member of the Nature Conservancy (Ohio) Board of Trustees. John is recognized as a Board Certified Environmental Engineer (BCEE) in solid waste management by the American Academy of Environmental Engineers. John holds a Master of Science in Civil Engineering from Stanford University and received his Bachelor's degree in Civil Engineering from Ohio Northern University.

Mr. White is a highly regarded expert on Great Lakes and Cuyahoga River issues and was the recipient of the 2006 Ohio Lake Erie Award by the Lake Erie Commission. His efforts at the Port Authority link economic and

Dr. Liu 's specialty is in the field of sustainable construction materials and management of infrastructure and green infrastructure. He is serving on the editorial board of Journal of Material Science Research.

Abstract: Approximately one million cubic yards of material is dredged annually from the 25-mile federal Toledo Harbor shipping channel (most of this material is open lake placed) and approximately 250,000 cubic yards of material is dredged every year from Cleveland Harbor's federal channel (this material is placed in a confined disposal facility). Statewide, 1.5 million cubic yards are managed annually. A recent Ohio law directs the elimination of open lake placement of materials by 2020 as a result of concerns that the current practice of open lake placement may be contributing to Lake Erie's nutrient load and the resulting harmful algal blooms, and the increased understanding that this material has value. Local and state leaders are working diligently to identify, fund and implement alternative dredged material management practices. Workshop panelists will share the details of this massive material management challenge in Ohio and describe current and proposed innovative management solutions in Toledo and Cleveland and research being done at Kent State University to explore the value of using this material in green infrastructure projects.

Concurrent 2 – Wastewater

Title: Comparison of Batch Disinfection of Residential Wastewater with Chlorine and UV for On-site Irrigation

Authors: Kun Liu, The Ohio State University; Karen Mancl, The Ohio State University; Olli Tuovinen, The Ohio State University

Biography: Kun is a PhD candidate in Environmental Science. His research focuses on advanced treatment of domestic and food processing wastewater, including disinfection and reuse, nutrient removal through sand biofilters, hydroponic systems and reverse osmosis.

Abstract: The objective of this study was to investigate the performance of onsite batch disinfection systems with chlorine and UV for reuse of residential wastewater for spray irrigation. The wastewater received primary and secondary treatment with a two-compartment septic tank and peat biofilter before disinfection. For the chlorine batch reactor, granular chlorine (sodium dichloroisocyanurate, NaDCC) was capsulized and released into the effluent storage tank (3785 l capacity, working volume 1000 l) daily using a pellet feeder to achieve initial concentration of 1.0 mg/l free chlorine. Each capsule contained about 0.8 g NaDCC. For the UV batch reactor, effluent in the storage tank was circulated through a UV disinfection unit (25 W lamp) for 2.5 to 3.5 h. The UV batch disinfection system achieved a 1-log reduction of Escherichia coli counts after 2.5 h of circulation. The intensity of UV radiation decreased by 20% over 200 h of use. In comparison, the chlorine batch disinfection system achieved a 3-log reduction down to non-detectable levels of E. coli within 15 min of contact time, and this effect remained over 24 h. Thus the chlorine batch system showed high efficiency of E. coli inactivation. A daily dispensing system of chlorine capsules was installed, but it required monthly refills of capsulized NaDCC. To treat the same wastewater volume, the UV system required less maintenance with servicing every 5-

6 months for cleaning of the UV source, but would have required at least 10 h of recirculation to achieve E. coli reduction comparable to chlorine based inactivation. Both chlorine and UV batch disinfection systems have the potential to reduce pathogens in daily onsite wastewater treatment, but the disinfection by-products and cost of treatment are different. Subsequent discharge of effluent by spray irrigation mandates efficacious disinfection to alleviate potential introduction of pathogens to unconfined environment.

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Title: Beneficial Use of Algae for Sustainable Wastewater Treatment, Five Year Treatment System Performance Update

Authors: Matt Gramza, Civil & Environmental Consultants, Inc

Biography: Mr. Gramza is a Water Resources Engineer and Certified Floodplain Manager with more than 19 years of experience. He currently serves Civil & Environmental Consultants, Inc. as a Senior Project Manager. His project experience includes wastewater treatment

Abstract: Algae is often considered the enemy in many of our nations' rivers and lakes in the form of Harmful Algal Blooms. In stark contrast, we will highlight a beneficial use technology featuring algae in a highly efficient wastewater treatment filtration process. Algaewheels use wastewater nutrients, sunlight, and carbon dioxide generated by bacteria in the system to grow algae in a controlled environment. In turn, the algae produce oxygen that the bacteria use to convert organics from the wastewater into carbon dioxide. Using algae for wastewater nutrient removal requires less energy, produces less sludge, and removes more contaminants than traditional biological treatment systems. This presentation is an update to one given at the 2013 WMAO Annual Conference which highlighted the technology, design, and construction of a decentralized wastewater treatment system powered by Algaewheel at the Cincinnati Nature Center. This update tells a successful story of system performance over the past five years including the necessity to treat much higher sanitary wastewater strengths than were previously determined in the treatment study and keep up with tremendous growth of the membership and visitations at the Cincinnati Nature Center. The system is required to treat wastewater to very high effluent water quality standards to avoid nutrient overloading in the receiving stream. It has consistently excelled at ammonia removal, a particularly difficult nutrient to treat in small wastewater treatment systems. The system utilizes flow equalization to keep the treatment consistent and effective. The design goal of implementing a low energy and sustainable treatment system is being achieved with a 50-75% reduction in energy usage and associated costs. The project has won several awards including the 2015 USGBC/Business Courier Green Business Award. The talk will summarize actual treatment system performance data including effluent water quality and energy usage.

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Title: Treating High Salt Wastewater with Sand Bioreactors

Authors: Kristen Conroy, The Ohio State University; Karen Mancl, The Ohio State University; Olli Tuovinen, The Ohio State University; Yu Zhongtant, The Ohio State University

Biography: Ms. Conroy is currently a University Fellow at The Ohio State Univeristy, Kristen is working on getting a Masters in Food, Agriculture and Biological Engineering. She has always been interested in water and especially enjoys working with the sand bioreactors.

Abstract: The treatment of high salt (>1% NaCl) wastewater is needed in Ohio for pickling, meat curing and tannery industries. High salinity wastewaters are also generated by other sources such as sea water sewage systems, some pharmaceutical processes and fish processing. Searching for novel solutions for biological treatment of saline wastewaters is increasingly important as mechanical and chemical treatments continue to rise in cost and environmental regulations become more stringent. The purpose of this study was to assess the feasibility of treating highly salt turkey processing wastewater with sand bioreactors. Lab-scale sand bioreactors consisted of three layers made of 6 inches of gravel, 6 inches of coarse sand and 18 inches of fine sand in 6 inch diameter vertical columns. The columns were dose fed at 1 gal/ft2/day using turkey processing wastewater as a control, then adding 6, 13 and 35 g NaCl per liter of wastewater. The sand bioreactor treating 35 g NaCl/L wastewater was inoculated with a sample of marine sediment. The removal of ammonia, total organic carbon (TOC) and chemical oxygen demand (COD) was monitored over the initial three month period. Each bioreactor successfully removed >90% ammonia, TOC and COD after initial lag periods of 5-7 weeks. This study shows that biological treatment of high salt content wastewater may be feasible using sand bioreactor technology.

Concurrent 3- Monitoring and Assessment

Title: Volunteer Stream Quality Monitoring: Fostering Community Engagement in Ohio's Scenic Rivers

Author: Matthew Smith, Ohio Department of Natural Resources

Biography: Mr. Smith, North East Region Scenic Rivers Manager, has an Associates of Applied Science Degree in Fish & Wildlife Management from Hocking College and a Bachelor's of Specialized Studies Degree in Aquatic Biology from Ohio University.

Abstract: The Ohio Scenic Rivers Program has had great success partnering with communities, government agencies, non-profit organization, businesses and individuals for the conservation of fourteen of the State's outstanding river ecosystems. Conservation goals have been achieved through regulation, implementation of innovative ideas, recreation, discussion of storm water management and emphasis on the importance of floodplain management. However, the most important tool that has enabled the success of the Scenic Rivers Program has been education and outreach through the Volunteer Stream Quality Monitoring Project. Volunteer Stream Quality Monitoring focuses mainly on the basic study of aquatic macroinvertebrate communities in Ohio's fourteen designated State Scenic Rivers. Introducing individuals to their first crayfish, mayfly or leech sparks a relationship. Participants become empowered with information and understanding; qualities that drive advocacy and

conservation action. Since the inception of the Volunteer Stream Quality Monitoring Project in 1983, most that 150,000 individuals and groups have participated in over 150 locations across Ohio. In 2015 alone, the Scenic Rivers Program had over 8,000 individuals participate state wide. This participation has helped the Ohio Scenic Rivers Program be successful. Sharing the methods behind our success may be valuable to other conservation organizations looking to grow voices for their waterways.

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Title: Integrating remote sensing images for in-season nitrogen management

Authors: Sami Khanal, The Ohio State University; et al.

Biography: Dr. Khanal is an environmental scientist currently working in the Department of Food, Agricultural and Biological Engineering at the Ohio State University. She focuses on quantifying ecosystem services utilizing GIS, remote sensing and modeling approach

Abstract: Remotely sensed images collected during the crop growing season offer opportunities for agronomists and growers to evaluate variability in soil and crop conditions for improving in-season management of nutrients and other inputs. However, many times images are unprocessed or inaccessible within a timely manner limiting value to growers. The objectives of this study were to investigate the relationship between corn grain yield and different types of remote sensed images collected over the growing season while connecting to important in-season nitrogen (N) management decisions including the corn yield prediction. Assessing the temporal change in spectral properties of corn plant as the function of N treatment is another objective of this study. Nitrogen rate and timing fertilization experiments utilizing twenty four different combinations of anhydrous ammonia application, N application in planter passes, side-dress and late season N application were conducted in 2015 for corn (maize). Aerial images were collected over the corn growing season for the various N management combinations, and geo-corrected for the analyses. Vegetation indices (VIs) and ratios derived from aerial images were examined temporally across various N treatments to assess their potential in explaining in-season N-stress in corn and yield variability. Among various VIs and ratios, plant pigment ratio (PPR) was found to be highly correlated to corn grain yield, and it correlated more with corn yield as corn growth stage progressed. A strong relationship existed between PPR and corn yield in plots particularly with limited N application. This result suggested that N as a limiting factor of corn yield but also that N application could be delayed to late-season growth stage while reducing overall N application. These results indicated that early season estimation of crop condition through remote sensing offers opportunities for better in-season N management.

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Title: Freshwater Mussels – The not so Silent Sentinels for Water Quality

Authors: Michael Hoggarth, Stone Environmental Engineering & Science, Inc

Biography: Dr. Michael Hoggarth is Professor of Biology at Otterbein University and Principal Ecologist with Stone Environmental Engineering and Science. He is one of the co-authors of The Mussels of Ohio

and has studies the ecology and systematics of mussels for 30 years. He will be presenting his paper today with Teagan Loew, Project Ecologist, also with Stone Environmental, who will describe the results of a recent mussel survey on the Blanchard River in Findlay, Ohio.

Abstract: Ecology is the study of the distribution and abundance of organisms in nature. Organisms, then, are sentinels of their environment. Aquatic animals, like freshwater mussels (family Unionidae), integrate three broad aspects of their environments: the quality of the chemical and physical attributes of the water (water quality), the presence or absence of their habitat (habitat quality) and who else is there (symbiotic function). Freshwater mussels are ideal for aquatic ecological assessment because 1) they are large and live a long time, 2) they represent a diverse assemblage of species with varied response to environmental conditions, 3) they depend on a host to complete their life cycle, 4) their taxonomy is sufficiently complete, and 5) they often leave their dead shells behind as a testament of their historic occurrence in a stream even though they may be absent today. Recently the US Fish and Wildlife Service and state departments of natural resources have acknowledged the importance of mussels in streams and have developed protocols for the assessment mussel community structure. Our discussion will focus on the presence of freshwater mussels in streams and what these animals tell us about stream quality, and how and why mussel surveys are conducted, with some examples of surveys performed in Ohio.

Poster Session

Poster 8 - Title: Reducing Harmful Algal Blooms in the Lake Erie Watershed: Investments in Nutrient Reduction from Non-Point Sources, 2010-2015

Author(s): Anish Akella Naga Venkata, Kent State University

Biography: Anisha Akella Naga Venkata is a Masters student at Kent State University concentrating in Health Policy and Management with interests in the field of environmental policy. She presents this poster to supplement the broader findings of KSU research team.

Abstract: Harmful Algal Blooms in Lake Erie have been a public concern for 50 years, although the concerns have heightened in recent years due to their growth and impact in the western basin of Lake Erie (IJC, 2014). Algal blooms result in impairment in water quality, hypoxia, and imbalance in the ecosystem. Excess nutrients (particularly phosphorous in addition to nitrogen) in Lake Erie are known to result in harmful algal blooms (IJC, 2014). Runoff from non-point sources is the largest source of excess loadings and elevated concentrations of the above-mentioned nutrients in the Lake Erie watershed (IJC, 2014; Ohio Phosphorous Task Force, 2013). The objective of this study is to obtain a snapshot of current federal and state funded projects in the Lake Erie watershed that are aimed to reduce nutrient inputs from non-point sources. An inventory of non-point source reduction activities and projects has been the primary method adopted to fulfill this objective. This poster will present the research findings under three broad headings: the type of initiatives (directly targeting nutrients, indirectly targeting nutrients, education/research/monitoring efforts, others), number of initiatives under each type, and their

expenditures. The result of this study is a systematic guide to federal and state supported non-point nutrient reduction efforts in the state of Ohio.

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Poster 5 - Title: Modelling the effects of green infrastructure on stormwater reduction at a catchment scale

Author(s): Seema Bardhipur, Cleveland State University; Ung Tae Kim, Cleveland State University

Biography: Seema Bardhipur is a graduate research assistant in Civil and Environmental Engineering Department at Cleveland State University focusing on Water Resources Engineering for a Master's degree.

Abstract: There is a strong challenge for controlling the excess runoff from impervious surfaces. The frequency and intensity of flood may increase by changing climate as well as rapid urbanization. One of the best approaches is low impact development (LID) practices using green infrastructures (GIs). However, to evaluate the benefits of GIs is not an easy task due to parameterizations of GIs and subcatchments. The goal of this study is to provide a practical guideline to parameterize and simulate popular GIs in residential areas. EPA Storm Water Management Model (SWMM) was selected as a test simulator due to its awareness by water resources engineers. Bio-retention cells and rain barrels are identified as popular GIs in many Cleveland areas. A residential subcatchment in Parma, Ohio was selected for demonstration examples. The hydrologic properties of a subcatchment and sewer networks were determined using Cuyahoga County Geographic Information System. GIs (bio-retention cells and rain barrels) were carefully parameterized into SWMM LID modules through field survey and existing related report. All step-by-step procedures were well documented. SWMM parameters were calibrated using the observed rainfall-runoff events with and without GIs. Finally, the calibrated models are used to evaluate the effects of GIs on existing stormwater drainage networks under various rainfall scenarios (25-, 50-, and 100-year return periods). The guideline developed in this study are easily applicable to other similar watersheds to evaluate or design GIs.

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Poster 15 - Title: Potential Applications of Lightweight Aggregate Made from Dredged Material in Green Infrastructure

Author(s): Shruit Bhairappanavar, Kent State University; Rui Liu, Kent State University; Reid Coffman, Kent State University

Biography: No biography provided.

Abstract: Open water placement of dredged material in Lake Erie will be banned in the State of Ohio after July 1, 2020. However, eight federal navigation harbors built along Ohio's Lake Erie coast still need remove more than 1.5 million cubic yards (CY) of sediment. How to treat the huge amount of material removed from the ports in Ohio is a major challenge. Disposal of the dredged material in a confined

disposal facility (CDF) is costly. An alternative to disposal is to reuse the dredged material in the built environment as a construction and landscaping material. A lightweight aggregate (LWA) prototype using the dredged material taken from a confined disposal facility in Cleveland has been developed by the researchers at the Kent State University, and it has been proved the LWA has high water retention capacity and stable physical properties. The toxicity risk of using the LWA was proved to be low. An ongoing research at Kent State University is advancing investigations of the performance of raw dredged material and the LWA made from the dredged material as growth substrate and structural soil in green infrastructure construction, to manage stormwater runoff and improve the quality of runoff. This presentation briefly discusses the physical properties of the LWA made from the dredged material and proposes potential applications in various types of GI e.g. porous pavement, bioretention swales, bioretention cells or rain gardens, etc. which emphasizes infiltration and hydrological retention to provide a flexible and affordable solution to manage stormwater, which may help remediate urban brownfields in many industrial cities in the State of Ohio.

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Poster 12 - Title: Pressure and Frequency Effects on Self-cleaning Piezoelectric Membranes

Author(s): Monica Chan, The Ohio State University; Ioannis Mergos, The Ohio State University, Linda Weavers, The Ohio State University; Hendrik Verweij, The Ohio State University

Biography: Monica Chan is a junior in Chemical Engineering at The Ohio State University. She is originally from Cleveland Heights, Ohio. She has worked in the lab of Dr. Linda Weavers since her second year of college. Her research focuses on increasing sustainability of membranes in water treatment systems through fouling inhibition. She has also gained experience in ceramic processing through her research. Following graduation, she hopes to continue involvement in the water treatment field by working in industry or attending graduate school.

Abstract: Water filtration membranes are used to selectively remove contaminants from water by a variety of physical and chemical mechanisms. Membranes used in industrial processes and wastewater treatment become fouled when particle accumulation develops a layer on the membrane surface or in the membrane pores that results in a decrease in flux. Since fouling can slow processes and be costly to clean, finding methods to clean membranes is critical. Sonication is a technique for membrane cleaning. Sonication works through applying an external ultrasonic source to generate cavitation bubbles that clean membrane surfaces though physical and chemical means. This research explores the fouling inhibition potential of piezoelectric membranes through internally generated ultrasound. Previous work has shown that ceramic microfiltration membranes made of porous lead zirconate titanate (PZT) inhibit fouling when voltage is applied. During voltage application, a mechanical response is generated by these membranes. These membranes vibrate, which releases ultrasonic pressure waves that inhibit formation of a fouling layer.

In this study, dead-end filtration was run at constant pressure with 500 nm latex particles to observe fouling. These particles were chosen as model foulants since they are mono-disperse and are larger than the membrane pore size of ~350 nm. Voltage was applied at resonant frequencies between 60 and 100

kHz to study fouling inhibition of these membranes at various pressures. In all cases, the membranes produced a high rejection of latex particles (>99%). The fouling inhibition was strong at several pressures when voltage was applied while the flux significantly declined with no voltage. Fouling inhibition effectiveness was strongly dependent on frequency. Different frequencies yielded different vibrational modes that were further studied in COMSOL Multiphysics 4.3b. The development of these self-cleaning membranes will improve efficient use of membranes in water treatment.

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Poster 7 - Title: Algae Bloom Forecasting Model for Western Lake Erie using Genetic Programming

Author(s): Amin Daghighi, Cleveland State University; Ung Tae Kim, Cleveland State University

Biography: Amin Daghighi is a graduate research assistant in Civil and Environmental Engineering Department at Cleveland State University focusing on Water Resources Engineering for a Master's degree.

Abstract: Harmful algal blooms (HABs) have been documented for more than a century occurring all over the world in both fresh and salt waters. A study has shown that approximately $2.2 billion is lost annually to freshwater eutrophication in the U.S. Recently, the number and frequency of HAB cases have drastically increased. The western part of Lake Erie has suffered from cyanobacteria blooms for many decades. These HABs were prevalent in the 1950s and 1960s and then were scarce for nearly twenty years until they came back in the late 1990s. The purpose of this study is to improve HAB forecast accuracy in western Lake Erie by letting watershed features tell the behavior of HABs. This study tests two machine learning techniques, artificial neural network (ANN) and classification and regression tree (CART), to forecast HAB indicators in western Lake Erie. Although these techniques have been tested in various countries, none of models was consistently maintained for real-world HAB forecasting. A stepwise regression was performed to identify the best correlation between various watershed features including climate and nutrient loading variables with Chlorophyll-A and Microcystin concentrations. Numerous ANN and CART models were created with different combinations of input variables and response variables. The final implementable form of both ANN and CART models will be coded in a user interface system to forecast monthly Chlorophyll-A and Microcystin concentrations (or classified severity index based on concentrations). The forecasting system developed will allow watershed planners and decision-makers to timely manage HABs in western Lake Erie.

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Poster 9 - Title: Exploring the Benefits and Practicality of Two-Stage Ditches

Author(s): Clair Heitkamp, Ohio Northern University

Biography: Claire Heitkamp is currently a senior at Ohio Northern University majoring in Civil Engineering.

Abstract: While looking at normal trapezoidal drainage ditches in Hardin County, two major concerns are apparent including phosphorus runoff from local farm fields and the hazard for heavy flooding. Due to the runoff from the fields, phosphorous has rapidly become an issue based on its contribution to the increase of cyanobacteria (blue-green algae), and as a result has become a hazard for drinking water. Another issue that is faced is the high potential for flooding. When the ditches experience high flow rates, water has no other option but to travel fast downstream, eventually flooding the Blanchard River in Findlay, Ohio and other surrounding areas. One way to help prevent any further damage resulting from the high concentrations of phosphorus and flooding is by implementing two-stage ditches. Two stage ditches contain both an inset channel and floodplain areas, otherwise known as benches. These benches serve as a natural filtration system and is proven to help prevent phosphorus and other unwanted minerals and sediments from flowing further downstream, and therefore, improve the water quality. Not only will the benches serve as a filter strip, but it will act as a better storage area for excess flow. The benches provide areas for large flows to spread out, which in turn reduces the peak flow and extends the time it takes for the water to travel further downstream. This will ultimately result in less flooding throughout the surrounding areas. Through modeling and computer simulations, we plan to demonstrate the positive effects two-stage ditches have on flood control and prevention. By implementing two-stage ditches near the farm fields in the Harding County area, it is hopeful that both issues are addressed.

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Poster 10 - Title: Modeling a short section of the Lower Olentangy River surface profile using new, high-resolution bathymetry data

Author(s): Ted Langhorst, Ohio State University;

Biography: Ted Langhorst is a research assistant at the Ohio State University, currently working on improving bathymetry data collection, cross-sectional area estimates, and a gradually varied flow (GVF) model of the Olentangy River.

Abstract: The Lower Olentangy River in Columbus, Ohio has a sharp change in slope and width near the crossing of the Henderson Rd. bridge. This sudden change in morphology had not been directly addressed, but previous studies suggest that these changes are results of the low-head dam near North Broadway, three kilometers downstream. The water surface elevation (WSE) is modeled by solving a gradually varied flow equation with input data collected by 16 stream gages in 2014, a nearby USGS gage station, and bathymetry data collected with a depth sounder in 2015. Two WSE profiles are computed, one using observed water elevation at the dam as a boundary condition, and the second using a boundary condition representing water elevation without the dam. The model shows the dam is not solely responsible for the change in surface slope, and that a 22.9% decrease in bed slope also contributes. The model developed for this study provides high resolution surface profiles and channel bathymetry, making it useful for the water management community.

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Poster 4 - Title: Winter Warming of a Wastewater Treatment System using a Greenhouse Heat Recovery System

Author(s): Wee Fong Lee, The Ohio State University; Christopher Gecik, The Ohio State University; Peter Ling, The Ohio State University; Karen Mancl, The Ohio State University

Biography: Wee Fong Lee is a PhD student from The Ohio State University. He graduated with a BS and MS in Agricultural Engineering from the same university. His research focus is on sustainable energy in greenhouse engineering.

Abstract: The project objective was to build and evaluate a heat recovery system using a greenhouse. Biological treatment processes are temperature dependent. Ammonia removal is especially sensitive to low temperature. A high tunnel greenhouse was constructed over a sand bioreactor wastewater treatment system. Sensible and latent Heats were recovered during the day from hot and humid air, using air-to-refrigerant and refrigerant-to-water heat exchangers. The heat was stored in an insulated water tank. At night, when bioreactor temperature dropped, stored heat would be delivered to the bioreactor by a radiant heat network placed on top of the insulated bioreactor. As a control, the temperature of an outside bioreactor was also measured. The system was tested in March when the outside air temperature was 3 °C at night and raised to 11 °C during the day. The system successfully extracted heat from the air during the day and delivered it to the bioreactor at night. The system was able to maintain 5.5 C higher than control. The system appears feasible to improve winter warming of the wastewater treatment system.

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Poster 3 - Title: Using Oxygen Isotope Ratios to Differentiate Sources of Phosphates Entering the Western Basin of Lake Erie

Author(s): Melanie Marshall, Bowling Green State University; Kevin McCluney, Bowling Green State University

Biography: Ms. Marshall is a PhD student at BGSU, researching the effects of pharmaceuticals on linked aquatic-terrestrial food webs as well as the use of oxygen isotope ratios in phosphates entering into Lake Erie and contributing to the growth of algal blooms.

Abstract: Algal blooms in Lake Erie have been receiving considerable attention from researchers as well as from members of society. These blooms are thriving on the nutrients provided by the waterways emptying into this drainage basin. Phosphorus, added to rivers in the form of phosphate, is believed to be a limiting factor in this growth. I am part of a project that is striving to determine the origin of phosphates in the main rivers flowing into the Western Basin of Lake Erie. This study is highly collaborative including ecologists and chemists from The Ohio State University, The National Center for Water Quality Research at Heidelberg University, and those of us at BGSU. My contribution to this research is centered on the analysis of the stable isotope ratios of oxygen. Phosphorus has only a single stable isotope, however the oxygen that is tightly bound to phosphorus in phosphate molecules has

multiple stable isotopes. Through the completion of a lengthy protocol of analytical chemistry, silver phosphate can be precipitated from water samples. This product can then be used to provide 18O:16O ratios. By performing this analysis on varying possible sources of river phosphates and on the waterways themselves, the goal is to be able to differentiate among the major contributors of stream phosphorus feeding potentially toxic algal blooms.

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Poster 1 - Title: Phosphorus Removal in Resorted Streams

Author(s): Gabrielle Metzner, Bowling Green State University

Biography: Ms. Metzner attended Ohio Northern University for her BS in environmental and field biology and she is currently attending BGSU for an MS in ecology. She has a passion for nature and enjoys capturing its beauty through photography, drawing, and painting.

Abstract: Recent algal blooms in Toledo, OH and around the world have grabbed the attention of the public and highlighted the consequences of nutrient loading to our rivers and lakes. Research shows that phosphorus is a limiting nutrient and is important for life (ex. DNA, RNA, ATP, etc.) (Sterner and Elser 2002) but too much of a good thing can have negative consequences. High concentrations of phosphorus in water bodies can lead to an increase in phytoplankton growth. This can block sunlight from penetrating the water column creating a hypoxic environment leading to fish kills (Withers and Jarvie 2008). Thus, it is important that we understand sources and sinks of phosphorous. My research will look at the rate of phosphorus removal through the emergence of aquatic macroinvertebrates. As adults, emergent insects transfer phosphorus from the aquatic system to the terrestrial system (sensu Sanzone et al. 2003). Insect samples (via floating emergence traps and sticky traps) will be taken at sites varying in floodplain geomorphology and vegetation; without restoration efforts, with restoration efforts, two stage ditches, and self-forming streams. By measuring the phosphorous content and density of these emergent insects, we can estimate their contribution to phosphorus removal from the watershed.

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Poster 14 - Title: Tree level hydrodynamic approach for resolving aboveground water storage and stomatal conductance and modeling the effects of tree hydraulic strategy

Author(s): Golnazalsadat Mirfenderesgi, The Ohio State University; et al.

Biography: Mrs. Mirfenderesgi is a Civil and Environmental Engineering PhD candidate at the Ohio State University, expected to graduate this summer. Her current academic advisor is Prof. Gil Bohrer.

The focus of her PhD research is on improving the prediction of transpiration in hydrological and land surface models by modeling the hydrodynamic processes within plants. She has formulated, developed, and verified a tree-scale hydrodynamic model of transpiration called Finite-difference Ecosystem-scale Tree-Crown Hydrodynamics model version 2 (FETCH2). FETCH2 resolves the fast dynamics of stomatal

conductance at the tree level through a multi-layer canopy. FETCH2 uses atmospheric forcing from the land-surface model, simulates water flow through trees as a system of porous media conduits, and calculates realistic hydraulic restrictions to stomatal aperture. Mrs. Mirfenderesgi also has other experiences such as data assimilation, bayesian analysis and hydrological modeling. During her Masters studies, she performed a comparative analysis of meta-models in an adaptive meta-modeling-based optimization in basin-scale optimum water allocation.

Abstract: The Finite-difference Ecosystem-scale Tree-Crown Hydrodynamics model version 2 (FETCH2) is a tree-scale hydrodynamic model of transpiration. The FETCH2 model employs a finite difference numerical methodology and a simplified single-beam conduit system and simulates water flow through the tree as a continuum of porous media conduits. It explicitly resolves xylem water potential throughout the tree's vertical extent. Empirical equations relate water potential within the stem to stomatal conductance of the leaves at each height throughout the crown. While highly simplified, this approach brings additional realism to the simulation of transpiration by linking stomatal responses to stem water potential rather than directly to soil moisture, as is currently the case in the majority of land-surface models. FETCH2 accounts for plant hydraulic traits, such as the degree of anisohydric/isohydric response of stomata, maximal xylem conductivity, vertical distribution of leaf area, and maximal and minimal xylem water content. We used FETCH2 along with sap flow and eddy covariance data sets collected from a mixed plot of two genera (oak/pine) in Silas Little Experimental Forest, NJ, USA, to conduct an analysis of the intergeneric variation of hydraulic strategies and their effects on diurnal and seasonal transpiration dynamics. We define these strategies through the parameters that describe the genus-level transpiration and xylem conductivity responses to changes in stem water potential. Our evaluation revealed that FETCH2 considerably improved the simulation of ecosystem transpiration and latent heat flux than more conventional models. A virtual experiment showed that the model was able to capture the effect of hydraulic strategies such as isohydric/anisohydric behavior on stomatal conductance under different soil-water availability conditions.

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Poster 11 - Title: Treatment of Cyanotoxins in Source Waters Using Recycled Plastic

Author(s): Igor Mrdjen, The Ohio State University

Biography: Mr. Mrdjen is a PhD student at the Ohio State University College of Public Health, whose research revolves around the environmental and public health impacts of harmful algal blooms (HABs), with a broad focus on detection, treatment, and outcomes of exposure to cyanotoxins.

Abstract: Microcystin (MC) toxin is a hepatotoxin produced by various cyanobacteria during harmful algal blooms (HAB's) that occur due to eutrophic conditions in freshwater environments. Currently, advanced treatment methods can remove MC from drinking water, but these methods are costly and do not address the issue of recreational water exposure. Here we aim to investigate the feasibility of the concept of using recycled plastic as an adsorbing medium for passive removal of MC toxin from freshwater sources so that it can decrease the toxin concentration in water resources used for

recreation, agriculture, aquaculture, and drinking water sources. For this, ~20 µg/L MC-LR was exposed to polypropylene plastic in glass containers at different temperatures (22°C, 37°C, and 65°C). Water samples were then collected at 0, 1, 2, and 6 hour-intervals to examine the short term treatment efficiency (working volume, 250 mL water/sample). Sampling was also done at 24 hours, 3 days, and 6 days to determine the long-term treatment efficiency. MC concentrations were analyzed using ELISA and the results showed: 1) a maximal reduction of nearly 80% of initial MC after treatment with polypropylene plastic; and 2) the MC reduction seemed to be temperature dependent, with 65°C temperature being the most effective, and 22°C being the least effective. A simple cost analysis was also done to investigate whether the technique could be employed in an affordable manner. We conclude that this method of treatment warrants further investigation and optimization, in hope of developing an, inexpensive, rapid and on-site treatment method at water sources under various situations, including resource-limited settings and emergency situations due to heavy blooms.

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Poster 6 - Title: Forecasting Harmful Algal Bloom for Western Lake Erie using Data-Driven Machine Learning Techniques

Author(s): Nicholas Reinoso, Cleveland State University; Amin Daghighi, Cleveland State University; Ung Tae Kim, Cleveland State University

Biography: Nicholas Reinoso is a graduate research assistant in Civil and Environmental Engineering Department at Cleveland State University focusing on Water Resources Engineering for a Master's degree.

Abstract: Harmful algal blooms (HABs) have been documented for more than a century occurring all over the world in both fresh and salt waters. A study has shown that approximately $2.2 billion is lost annually to freshwater eutrophication in the U.S. Recently, the number and frequency of HAB cases have drastically increased. The western part of Lake Erie has suffered from cyanobacteria blooms for many decades. These HABs were prevalent in the 1950s and 1960s and then were scarce for nearly twenty years until they came back in the late 1990s. The purpose of this study is to improve HAB forecast accuracy in western Lake Erie by letting watershed features tell the behavior of HABs. This study tests two machine learning techniques, artificial neural network (ANN) and classification and regression tree (CART), to forecast HAB indicators in western Lake Erie. Although these techniques have been tested in various countries, none of models was consistently maintained for real-world HAB forecasting. A stepwise regression was performed to identify the best correlation between various watershed features including climate and nutrient loading variables with Chlorophyll-A and Microcystin concentrations. Numerous ANN and CART models were created with different combinations of input variables and response variables. The final implementable form of both ANN and CART models will be coded in a user interface system to forecast monthly Chlorophyll-A and Microcystin concentrations (or classified severity index based on concentrations). The forecasting system developed will allow watershed planners and decision-makers to timely manage HABs in western Lake Erie.

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Poster 13 - Title: Bacterial Denitrification and Phosphate Absorption in Agricultural Wastewater

Author(s): Micah Stauder, The Ohio State University;

Biography: Mr. Stauder is an undergraduate student in the third year at Ohio State University in the environmental engineering program. He has been working on the research project for a year under the supervision of two professors in the engineering department.

Abstract: As agriculture has developed towards the wide scale use of fertilizers, excess of these nutrients in streams and lakes, or eutrophication, has become an increasing concern. Agricultural runoff of these nutrients contain high levels of phosphates and nitrates leading to large scale cyanobacterial blooms in the bodies of water receiving these nutrients. These cyanobacterial blooms cause imbalances in aquatic ecosystems and produce compounds that lead to water quality concerns for the people that rely on the body of water. Previous studies have analyzed potential ways of removing these nutrients by capturing phosphates with metal-rich solids or by relying on bacteria or plant utilization of nitrates. However, there has yet to be a system developed that simultaneously removes both phosphate and nitrate in a way that could be contained within an agricultural drainage site. The purpose of this study is to analyze the potential of waste solids from coal flue gas desulfurization (FGD) for the removal of phosphate in conjunction with the removal of nitrate through bacterial denitrification. Batch and column tests were used to analyze the effectiveness of the FGD material in capturing phosphate and nitrate in an aqueous solution. Ion chromatography analysis was performed on the water samples to determine changes in phosphate and nitrate concentrations. The results of several column studies showed that the FGD material removed a large percentage of phosphate from the water samples. However, very little nitrate loss was seen. These results confirmed the effectiveness of the FGD material for removing phosphate through absorption, but another component of the system is needed if nitrate concentrations are to be reduced. The addition of organic matter to the system in order to promote bacterial denitrification is currently being tested in order to develop a complete system for reducing both nitrogen and phosphorus nutrients in water bodies.

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Poster 2 - Title: Measurements of water surface variables in anticipation of the Surface Water and Ocean Topography mission SWOT and potential applications of SWOT for water resource management in Ohio

Author(s): Steve Tuozzol, The Ohio State University; Dr. Michael Durand, The Ohio State University

Biography: Mr. Tuozzol is a PhD student at Ohio State and works in Dr. Mike Durand's research group at Byrd Polar Research Center. Steve's research is funded by a NASA Earth Systems Science Fellowship and focuses on land surface and fluvial hydrology.

Abstract: The Surface Water and Ocean Topography satellite mission (SWOT) launches in 2021 and will measure near-global swaths of water surface extent and elevation. SWOT seeks to provide these measurements on all rivers with widths larger than 100m and lakes larger than 250x250m. In

anticipation of this mission, work is being done to estimate discharge from SWOT-measurable hydraulic variables: specifically, water surface elevation, slope, and width. We present a series of in-situ measurements of those variables on a 6.5km reach of the Olentangy River in Columbus, Ohio. Data were collected at 20 sites along the study reach and analyzed in the context of Manning's equation and a proposed SWOT discharge algorithm. We show that these reach-averaged measurements fit in the context of Manning's equation with relatively low error, and that some modifications to the estimate of Manning's roughness coefficient allows for improved agreement with true gage-measured discharge. Discharge algorithm errors on the Olentangy data are shown to be large (>100% RRMSE) and highly dependent on prior estimates of discharge. Both discharge and water storage change data will have significant potential uses for both water managers and hydrologists. With such uses in mind, we examine the SWOT mission in the broader context of Ohio's water resources. We look at the coverage of water bodies and the frequency of SWOT sampling over Ohio to discuss potential applications for resource managers and watershed science.

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Thursday, November 10, 2016

Concurrent 1- Ground Water

Title: Flowing Wells in Northwest Ohio

Author(s): Curtis Coe, Ohio Department of Natural Resources

Biography: Curtis graduated from Ohio State University with his BS degree from Ohio State University in 1975. He received his MS Degree from Florida State University in 1978. He is registered professional geologist in North Carolina, Kentucky and internationally he is a registered professional geologist in Alberta Canada. He joined Ohio Section AIPG as a Certified Profession Geologist in 1983. He was Ohio Section President in 1986; He was National Chairman for the Ohio Section AIPG Meeting held here in Columbus in 1996.

Since graduating from College, Curtis has worked for industry, government, as well as Consultants throughout the USA and Canada. Research activity has included ground water supply; Coal Geology; Under Ground Storage Tank Management, Site Assessment and Remediation as well as Contaminate Transport activity of all types. He has published numerous papers on the impact of Surface and Long-Wall Deep Coal mining, Well Field Protection, and Contaminate Transport Hydrogeology

Curtis has joined the ODNR Division of Soil and Water Resources as a Hydrogeologist. He is currently conducting Ground Water Supply Conflict Investigations for High Yielding Irrigation wells, Utica Shale Oil and Gas well drilling as well as Coal Mine Permits. He is involved with Ground Water Potentiometric Surface Mapping, GIS Investigations for ground water supply exploration. He is providing Technical Support to the public, government, consultants, and Industry. You can contact Curtis at 614-265-6733 or

by e-mail at Curtis.coe@dnr.state.oh.us, with any questions you may have regarding the hydrogeology of the State of Ohio.

Abstract: Historically, a line of flowing artesian wells occurs in northwestern Ohio. The flowing wells cover a four to five-mile wide band that extends from southwestern Defiance County through southeastern Williams County and into northwestern Fulton County. In recent years, the Ohio Department of Health (ODH), Bureau of Environmental Health and Radiation Protection has been increasingly concerned with the installation and upkeep of private water system wells in this area. This investigation was set up to map and study the hydrogeologic occurrence and movement of ground water in the artesian aquifer.

Bedrock under the site consists of Antrim and Coldwater shales. These shales are impermeable and have a low porosity. They generally produce less than five gallons per minute (gpm) to drilled wells. As a result, they form a lower confining unit in the study area.

The bedrock is covered by a complex mixture of unconsolidated glacial and lacustrine (lake) sed-iments. The sand and gravel outwash was deposited over the shale bedrock in Defiance and Wil-liams Counties. Impermeable glacial and lakebed clay deposits that form an upper confining layer covers the outwash. The sand and gravel outwash deposits thicken into the Michigan Ba-sin. The sand and gravel outwash deposits pinch out in the southwestern parts of the study area where the bedrock rises along the western limb of the Cincinnati Arch.

As the ground water flows from the northwest to the southeast under the lake bottom sediments the specific capacity in individual wells declines from 17.9 to 5.02 gpm/foot. The ground water seepage velocity also decreases while the force potential of the ground water increases. This causes the pressure of the water to build up. Thus, when the potential energy builds high enough to overcome the force of gravity at the land surface, the wells will flow as observed in Defiance and Williams Counties. In some cases it is possible that the ground water stagnation point is reached where the sand and gravel pinches out against the bedrock.

In Fulton County, two ground water recharge areas exist. The western recharge area is associat-ed with sand and gravel deposits interbedded in the Williams End Moraine and Complex Aquifer Systems. The ground water recharge to the east of the flowing well zone is associated with the Oak Openings Beach Ridge Aquifer sand deposits. As a result, the ground water flow vectors in the sand and gravel aquifer converge under pressure. The ground water is being forced to dis-charge naturally to tributary channels along Bean Creek; however, the ground water is trapped in the subsurface between two confining layers. The value of the hydraulic potential is equal and opposite and the ground water has nowhere to go and thus forms a stagnation point in the subsur-face. Therefore, when wells are drilled into the underlying sand and gravel aquifer, the force po-tential of the ground water causes the water to rise in the well under artesian pressure until the potential energy of the water in the aquifer matches the kinetic energy of the water rising in the well. In cases where the force potential of the water is great enough, the ground water will rise above the land surface resulting in flowing wells

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Title: Short-term influence of coal mine reclamation using coal combustion residues on groundwater quality

Author(s): Cheng Chin-Min, The Ohio State University, et al.

Biography: Dr. Chin-Min Cheng is a senior research associate at the Ohio State University. His research interests focus on the environmental implications associated with reuse of industrial by-products and advanced water treatment technology

Abstract: Two full-scale coal mine reclamation projects using coal combustion residues (CCRs) were recently carried out at highwall pit complexes near the Conesville and Cardinal coal-fired power plants owned by American Electric Power. The environment impacts of the reclamation projects were examined by regularly monitoring the leaching characteristics of the backfilling CCRs and the water quality of the uppermost aquifers underlying the sites. With over five years of field monitoring, it shows that the water quality at both demonstration sites had changed since the reclamation began. By analyzing the change of the hydrogeochemical properties, it was concluded that the water quality impact observed at the Conesville Five Points site was unlikely due to the seepage of FGD material leachates. Reclamation activities, such as logging, grading, and dewatering changed the hydrogeological conditions and resulted in the observed water quality changes. The same hydrogeological effect on water quality was also found at the Cardinal Star Ridge site during the early stage of the reclamation (approximately the first 22 months). Subsequent measurements showed the water quality to be strongly influenced by the water in the reclaimed highwall pit. Despite the changes to the water quality, the impacts are insignificant and temporary. None of the constitutes showed concentration levels higher than the regulatory leaching limits set by the Ohio Department of Natural Resources' Division of Mineral Resources Management for utilizing CCRs in mined land reclamation. Compared to the local aquifers, the concentrations of eleven selected constituents remained at comparable levels throughout the study period. There are four constituents (i.e., As, Be, Sb, and Tl) that exceeded their respective MCLs after the reclamation began. These detections were found shortly (i.e., within 2 years) after the reclamation began and decreased to the levels either lower than the respective detection limits or similar to the background levels.

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Title: Arsenic in groundwater of Licking County, Ohio – An investigation that combined public awareness and scientific investigation

Author(s): Mary Ann Thomas, United States Geological Survey, Ohio Water Science Center

Biography: Mary Ann Thomas is a Hydrologist with the U.S. Geological Survey Water Science Center in Columbus, Ohio. Her educational background is in Geology; she received a PhD from Kent State University, and a Master's degree from the University of South Carolina. She began her career as a geologist for a major oil company, and for the past 23 years has worked for the US Geological Survey doing ground-water quality investigations. Since 2000, one of her primary interests has been arsenic in groundwater.

Abstract: Arsenic is a relatively common contaminant in Ohio groundwater, but most private wells are never tested for arsenic because well owners generally are unaware of the potential problem. In addition, scientists and regulators lack information about where elevated arsenic is most likely to occur, and this makes it difficult to target testing and education to areas of greatest need. To address both problems, the USGS designed a pilot study of arsenic in groundwater of Licking County. The study was done in cooperation with a group of county, state, and federal agencies, and was funded by the Ohio Water Development Authority.

During the summer of 2012, three "Test Your Well" workshops allowed well owners to have their water tested at no charge. Water samples were collected by homeowners and county sanitarians and were analyzed at a local laboratory. Because these methods were relatively inexpensive, it was possible to collect much more data than is typical for water-quality studies.

A total of 168 wells were tested, and about 12 percent (1 in 8) had elevated arsenic concentrations (greater than 10.0 µg/L). There was a clear relation between water quality and geology. Elevated arsenic was not detected in bedrock wells in the eastern part of the County, where the landscape is hilly and glacial deposits are thin or absent. In contrast, elevated arsenic was relatively widespread in glacial and bedrock wells in the western half of the County, where the land surface is flatter and glacial deposits are thicker. These factors are conducive to the development of geochemical conditions that allow arsenic in the aquifer solids to be released to the groundwater. Information from this study was used to develop a preliminary conceptual model of arsenic occurrence in Ohio, which can be tested and refined as more data become available.

Concurrent 2- Agriculture

Title: Blanchard River Watershed Demonstration Farms Network

Author: Aaron Heilers, Ohio Farm Bureau

Biography: Aaron is the Project Manager for the Blanchard River Watershed Demonstration Farms Network. Previously he was employed with the Auglaize Soil and Water Conservation District as a Nutrient Management Technician and is certified as a TSP with NRCS.

Abstract: The Blanchard River Demonstration Farms Network is a Great Lakes Restoration Initiative project designed to showcase and demonstrate leading edge conservation practices to improve Great Lakes water quality. Lake Erie is part of the Great Lakes System which contains 20 percent of all the freshwater in the world. Studies have identified Lake Erie as severely impacted due to excessive loadings of sediment and nutrients. Long-term water quality monitoring has identified the Maumee River as being a key contributor of nonpoint source pollution to the lake. In 2009, the Great Lakes Restoration Initiative (GLRI) committed the federal government to significantly advance Great Lakes protection and restoration. As part of this effort, the USDA Natural Resources Conservation Service (NRCS) and the Ohio Farm Bureau Federation (OFBF) have announced an agreement to establish a Blanchard River

Demonstration Farm Network, the first of its kind, in Ohio. The Blanchard River Watershed, in the Western Lake Erie Basin, will be home to a network of farms that will demonstrate standard and innovative conservation systems to reduce sediment and phosphorus entering the Western Basin of Lake Erie. The agreement between the USDA and OFBF is a five-year, $1 million project. OFBF collaborated with stakeholders in Hardin and Hancock counties, as well as NRCS and other partners, in identifying the farms and farmers who are participating and in establishing the demonstration sites. The specific objectives of the project are to: • Establish sites within the Blanchard River Watershed to test new and standard conservation systems in reducing phosphorus and sediment. • Establish an efficient mechanism to share this technology and information with farmers, agribusiness, conservation agencies and the public. • Create opportunities for others to test their research, technical and program ideas at the demonstration farms. • Share information and lessons learned from the Blanchard River Watershed throughout the Lake Erie and Great Lakes basin

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Title: Phosphorus displacement by herbicides: A new source of dissolved P for Lake Erie

Author(s): Christopher Spiese, Ohio Northern University

Biography: Dr Spiese is an Assistant Professor of Chemistry. His research focuses on phosphorus dynamics between soil and water. 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 25% of the observed increase. A related herbicide, glufosinate, and glyphosate's primary metabolite, aminomethylphosphonate, showed little to no phosphorus displacement. The underlying physical chemistry is also explored, and a model for phosphorus loss by glyphosate was constructed. The in situ loss of phosphate was determined for plots exposed to glyphosate and phosphate fertilizer under simulated rainfall conditions.

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Title: Reducing Nutrient Flows to Lake Erie in Ohio: An Inventory and Alternative Policy Approaches

Author: John Hoornbeek, Kent State University

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: In recent years, harmful algal blooms (HAB) in Lake Erie have created growing concerns about water quality and the potential contribution of toxic pollution to water supply systems in the Lake Erie basin. Investigators report that nutrients – and particularly phosphorus – play a key role in the development of HAB's in Lake Erie's western basin (IJC, 2014; OPTF, 2013). In addition, HAB's are likely to become more common over time, as recent research suggests that global climate change is contributing to warming trends in lakes across the globe that can lead to HABs (O'Reilly, et al, 2015). Policymakers and water quality professionals in Ohio, Washington DC, and elsewhere are thus seeking ways to address HAB problems in the Ohio Lake Erie basin and elsewhere. This presentation offers a voice articulating approaches that could be taken to reduce nutrient flows in the Ohio Lake Erie basin and elsewhere. It shares final results from a year-long project to inventory federal and state supported nutrient reduction efforts in the Ohio Lake Erie basin and identify policy tools (Hood, 1984) that are being used to address nutrient enrichment in other major water bodies around the United States (US). To develop our inventory of Ohio-Lake Erie basin nutrient reduction efforts and to identify policy tools used to reduce nutrient flows in other American water basins, we relied on web searches, reviews of literature, and targeted interviews with knowledgeable water quality professionals. The result is an informed menu of potential nutrient reduction policy approaches that we seek to share at WMAO's 2016 Fall conference. This presentation updates preliminary findings offered at WMAO's 2015 Fall conference, and provides more specific information on alternative policy approaches used in the Chesapeake Bay, Long Island Sound, and Tampa Bay.

Concurrent 3- Stormwater

Title: Residential green infrastructure

Author(s): John Herchl, Davey Resource Group

Biography: No biography provided.

Abstract: No abstract provided

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Title: Getting Back to Nature in Stormwater Management: The Benefits of Stormwater Wetlands

Author(s): Mark Dilley, Mary Skapof; Jenny Adkins; Aaron Laver, Daniel DeBruler, and Logan McClish; MAD Scientist Associates

Biography: Mark Dilley earned a B.S. in Natural Resources (Fisheries Management) in 1991 and a M.S. in Environmental Science (specializing in wetlands) in 2003, both from The Ohio State University. He and his wife Chris are co-owners of an EDGE-certified environmental consulting firm, MAD Scientist Associates, specializing in ecological and wetland consulting.

Mark has over 20 years of experience as a field biologist, ecologist, and wetland scientist. His academic research has focused on biological monitoring of streams and rivers and atrazine (agricultural herbicide) fate and transport processes in constructed wetlands. Mark is knowledgeable in the use of aquatic organisms as water and sediment quality indicators, including experience with U.S. EPA Rapid Bioassessment Protocols and Ohio EPA's Index of Biotic Integrity. He is an EPA-certified Level 3 Qualified Data Collector (QDC) for fish and habitat studies in Ohio.

As consultants, Mark and his staff are responsible for wetland delineation, permitting, assessment, and restoration, mitigation design and monitoring, as well as ecological surveys and ecological risk assessment. Mark manages several dozen projects annually in the areas of wetland and ecological consulting for a wide variety of public and private clients.

Abstract: Changing weather patterns, hardening of watersheds and a concern for protecting property and water quality have led to a proliferation of ordinances and engineering approaches to manage the effects of stormwater, particularly in urbanized areas. These approaches involve detaining or retaining stormwater to reduce the potential for downstream flooding and erosion and to improve water quality – all functions that were historically provided by wetlands in the natural, pre-development landscape. As stormwater management requirements continue to increase and natural areas and habitat quality diminish under increasing human demands, a return to nature as the model for dealing with runoff offers stormwater professionals an unprecedented opportunity to create and restore wetlands in urban environments. Stormwater wetlands not only accomplish the typical quantity and quality requirements for stormwater management, but can provide numerous other ecosystem services that benefit humans, wildlife, and the environment. MAD Scientist Associates has been responsible for several stormwater wetland projects, including an Ohio EPA Section 319-funded wetland restoration and enhancement project in a Westerville park and the “wetland retrofit” of a conventional storm detention basin on the campus of the New Albany Plain Local High School. These projects have been rapidly colonized by wetland biota and embraced by the local community, providing ecological benefits and raising public awareness of the beauty and intrinsic value of wetlands and natural habitat. This presentation will share some of the details of the planning of these projects, the results, associated challenges, and some of the pleasant surprises that have resulted from designing and constructing wetlands in urban environments.

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Title: Stormwater Green Street Retrofits: Lessons Learned and Expected Outcomes in Ohio

Author(s): Ryan Winston, The Ohio State University; Martin Jay, The Ohio State University

Biography: Ryan Winston is a Research Scientist in the Department of Food, Agricultural, and Biological Engineering at the Ohio State University.

Abstract: Degraded water quality in urban watersheds is often directly linked to stormwater runoff from anthropogenic impervious surfaces. Cities across Ohio are challenged to control stormwater runoff in their existing rights-of-way. Green infrastructure techniques are often touted for their ability to reduce runoff volume, but their implementation in street rights-of-way has been rarely studied. A study located in Wilmington, North Carolina, focused on a retrofitted street (two bioretention cells, two permeable pavements, and two tree box filters) and a nearby control street (no treatment). Through a paired watershed approach with calibration and treatment monitoring periods, it was shown that substantial and significant pollutant load reduction occurred for most pollutants (49% for total nitrogen, 54% for orthophosphorus 72% for total phosphorus, 91% for total suspended solids, and >50% for Cu, Pb, and Zn). Runoff volume and peak flow rate were 52% and 28% less, respectively, from the LID street vis-à-vis the control street. These results were quite promising; however, this study was located in a watershed with very low slopes and sandy soils, differing substantially from typical conditions in Ohio. The Columbus Blueprint project is a 7 year effort to characterize watershed scale impacts of LID retrofits in the right-of-way (i.e., bioretention and permeable pavement) across disciplines: hydrology, water quality, ecological engineering, economics (e.g., property values), and social science (e.g., community acceptance). An overview of the project will be presented including lessons learned to date. Four watersheds, less than 1 mi2, have been instrumented to collect hydrologic and water quality data, including a control watershed and three watersheds that will receive various levels of green infrastructure treatment. Results from this study will provide a litmus test for other communities across Ohio with respect to implementation, maintenance, and resulting benefits of the installation of green infrastructure stormwater controls on a watershed-scale.

Concurrent 1- Mineral Resources Management

Title: Potential for Remediation of Coal Mine-Derived Acid Mine Drainage by Soil-Associated Microorganisms

Author(s): Shagun Sharma, University of Akron; John M. Senko, University of Akron; Matthew Lee, University of Akron; Teresa J. Cutright, University of Akron.

Biography: Ms. Sharma received her bachelor's degree in Biotechnology from Uttar Pradesh Technical University, India. During my undergraduate studies, she worked with the Defense Research & Development Organization (DRDO) lab focusing on understanding the neurobiology of anxiety in the human brain at low temperatures. To further pursue her interest of applying technology in biological systems, she worked with Mankind Pharmaceuticals, a pharmaceutical company (antimicrobial division) to understand how we are using the end product of previous biomedical research in commercially driven fields. Ms. Sharma industrial tenure sparked an interest in learning about the resistance of ever-changing microorganisms to presently available treatments. In order to understand the complexity of interactions between different biological systems, she joined The MS program at The University of Akron in 2012, advised by Dr. Todd Blackledge. The focus of her thesis was the investigation of the biomaterial properties of spider silk and its potential use as an antimicrobial. The motivation was to integrate

different microbial techniques to learn how microorganisms respond to the presence of spider silk in their environment, and also how proteinaceous spider silk, a prospective food source, survives in the presence of bacteria.

Ms. Sharma chose to pursue her doctorate in Integrated Biosciences, Department of Biology at The University of Akron because the program provides me an opportunity to think out-of–the-box since it lies at the interface of multiple disciplines. She is currently studying bioremediation of acid mine drainage and its geochemistry in Dr. John Senko's Lab (Geo-microbiology, Environmental Biogeochemistry) as an IB student. Her work focuses on understanding the microbial mediation of redox transformation of iron and sulfur species in acid mine drainage (AMD)- impacted systems. She is also using bioinformatics to understand the changes in the microbial communities of acid mine drainage. Ms. Sharma is interested in learning how different environments affect the biology of microorganisms, how their changes proceed in the ecosystem, and how can we use microbial systems for developing novel, sustainable, and eco-friendly resources.

Abstract: Thousands of kilometers of streams are adversely impacted by acid mine drainage (AMD) in the Appalachian coal mining regions of the United States. AMD forms when oxygen-rich water interacts with coal seam associated FeS2 (pyrite), leading to the formation of acidic fluids with high concentration of Fe. Geochemical and microbiological analyses were conducted at two different actively monitored abandoned coalmine sites in southeastern Ohio: Huff Run-mineral city (MC) and corning mine pool (CMP), affecting major watersheds in their regions. These mine pools had similar chemical characteristics (MC, pH 5.5 to 6.5; Fe (II) 0.02 to 0.05 mM) (CMP, pH 6.4 to 7.1; Fe(II) 0.01 to 0.04 mM). To determine how microbial communities associated with pristine soil respond to intrusion of AMD, we incubated AMD-unimpacted soil with the two AMD types. Pyrosequencing-derived 16S rRNA gene sequences recovered from incubations revealed that both MC and CMP sites had microbial communities, with abundant phylotypes attributable to Gallionellales (MC), Legionellales (CMP), Burkholderiales (CMP), Methylophilus & Rhizobiales (methanotrophs). Incubation of CMP AMD with soil resulted increase in the contribution of Burkholderiales (21-25%) (Betaproteobacteria) in the community composition in comparison to the CMP drainage alone (5%). Incubation of MC AMD with soil led to a decline in the relative abundance of Fe(II) oxidizing Gallionellales- affiliated phylotypes (lithotrophic lineages), resulting in a microbial community with composition similar to that of pristine soil. This study indicates that minor differences in AMD chemistry elicit dissimilar responses of soil-associated microbial communities to AMD intrusion.

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Title: Mine Drainage Impact Assessment of Ohio Watersheds

Author(s): Chad Kinney, Ohio Department of Natural Resources; Benny McCammet, Ohio Department of Natural Resources; Jeff Calhoun, Ohio Department of Natural Resources

Biography: Mr. Kinney obtained a B.S. in Wildlife Biology from Ohio University in 2003, a M.S. of Environmental Studies from Ohio University in 2006. He worked as a biologist with BHE Environmental

Inc. from 2006 – 2009. Mr. Kenney is now a Biologist/Environmental Specialist 2 at ODNR, Division of Mineral Resources Management, Abandoned Mine Lands Program, 2009 – present.

Abstract: The purpose of the Mine Drainage Impact Assessment of Ohio Watersheds report is to identify and prioritize acid mine drainage (AMD) impacted watersheds in order to further assist in the development of Acid Mine Drainage Abatement and Treatment (AMDAT) plans. Watersheds that show the potential to meet state biological water quality standards based on a designated use are identified as a priority for AMDAT development. Due to the large scale of the study area and limited resources, the assessment process includes a phased approach which directs the focus to areas with significant environmental issues. The first phase (primary assessment) is to determine if AMD is present in 12 digit hydrologic unit code (HUC) watersheds that are potentially impaired by abandoned coal mines. The second phase (secondary assessment) involves a more detailed investigation of mine impacted watersheds to determine the degree and extent of impact on water quality and on the aquatic biology. The third phase (watershed prioritization) consists of developing and utilizing a ranking mechanism to prioritize watersheds for further investigation. This step involves determining which watersheds/streams are most likely to recover biologically if AMD abatement and treatment is initiated. The fourth phase is ongoing and includes the development of AMDAT plans for priority watersheds.

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Title: Appalachian Ohio Clean Watershed Initiative: Expanded Scope, Scale, and Geography

Author(s): Marissa R. Lautzenheiser, Rural Action; Jennifer Bowman, Ohio University

Biography: *Marissa Lautzenheiser* works with Rural Action as the Middle Tuscarawas River Watershed Coordinator. She coordinates watershed management projects throughout eastern Ohio and works with many local, state, and federal funding partners. She is a resident of Huff Run Watershed and has been involved in its restoration for over eight years. Marissa graduated from Malone University with a degree in Political Science and Biology.

Jen Bowman is the acting director of environmental programs at Ohio University's Voinovich School. Jen has 20 years of water quality experience and holds a Master's in Environmental Geochemistry. She coordinates the research efforts of the Appalachian Watershed Research Group across OU's campus. She leads the statewide online database management system (watersheddata.com) for watershed stakeholders and has done extensive research in acid mine drainage water quality characterization and restoration.

Abstract: Watershed restoration has been on-going in eastern and southeastern Ohio for over 20 years. Until recently most work focused mainly on remediating the effects of abandoned coal mining and the subsequent acid mine drainage (AMD). Rural Action and Ohio University's Voinovich School of Leadership and Public Affairs has long partnered on successful AMD restoration projects and supported a team of watershed professionals active in the region. Legacy AMD watersheds such as Raccoon Creek, Sunday Creek, Monday Creek, Leading Creek and Huff Run have seen incredible water quality increases

and even meeting biological attainment in some stream reaches, but success has been limited to these certain watersheds and AMD impairments.

After a year-long planning process, the Appalachian Ohio Clean Watershed Initiative (AOCWI) was formed as a collaborative project between RA and OU to expand upon the successes we've seen in AMD treatment and work on a more regional scale while addressing other rural impairments as well. With funding through an Ohio EPA 319 grant and partner ODNR-Div. of Mineral Resources Management, the AOCWI has been able to provide services and technical assistance throughout the AOCWI service area. By focusing on outreach, implementation, research, and grant development the AOCWI has been able to add capacity and support watershed restoration on a more regional scale and scope.

Concurrent 2- Nutrients

Title: Ohio Nutrient reduction Strategy: Determining Critical Ground Water Impact Areas

Author: Mike, Slattery, Ohio Environmental Protection Agency

Biography: Michael Slattery has worked as a geologist at Ohio Environmental Protection Agency since 1998. He received a Bachelor of Science degree in Earth Science from Southern Illinois University at Edwardsville. His undergraduate work involved the study of formation water mixing relationships between two oil reservoirs of the Illinois basin utilizing strontium isotopes. He received a Master of Science degree from the Dept. of Geological Sciences at UNLV and the Desert Research Institute, Southern Nevada Science Center. His focus at UNLV/DRI was on stable isotope hydrology work at the Nevada Test Site. His thesis involved the isotopic exchange between water and water vapor using tritium and the stable isotopes of water as tracers. Currently Mr. Slattery works in the Division of Drinking and Ground Waters compiling and analyzing groundwater geochemical data gathered on public water systems. Current interests include arsenic, as a naturally occurring contaminant in groundwater, and the use of nitrogen isotopes of nitrate to help determine nitrate sources in groundwater.

Abstract: No abstract provided.

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Title: Monitoring water quality in the Mohican Watershed

Author: Ozeas Coasta, Jr., The Ohio State University

Biography: Dr. Costa is a biogeochemist in the School of Earth Sciences at the Mansfield Campus of the Ohio State University. He has a PhD in aqueous geochemistry (2002) and a master's in Coastal Geology and Geochemistry (1998).

Abstract: We will present the results of long-term monitoring of nutrients in the Mohican Watershed - a mixed-use catchment in north-central Ohio - and explore the relationship between land use, precipitation, stream discharge, and nutrient concentrations. 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: Status of Water Quality in Ohio: The 2016 Integrated Report

Author(s): Rahel Babb, Ohio Environmental Protection Agency

Biography: Rahel Babb is an environmental specialist at Ohio EPA. She has worked for the Agency since 2002 and has experience in hazardous waste management, CWA Section 401 water quality certification and the State Revolving Fund program. She is currently a TMDL coordinator in the Division of Surface Water. She has a Bachelor of Science degree in Environmental Biology from the University of Dayton.

Abstract: The federal Clean Water Act was created with a goal of restoring and maintaining the chemical, physical and biological integrity of the nation's waters. In accordance with Sections 303(d) and 305(b) of the Clean Water Act, the Integrated Water Quality Monitoring and Assessment Report (Integrated Report or IR) describes and lists the condition of the state's water quality; provides an overview of how much water quality has improved; and includes an estimate of actions that are still needed. Four uses are reported on in the IR: aquatic life, human health (fish consumption), recreation and public drinking water supplies. Ohio's 2016 IR includes analysis of data acquired during 2013 and 2014 for all of the uses; recreation and public drinking water supply also includes data collected during 2015.

Concurrent 3- Green Infrastructure

Title: Hydrocarbons in Bioretention, as Measured by Carbon Isotopes

Author(s): Abigail Tamkin, The Ohio State University; Jay Martin, The Ohio State University; James Bauer, The Ohio State University; Yu-Ping Chin, The Ohio State University; Andrew Ward, The Ohio State University

Biography:

Abstract: Hydrocarbons are a prevalent pollutant in stormwater, coming from sources such as automotive fluids, combustion products, and asphalt. Quantifying hydrocarbons effectively is a priority for monitoring urban and suburban water quality, as many hydrocarbons are carcinogenic or mutagenic. Current methods of hydrocarbon measurement are known to have low detection of high molecular weight and weathered compounds which are prevalent in stormwater. We have developed a new isotopic method to quantify total anthropogenic hydrocarbons in a given sample. This method is being used to validate the existing hydrocarbon quantification methods. The methods used in the study as a baseline are US EPA Method 1664 B: N-Hexane Extractable Material (hexane extraction, gravimetric analysis) and US EPA Method 8015 (methylene chloride extraction, GC-FID extraction). Analysis of stormwater sediments shows that the isotope method is comparable to Method 8015, while Method 1664B estimates much higher concentrations. Average concentrations are: (all numbers are mg/g dry particulate mass) Isotope - 50, Method 8015 (C10-C34) - 24, Method 1664B - 946. In addition, a series of controlled, simulated rain events using synthetic stormwater were performed on a set of bioretention cells in a suburb of Westerville, OH (Columbus suburb). Preliminary analysis of particulates shows a reduction in hydrocarbons between inflow water (28% of carbon load) to first flush outflow water (10% of carbon load), to outflow water at 15 minutes (7% of carbon load). Further data from rain garden tests, as well as correlating data using the conventional methods, will be obtained this summer.

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Title: A Neighborhood-Scale Green Infrastructure Retrofit: Experimental Results, Model Simulations, and Resident Perspectives

Author(s): Anne J. Jefferson, Kent State University; Pedro M. Avelinaneda, Ken State University; V. Kelly Turner, Kent State Universiyt; Jennifer M. Grieser, Kent State University

Biography: Anne J. Jefferson is an Associate Professor in the Department of Geology at Kent State University in Kent, Ohio. Jefferson is a Leshner Leadership Institute Public Engagement Fellow of the American Association for the Advancement of Science (AAAS) in 2016-2017. Jefferson's research focuses on urban watersheds and stormwater management, hydrologic responses to climate variability and change, and landscape evolution. The goal of her research is to improve the resilience and sustainability of water resources and aquatic ecosystems in the Anthropocene. Jefferson engages in interdisciplinary collaboration with ecologists, social scientists, engineers, and architects. Her work has been funded by the National Science Foundation, US Environmental Protection Agency, and US Geological Survey among other organizations. Jefferson earned a Ph.D. in Geology from Oregon State University in 2006. From 2007-2012, Jefferson was an assistant professor at the University of North Carolina at Charlotte.

Abstract: There is growing interest in distributed green infrastructure approaches to stormwater management that can be retrofit into existing development, but there are relatively few studies that demonstrate effectiveness of these approaches at the neighborhood scale. In suburban northeastern Ohio, homeowners on a residential street with 55% impervious surface were given the opportunity to receive free rain barrels, rain gardens, and bioretention cells. Of 163 parcels, only 22 owners (13.5%) chose to participate, despite intense outreach efforts. After pre-treatment monitoring, 37 rain barrels, 7 rain gardens, and 16 street-side bioretention cells were installed in 2013-2014. The monitoring results indicate that the green infrastructure succeeded in reducing peak flows by up to 33% and total runoff volume by up to 40% per storm. The lag time between precipitation and stormflow also increased. A calibrated and validated SWMM model was built to explore the long-term effectiveness of the green infrastructure under 20 years of historical precipitation data. Model results confirm that green infrastructure reduced surface runoff and increased infiltration and evaporation. The model shows that the green infrastructure is capable of reducing flows by >40% at the 1, 2, and 5 year return period, and that, in this project, more benefit is derived from the street-side bioretention cells than from the rain barrels and gardens that treat rooftop runoff. Surveys indicate that many residents viewed stormwater as the city's problem and had negative perceptions of green infrastructure, despite slightly pro-environment values generally. Substantial hydrological gains were achieved despite low homeowner participation. The project showcases the value of careful experimental design and monitoring to quantify the effects of a green infrastructure project. Finally, the calibrated model allows us to explore a wider range of hydrologic dynamics than can be captured by a monitoring program.

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Title: Is black the new green? Exploring the impact of biochar amendments on water and nutrient retention in vegetated roofs

Author(s): Ishi Buffam, University of Cincinnati; Mark Mitchell, University of Cincinnati; Alicia Kosielski, University of Cincinnati

Biography: Ishi Buffam is an Ecosystem Ecologist/Aquatic Biogeochemist, Assistant Professor at the University of Cincinnati. Ishi teaches courses in Aquatic Ecology, Water Resources, and Ecosystem Ecology, and leads a team of undergraduate and graduate students in field and lab-based

Abstract: Vegetated (green) roofs provide many ecosystem services and are a growing component of green infrastructure in many cities, but recent research has revealed that these engineered ecosystems can leach out nutrients N and P at high concentrations to downstream waterways, an ecosystem dis-service. Biochar – an inexpensive type of activated carbon – has been used as an additive to increase fertility and moisture-holding capacity in agricultural soils, and has been proposed as a potential enhancement to green roof substrate. We hypothesized that biochar-amended substrate would decrease nutrient runoff from green roofs by binding both water and nutrients as the runoff passes through the substrate, while at the same time increasing plant performance. We used a combination of laboratory experiments, as well as small green roof plots, to test this hypothesis. Using column experiments we found that the incorporation of biochar substantially increased the water holding

capacity of the substrate, reduced and delayed the efflux of ammonium and slightly delayed the passage of nitrate, but had little effect on phosphate, the leaching of which remains a problem for many roofs. We also carried out batch experiments on the dynamics of sorption/desorption, which suggest a two-phase sorption mechanism onto biochar, the slower process taking several days to reach equilibrium. Newly constructed experimental plots with varying levels of biochar, and with/without vegetation (Sedum spp. mixture) are now being used to explore the effects of biochar on water retention, evapotranspiration rate, nutrient retention, and plant performance. Our results so far indicate that biochar has good potential as a low-cost amendment to green roof substrate to improve downstream surface water quality by water and N retention. The effects on plants are as yet unknown.

Concurrent 1 – Public Water Systems

Title: Evaluating Risks in a Source Water Protection Area – Modernized Methodologies

Author(s): Aaron Colson, City of Dayton Department of Water; Paul Stork, Amec Foster Wheeler Environment & Infrastructure, Inc; James Shoemaker, City of Dayton Department of Water; Brent Huntsman, Terran Corporation

Biography: Since 2011, Aaron Colson has worked for the City of Dayton's Department of Water, Division of Environmental Management in the Source Water Protection Program. Aaron started out as an Environmental Scientist for the Dayton Water Department, and is currently working as the Source Water Protection Area Environmental Risk Assessor. Before that Aaron was an Advanced Level Environmental Compliance Specialist with the State of Georgia Environmental Protection Division, and he previously held the position as Environmental Director for the St. Croix Chippewa Indians of Wisconsin. Aaron has a B.S. in Political Science from the University of Wisconsin-Madison, an M.S. in Environmental Science and Policy from the University of Wisconsin-Green Bay, and an M.S in Applied Plant Sciences from the University of Minnesota-Twin Cities Campus Department of Agronomy and Plant Genetics. Aaron held several positions while working his way through his degrees, including Executive Director for the Minnesota River Basin Joint Powers Board, Water Resource Specialist for the Oneida Nation of Wisconsin and a Research Specialist for the State of Wisconsin Department of Natural Resources.

Abstract: The City of Dayton provides drinking water for approximately 400,000 customers utilizing three well fields. Three well fields supply over 60 MGD of groundwater and are located in areas of mixed urban and industrial use within the incorporated limits of the City of Dayton. In 2015 the City expanded their source water protection area (SWPA) to include the 5-year time of travel capture zone. The SWPA is comprised of neighboring municipalities and townships and encompasses an area of 15 square miles. Even though the City has a good understanding of the land use and risk within the 1 year time of travel, there are unknown risks due to the types of mixed land use (USTs, ASTs, storage piles, dry wells, etc.) within the larger designated 5 year time of travel SWPA. For the City to better characterize risk posed by specific potential sources of contamination in the 5 year time of travel area, the USEPA's Priority Setting Approach (PSA) has been adapted for use in a spreadsheet model platform. As a risk screening tool, PSA

is a simplified form of risk assessment that uses limited data to yield a relative expression of threat to groundwater. To accommodate the lack of site-specific information, the original PSA utilizes a series of generalized charts, table and graphs to estimate parameter values. Fortunately, many of the input data requirements for implementing the PSA were explicit, comparable or surpassed by the site-specific information assembled in previous risk screening efforts for the City's well fields. These two approaches were combined into a new hybrid risk model which provides a much better assessment of risks in the SWPA than either method used separately. This presentation details the data inputs that are required and the resulting rankings of the various risks to the well fields.

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Title: Establishing a Source Water and Reservoir Monitoring Program

Author(s): Jeff Kauffman, Del-Co Water Company, Inc

Biography: Mr. Kauffman has worked over 15 years in the water/wastewater industry. At Del-Co Water, he assures and provides environmental compliance, watershed protection, emergency preparedness, safety and OSHA training, NPDES permitting, public outreach, and water quality compliance. While employed at the City of Columbus Mr. Kauffman supervised the day-to-day operations of the Microbiology section, oversaw total coliform collection and chlorine residual measurements. He also is OEPA certified for total coliform, E. coli, total organic carbon, chlorine, lead, and copper. He manages on-line distribution system water quality program, oversees Cryptosporidium sampling for LT2. Oversees Lead & Copper sampling, analysis, and reporting. Safety and training for appropriate staff OEPA Class III Water Supply Operator MASI Environmental Services Water quality testing for metals, bacteria, wastewater, and chemical parameters. Ohio EPA certified in microbiology, metals, and chemistry. He assures compliance with SDWA and NPDES regulations. Mr. Kauffman has a Bachelor of Science in Natural Resources (1999) from Ohio State University, Master of Environmental Management (2002) from the University of South Carolina, and from Walden University, Master of Science in Public Health (2009)

Abstract: Establishing a Source Water and Reservoir Monitoring Program Del-Co Water Company, Inc. is a private, non-profit drinking water utility that is developing a source water and reservoir monitoring program to allow for informed decision making and the identification of water resource issues. The program will address water quality issues in wake of the continued development in Delaware County, changing land-use characteristics, non-point source runoff, and new and emerging regulations. This water quality monitoring will be conducted in the Upper Olentangy River watershed, at six off-stream reservoirs, and at raw water intakes. Analysis of biological and chemical parameters will include grab sampling, event monitoring, reservoir profiling, and continuous, on-line monitoring. Results from analyses will assist management in assessing source water quality, assist in operational decision making, avoid potential treatment issues, indicate potential sources of contamination, and establish a baseline for future comparisons. Future recommendations may include expanding the program, educational outreach, and additional stakeholder involvement.

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Title: Asset Management for Public Water Systems

Author(s): Susan Schell, Ohio Environmental Protection Agency Division of Drinking and Ground Waters

Biography: Ms. Susan Schell has BS in Chemical Engineering from The Ohio State University, Class III Water Treatment Operator license, with over 25 years of experience in drinking water as a plan reviewer, water system inspector and Manager of the Engineering & Infrastructure Section

Abstract: Ohio EPA DDAGW has increasingly been dealing with failing water systems. Water systems struggle to maintain proper operation and maintenance of their water systems due to years/decades of inadequate investment in their water treatment plants, distribution systems and financial resources. In an effort to raise the technical, managerial and financial capability of all water systems, we are developing an asset management program to be implemented by all public water systems. The presentation would outline the necessary components of an adequate asset management program along with expected metrics to ensure long term implementation of the asset management program and show improvement in quantity, quality and reliability of water systems for the customers of the water systems. We would also highlight funding opportunities for water systems to assist them in this effort.

Concurrent 2- Floodplain Management

Title: Alternatives for Willow Creek Flood Mitigation Study

Author(s): Chad Boyer, ms Consultants; Anil Tangirala, ms Consultants

Biography: Mr. Boyer serves as Project Engineer for ms consultants in Columbus, OH. At ms, Mr. Boyer designs water resources related projects, specializing in floodplain hydrologic and hydraulic analyses and storm water management projects. Mr. Boyer holds Bachelors of Science Degree in Civil and Environmental Engineering. He is a Certified Floodplain Manager and Professional Engineer.

Abstract: This presentation will discuss a case study of a flood mitigation project in Ohio and how innovative H&H tools were used to analyze flood mitigation alternatives. Several Properties along Western Reserve Road in Boardman Township, Mahoning County, Ohio and the roadway itself in between Market Street and Hitchcock Road frequently become inundated with surface runoff during moderate to heavy storms. Patterns of flooding also occur both upstream and downstream of SR-7. Mahoning County Engineer hired ms consultants to perform a study to identify and recommend alternatives to mitigate flooding in conjunction with the roadway improvement project for Western Reserve Road. ms consultants performed hydrologic and hydraulic analysis for Willow Creek and evaluated drainage improvements/alternatives to mitigate flooding in the project limits from the Sheetz CMP culvert near SR-7 upstream to Hitchcock Road downstream. Several flood mitigation alternatives were evaluated including detention, diversion, culvert upgrades and storm infrastructure. Pros and Cons were evaluated for each alternative including benefits and cost analysis. The presentation will discuss

hydrologic and hydraulic analysis conducted for the existing and proposed alternatives for this project. The presentation will also include the thought process of development of alternatives and how hydrologic and hydraulic models were useful in analyzing the different alternatives. Since its release in 1995, the US Army Corps of Engineers HEC-RAS modeling software has become the most commonly accepted and preferred means for analyzing 1-dimensional stream and culvert hydraulics. Despite nearly global familiarity with the software within the floodplain management community, many are unaware of tools that are available within HEC-RAS such as modeling LIDs which give it the capacity to analyze a variety of complex culvert scenarios and diversion alternatives. This presentation highlights such tools used as part of alternatives analysis. Several GIS tools developed to enhance the efficiency and accuracy of the hydrologic and hydraulic models will also be discussed.

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Title: Ohio Silver Jackets

Author(s): Ashley Stephen, U.S. Army Corps of Engineers

Biography: Ashley Stephens, CFM - Serves as Community Planner with the Huntington District USACE. Ms. Stephens duties include Ohio Silver Jackets Co-Lead, Lead Planner on Continuing Authorities Program Projects, and preparing documentation for assessment of environmental impacts in accordance with the National Environmetnal Policy Act. Ms. Stephens has served 7 years in the Planning Branch and is a Certified Floodplain Mananger. Ms. Stephens obtained her Masters of Science in Geography.

Abstract: The Ohio Silver Jackets Team is an interagency team dedicated to creating a collaborative environment to bring together Federal, State, local, and other stakeholders to develop and implement solutions to natural hazards and mitigation by combining available agency resources, which include funding, programs, and technical expertise. The Ohio Silver Jackets Team was the first state team established in the Silver Jackets program. The name Silver Jackets is symbolic and meant to symbolize unified State and Federal action. The national program provides a formal and consistent strategy for an interagency approach to planning and implementing measures to reduce the risks associated with flooding and other natural hazards.

The intent of the Silver Jackets program is to bring agencies together to manage a state's flood risk throughout the life-cycle. Priorities of the Ohio Silver Jacket's team are in support of the State Hazard Mitigation Plan objectives, flood risk awareness efforts, and implementation of projects funded through the Silver Jackets initiative. The presentation will focus on describing the goals and objectives of the Ohio Silver Jackets team, discuss completed interagency projects, and describe current interagency efforts.

Concurrent 3- Water Resources Management

Title: Impact assessment of water resource use

Author(s): Eric Mbonimpa, Department of Systems Engineering and Management, Air Force Institute of Technology

Biography: Dr. Eric Mbonimpa is an assistant professor from Air Force Institute of Technology, Department of Systems Engineering and Management. He obtained his PhD in Environmental Engineering from Purdue University. He does research in environmental sustainability, and teaches courses related to environmental engineering and science.

Abstract: The pressure on fresh water resources is presently a concern in many parts of the world. The scientific community has been working on standardizing methods to estimate and assess the impacts of fresh water use. The most widely used methods include the water footprint, life cycle water use analysis, and withdrawal-to-availability ratio. The water footprint classify water into green (rain), blue (surface and groundwater), and gray (used). It tracks exported and imported water volumes, bound into products such as agricultural commodities. The life cycle analysis has mostly concentrated on how products and processes impact water quality and quantity. The withdrawal-to-availability ratio indicates the water stress of a certain region. An approach combining these various water accounting methods can give a robust assessment of water resources. However, lack of data especially in developing countries can make water accounting results inaccurate.

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Title: Impact Assessment of Water Resource Use

Author(s): James Roberts, Ohio Environmental Protection Agency

Biography: Jamie Roberts has been employed with Ohio EPA for 15 years and has a total of 18 years of experience in the environmental field. He has a

Master of Science in Geology and Master of Business Administration. He has been working in the Division of Surface Water for the past 11 years primarily focusing on the development and implementation of the electronic discharge monitoring report (eDMR) online data submittal system and STREAMS (Surface Water Tracking, Reporting, and Electronic Application Management System) electronic application systems; providing system outreach and permit compliance technical assistance, and enterprise level database management. Prior experience includes four years in the Division of Environmental Response & Revitalization as a Risk Assessment Coordinator for the Voluntary Action Program and three years in environmental consulting working as a Staff Hydrogeologist focusing on well field evaluation, development, and monitoring; conducting geophysical surveys, GIS, and environmental modeling.

Abstract: The Ohio Environmental Protection Agency - Division of Surface Water is now accepting online NPDES permit applications. The Surface Water Tracking, Reporting and Electronic Application

Management System (STREAMS) service, available through the agency eBusiness Center, hosts electronic application forms for individual NPDES permits, requests for permit modifications, 17 unique Notice-of-Intent (NOI) forms for coverage under a master general permit, and construction general permit specific co-permittee and individual construction lot coverages. The service also provides electronic application forms for submission of notice-of-termination, permit transfers and no-exposure certificate applications. The STREAMS service provides facilities and permitted entities a convenient interface for correct and accurate completion of application forms, electronic application submission, and tracking of their application status. The system utilizes "smart" forms to ensure that the minimum requirements of each field are met with respect to formatting and completeness. Additionally, as you work through the form, only the required sections of the application are made available based on how you have populated the application. This streamlines the permit application and the applicant is only required to populate the sections that pertain to the unique circumstances of their specific application. If the applicant is submitting a renewal application, when the form is first initiated, the user will find that much of the form has been pre-populated from their previous application and only the necessary changes and updates will need to be made. Upon submission, the eBiz user is immediately emailed an invoice for any fees and may elect to immediately submit payment through the eBusiness Center e-Pay service. Similarly, the facility may submit permit-required reports through the new system. The reports utilize the same form logic-driven approach and depending on the report, may compile submitted eDMR data into the forms.

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Title: The Changing Value of Water and the Role of Water Technology Collaboration in Accelerating Water-Tech Development and Adoption

Author(s): Bryan Stubbs, Cleveland Water Alliance

Biography: Bryan Stubbs is Executive Director of the Cleveland Water Alliance, a cross-sector network whose purpose is to share knowledge and spur innovative solutions to freshwater issues. Prior to joining the Cleveland Water Alliance Bryan was a consultant for the Regional Economic Competitiveness Strategy, which is comprised of business, academic, philanthropic and civic leaders from Northeast Ohio. In the past decade, he has worked on mission-driven initiatives, including the Oberlin Project, with which the city of Oberlin became the third project in the world to receive 'participant' status as part of the Clinton Climate Initiative and Bloomberg's C40 Climate Positive Development Program.

Abstract: Cleveland Water Alliance will present its water technology and innovation program, AquaHacking, and how it puts environmental and technological innovation to work for water through a Data Competition and Water Accelerator Program that ranges across the three basins of Lake Erie. Aquahacking leverages the public's interest in apps, hacking, open data, and new technology to elevate the value of clean water and improve understanding of its importance to the economic vitality of the Great Lakes region. It is an opportunity to drive innovation in the water technology sector and engage younger people pursuing technical careers in the "Blue Economy."