ORBA/ORBCRE SUMMIT

FROM PLANNING TO ACTION: PROTECTING AND RESTORING THE OHIO RIVER BASIN

OCTOBER 5-6TH, 2023

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PROGRAM SCHEDULE

Thursday, October 05th

7:30-8:30 am: Registration- *Hotel Lobby*
Includes continental breakfast

8:30-9:00 am: Opening Remarks-*City View Ballroom*
Welcome remarks by Craig Butler, ORBA Chair, and Chuck Somerville, ORBCRE Executive Director. Video welcome by Ohio River Caucus Co-chairs Bill Johnson (OH) and Morgan McGarvey (KY).

9:00-10:00 am: Keynote Speaker-*City View Ballroom*
Colonel Jayson Putnam, Commander of the Huntingon District, U.S. Army Corps of Engineers

10:00-10:30am: Break-*Hotel Lobby*

10:30 am-12:00 pm: Restoration Initiative and Work Group Sessions-*City View Ballroom*

- 10:30-11:00 am: Overview of the Restoration Plan, Jordan Lubetkin (NWF) and Richard Harrison (ORSANCO)
- 11:00 am-12:00 pm: Reports from ORBA Work Groups

12:00-1:00pm: Lunch- *City View Ballroom*

1:00-3:00pm: Federal Agencies and Organizational Partners in the Ohio River Basin-*City View Ballroom*

This session will highlight collaborative projects within the Ohio River Basin. The following federal agencies and organizations have been invited to participate:

- Americas Watershed Initiative
- Mon Water Project
- National Parks Service
- Ohio River Valley Water Sanitation Commission
- Ohio River Way
- US Army Corps of Engineers
- US Environmental Protection Agency
- US Geological Survey

3:00-3:30pm: Break-*Hotel Lobby*

Thursday, October 05th (continued)

3:30-4:30 pm: USACE Workforce Development- *City View Ballroom*
Moderated by Dr. Charles Somerville, Executive Director, Ohio River Basin Consortium for Research & Education (ORBCRE) and Norma White-Caruso, USACE/Great Lakes and Ohio River Division (LRD), Program Manager for Talent.

In this session, academic, government and industry representatives will provide insight into how relevant traditional academic curricula are to the skillsets needed to be successful in positions across the US Army Corps of Engineers Great Lakes and Ohio River Division (LRD). Positions of focus are Civil Engineers, Electrical Engineers, Mechanical Engineers, Natural Resource Specialists, and Biologists.

4:30-5:30 pm: Student Poster Session- *Hotel Lobby*
Poster abstracts can be found in Appendix A.

Authors	Affiliation	Title
Arkenau, Nicole, Cole Musical and Christopher Lorentz	Thomas More University	Erosion Control: Continuous Monitoring and Adaptive Control Technology.
Atutey, Esther and Mark Pyron	Ball State University	Temporal and Spatial Variation in Macroinvertebrate Assemblages in the Ohio River.
Dahal, Rajati, Suresh Sharma and Keely Davidson- Bennett	Youngstown State University	Community-Engaged Best Management Practices for Storm Water Management using PCSWMM.
Daniel, Lillie and Susan Brown	Thomas More University and Boone County (KY) Conservation District	A Comparison of Bat Acoustic Monitoring Survey Methods within an Ohio River Riparian Forest.
Gibson, Sarah R., Nolen Honkomp and Christopher Lorentz	Thomas More University	Fish Host Identification Procedure and Characterization of the Glochidia of *Elliptio dilatata.*
Khan, Mohsin and Kelly Johnson	Ohio University	Survey of microplastics and microfibers in selected urban Ohio rivers.
Laue, Carley, Dani Martinez, and Christopher Lorentz	Thomas More University	Analyzing Channel Catfish, Common Carp, and Freshwater Drum as Biocontrols for Zebra Mussels (Dreissena polymorpha) in the Ohio River.

Continued on next page.

Thursday, October 05th (continued)

Authors	Affiliation	Title
Maldonado-Febres, Luz Y., Yairimar Tardy-Jusino, and Christopher Lorentz	Universidad del Sagrado Corazón and Thomas More University	New Fish Host-Mussel Identification for *Lampsilis cardium* Freshwater Mussel.
Ortiz, Matthew, Nathaniel Gramza and Christopher Lorentz	Universidad del Sagrado Corazón and Thomas More University	Examining the Use of Macrophyte Species for Nutrient and Turbidity Removal.
Wimmers, Matthew and Christopher Lorentz	Thomas More University Center for Ohio River Research & Education	Fish-Host Identification of Wavy-Rayed Lamp Mussel, *Lampsilis fasciola.*

5:30-7:30 pm: Banquet- *City View Ballroom*
Student Poster Award and Riverkeeper Award presentation

Friday, October 06th

7:30-8:30 am: Registration (with continental breakfast)-*Hotel Lobby*

8:30-11:20 am: Research Presentations-*City View Ballroom*
Research presentation abstracts are located in Appendix B

Time	Speaker	Affiliation	Title
8:30-8:50	Miller, Michael and David Schmitt	Mill Creek Alliance and American Rivers	What happens when a major urban WWTP shuts down for several days in Cincinnati?
8:50-9:10 am	Bowman, Jen and Amy Mackey	Ohio University Voinovich School of Leadership and Public Affairs	Restoration and Recovery in the Raccoon Creek Watershed.
9:10-9:30 am	O'Neal, Melissa and Rachel Pell	West Virginia Water Research Institute, West Virginia University	Three Rivers QUEST: Success in Collaboration.
9:30-9:50	Trueman, Becca	Quantified Ventures	The Role of State Revolving Funds in Implementing the Ohio River Basin Strategic Plan.
9:50-10:00 am	Break		
10:00-10:20 am	Spirnak, Rachel and Melissa O'Neal	West Virginia Water Research Institute, West Virginia University	Three Rivers QUEST Beta Mapping Tool for the Upper Ohio River Basin.
10:20-10:40 am	Fitch, Eric	Environmental Science, Marietta College	Sackett et ux. v. Environmental Protection Agency: Potential Impacts on the Protection of Water Quality in the Ohio River Basin.
10:40-11:00 am	Sharma, Suresh and Shuvra Bijukshe	Civil and Environmental Engineering, Youngstown State University	SWAT Model Development to Reduce Nutrient in Tappan Lake and Atwood Lake Watersheds Using Various Best Management Practices.
11:00-11:20 am	Divers, Marion, Laura Mattingly and Megan Wilburn	USACE Pittsburgh District, USACE Louisville District and USACE Huntington District	Identification of Environmental Opportunities at USACE Locks and Dams on the Ohio River with the Sustainable Rivers Program.

Friday, October 06th (continued)

11:20 am-12:00 pm: ORBA Business Meeting "Next Steps: Putting Planning Into Action"- *City View Ballroom*
Craig Butler, ORBA Chair and Chris Lorentz, ORBA Co-Chair

12:00-1:00 pm: Lunch on your own

1:00-4:00 pm: Optional Field Trips-*Various locations*
Field trip descriptions are located in Appendix C. Please email Chris Lorentz at lorentc@thomasmore.edu by Wednesday, October 4th to reserve your spot.

Greater Cincinnati Water Works Richard Miller Treatment Plant Tour *5651 Kellogg Avenue, Cincinnati, OH 45230*	**Thomas More University Biology Field Station Tour with Boat Electrofishing Demonstration** *8309 Mary Ingles Highway, California, KY 41007*	**USEPA Experimental Stream Facility Mesocosm/East Fork Watershed Cooperative Tour** *1003 US-50, Milford, OH 45150*	**SD1 Green Building Tour and nearby Constructed Wetlands** *1045 Eaton Drive, Ft Wright, KY 41017*

Keynote Speaker: Colonel Jayson Putnam, *Commander of the Huntington District, U.S. Army Corps of Engineers*

Colonel Jayson Putnam assumed command of the Huntington District, U.S. Army Corps of Engineers, on July 15, 2021. As the District Commander, he is responsible for carrying out the District's mission within the Ohio River Basin, which includes more than 300 navigable miles of the Ohio River in West Virginia, Kentucky, and Ohio, plus nine major tributaries. This area encompasses 45,000 square miles in five states – West Virginia, Kentucky, Ohio, Virginia, and North Carolina. His staff of more than 1000 employees supports the District's mission to operate and maintain 35 multi-purpose reservoirs and 9 locks and dams, providing flood damage reduction, commercial navigation, recreation, and water supply while protecting the environment.

The District is involved in significant planning, design, and construction efforts that address replacement of outdated navigation structures on the Ohio and Kanawha Rivers, dam safety measures at operating projects in central Ohio and southern West Virginia, other significant water resource challenges, as well as emergency management. His staff performs the Corps' regulatory mission in West Virginia and Ohio.

Colonel Putnam was born in Berlin, VT. He was commissioned into the Corps of Engineers through the United States Military Academy at West Point in 1997. Prior to his assignment to the Huntington District, he served as the USACE G3 at HQ, USACE. His previous assignments include Commander of the 9th Brigade Engineer Battalion; Brigade Deputy Commander/Provisional Commander for 3rd Brigade, 3ID; Commander of the 11th Engineer Battalion at Ft. Benning; Executive Officer for the Director of Operations, OACSIM at the Pentagon; Executive Officer for the Strategy & Effects Directorate at ARCENT's Operational Command Post (OCP) in Kuwait; Battalion Executive Officer and Operations Officer for the 249th Engineer Battalion (Prime Power) at Ft. Belvoir; Executive Officer for the Deputy Chief of Engineers at HQ USACE, Branch Chief for the Multi-Spectral Branch at NGA's School for Geospatial-Intelligence (TSG); Brigade Engineer for 4/3 ID at Ft. Stewart and in Iraq; Company Commander for E/3-7 Infantry (C/11th EN BN) at Ft. Stewart and in Iraq; Battalion Adjutant and Company Executive Officer for the 65th Engineer Battalion at Schofield Barracks; and Platoon Leader for C/91st Engineer Battalion at Ft. Hood and in Bosnia.

Colonel Putnam's decorations include the Bronze Star Medal, the Defense Meritorious Service Medal, the Meritorious Service Medal (with four Oak Leaf Clusters), Army Commendation Medal (with three Oak Leaf Clusters), Army Achievement Medal (with two Oak Leaf Clusters), NATO Medal, Parachutist Badge, Air Assault Badge, and the Combat Action Badge. Colonel Putnam has deployed to Bosnia, Iraq, and Kuwait.

Colonel Putnam earned his Bachelor's of Science Degree in Environmental Engineering at West Point, a Master's of Science Degree in Engineering Management from the University of Missouri-Rolla, a Master's Degree in Defense Geographic Information Systems from the Royal School of Military Survey at Denison Barracks, Hermitage, UK and a Master's Degree in Strategic Studies from the US Army War College.

APPENDIX A: POSTER ABSTRACTS

Erosion Control: Continuous Monitoring and Adaptive Control Technology.

Arkenau, Nicole, Cole Musical and Christopher Lorentz. CVG Airport and Thomas More University

Gunpowder Creek originates west of the CVG Airport and the Boone County West Study Basin, which flows into the Ohio River, and the stream was determined to be impaired due to the runoff of deicing fluids. Many cooperative efforts have been performed to repair and maintain the waterway. CVG has installed a Continuous Monitoring and Adaptive Control technology to the Southwest Detention Basin located at the headwaters of Gunpowder Creek. This system is designed to increase hydraulic residence time and as a result, reduces erosion. This research focused on conducting a baseline of the stream's morphological characteristics. The initial characterization based on the Rosgen Stream Classification scale was found to exhibit a stream type F.

Temporal and Spatial Variation in Macroinvertebrates Collected with Hester-Dendy Samplers in the Ohio River.

Atutey, Esther and Mark Pyron. Ball State University, Department of Biology, Muncie, IN 47306

We investigated the long-term impact of the Clean Water Act of 1974 on the macroinvertebrate assemblages in the Ohio River. Samples were collected by ORSANCO from 1964 to 1981 and from 1991 to 2021 using Hester Dendy samplers - Hester Dendy (HD), Hester Dendy Deep (HDD), and Hester Dendy Shallow (HDS). Collections resulted in a total of 4,130,538 individuals that were further categorized for analyses as collectors-gatherers, collector-filterers, predators, scrapers, shredders, piercer/herb, and piercer/carnivore. We divided the river into three sections – upper (0-327), middle (328-654), and lower (655-981) to test for spatial variation. The upper river had higher species richness (882) than the middle (615) and lower (523) sections. We detected significant temporal variation in the functional composition of the macroinvertebrate assemblage using taxonomy and tropic categories.

Community-Engaged Best Management Practices for Storm Water Management using PCSWMM.

Dahal, Rajati[1], Suresh Sharma[2] and Keely Davidson-Bennett[3]. [1],[2] Department of Civil & Environmental Engineering, Youngstown State University, Youngstown, Ohio, USA. [3]Chagrin River Watershed Partners

The conventional drainage system relies on the design of a network of curb gutters and underground pipes. Such gray infrastructure may not be environmentally suitable, as they do not fully avoid problems but transfer the problem leading to intense flooding downstream. In addition, such drainage systems are based on historical records of precipitation, assuming the precipitation intensity would remain constant. As the precipitation intensity and frequency are expected to increase in the future due to climate change within the Lake Erie Basin, the capacity of the drainage system designed using the conventional design approach may not be able to accommodate the increased runoff resulting in the failure of storm drainage systems. Consequently, there is a critical need to explore the extent to which GI or LID can be beneficial over the gray infrastructure to reduce flooding problems downstream. Therefore, this study is examining communities preferred LID i.e., raingarden in residential area and Permeable Pavement in commercial area and the extent of runoff reduction on different implementation level in the Town of Willoughby-HUC 12 watershed of Lake Erie Basin. Following extensive collaboration with stakeholders and communities, these two LIDs were chosen. The effects of two LID strategies (permeable pavement, and rain garden) on urban floods are evaluated and contrasted with the traditional drainage system design. For a comprehensive evaluation of the LID approaches, a variety of storm occurrences with various amounts of rainfall and durations are evaluated. When compared to the design of a traditional drainage system, the results are quantified by the overall stormwater runoff reduction that occurs after a storm event. Results showed an increased peak runoff reduction, from 15% to 62%, with increased implementation levels from 20% to 100% from the use of permeable pavement and from 6% to 27%, with increased implementation level from 25% to 100% for the raingarden. In the meantime, various scenarios of CMIP5 and CMIP6 climate models are used to downscale the climate data for the 21st century to investigate whether the proposed LID would mitigate the climate change impact to minimize the increased runoff. This study aims to effectively communicate the key messages regarding the implementation of Low Impact Development (LID) in the field, with the goal of benefiting the community to combat the climate change effect in future.

A Comparison of Bat Acoustic Monitoring Survey Methods within an Ohio River Riparian Forest.

Daniel, Lillie[1] and Susan Brown[2]. [1]Thomas More University and [2]Boone County Conservation District

Bats fulfill several integral purposes within an ecosystem including insect control, pollination, seed dispersal, and forest health indication. The diversity of species present in an area is an important indicator to the health and stability of the ecosystem (Tuneu-Corral et al 2020). The following study was conducted in June and July 2023 to determine what species of bats were present in three Ohio riparian forest sites and two inland sites in Boone and Campbell County, Kentucky. This study was twofold: to provide baseline data about species diversity within Northern Kentucky and to evaluate the impact of unique habitat based on geology to this diversity. Two ecosystems were evaluated as part of this study: riparian forest and inland habitat. A riparian forest buffer includes an area near a wetland that can provide conservation benefits especially for wildlife habitat (USDAgov 2014). This study looked specifically at the Ohio riparian forest with its open and closed canopy woods and valuable water source. The inland habitats include areas defined by glacial deposits, limestone, sinkholes, rock caves, and large canopy forest. Boone Cliffs is notable in Boone County for its Quaternary glacial conglomerates with cave-like structures and protected holes for roosting. The purpose of this study was to gain better understanding of our forest's health in order to make wise land use decisions. This is part of an ongoing project between the Boone County Conservation District and partners to learn more about habitat biodiversity and review the overall forest health in the county and nearby areas. After weeklong stationary surveys and mobile acoustic monitoring of echolocation calls, a total of eleven species were detected across five sites.

Fish Host Identification Procedure and Characterization of the Glochidia of *Elliptio dilatata.*

Gibson, Sarah R., Nolen Honkomp and Christopher Lorentz, PhD. Thomas More University

Freshwater mussels possess a unique symbiotic relationship as a vital part of their life cycle. The mussel larvae, known as glochidia, are considered parasitic during the first few weeks of life. A gravid female mussel will often use an organ depicted as a lure to attract a fish host and release glochidia onto its gills. This study will define the process of determining potential fish host for the species Elliptio dilatata, commonly known as a spike mussel; furthermore, it will serve as a characterization of the morphology of the glochidia. Twenty individuals were attained for extraction of glochidia by means of flushing the gill pouch with a hypodermic needle. Various species of Notropis and Etheostoma were collected and prepared for infestation. No glochidia was present, yet previously released larvae had been preserved for further analysis. The organisms were observed to have a 1:1 ratio in length and height that measured 203µm, which paralleled in size. Physical characteristics were compared to those of juveniles developmentally. As no fish host could be identified, further research is needed to identify viable species for E. dilatata.

Survey of Microplastics and Microfibers in Selected Urban Ohio Rivers.

Khan, Mohsin[1] and Kelly Johnson[1],[2]. [1]Department of Biological Sciences, [2]Voinovich School of Leadership and Public Affairs, Ohio University

Microplastics are emerging contaminants due to their potentially harmful impacts on aquatic biota. There is growing evidence that ingestion of microplastics can alter feeding behavior, reduce growth and development, cause deformities, and increase oxidative stress and immune responses in aquatic insects, crustaceans, and fish. Microplastic particles from plastic litter, cigarette butts, automotive tire fragments, and textile fibers from household laundry are more prevalent in urbanized areas but can be transported with other particulate matter into streams, rivers, and lakes, depending on their buoyancy. In the present study, we investigated microplastics and microfibers in sediment and water samples collected from 5 sites on rivers that flow through urbanized areas of Columbus, Lancaster, and Athens OH (Scioto, Black Lick, and Hocking Rivers). Organic matter was digested and removed from sediment using H2O2 and Fenton reagent, then microplastics were floated using NaCl as a density separator. Various polymers and microfibers were visually identified using a stereomicroscope, and then Nile Red was used to further separate natural particles from microplastics. Based on our visual identifications, microfibers and aluminum foil were the dominant categories of contaminants in sediments. FTIR and Raman analysis will be conducted to confirm the polymeric composition of the microplastics and microfibers present in the samples. Our preliminary results demonstrate that microplastics are present in Ohio surface waters and could be of concern. We plan to expand this study to more Ohio river sites, especially those downstream of wastewater treatment facilities and stormwater outlets, to better understand sources and potential 'hotspots' of accumulated microplastics in urban streams and constructed retention ponds. Microplastics will likely continue to enter waterways over the next decades, and a better understanding of their origin and biological impact would help inform future monitoring and management efforts.

Analyzing Channel Catfish, Common Carp, and Freshwater Drum as Biocontrols for Zebra Mussels (Dreissena polymorpha) in the Ohio River.

Laue, Carley, Dani Martinez, and Christopher Lorentz, PhD. The Center for Ohio River Research & Education, Thomas More University Biology Field Station

Zebra mussels (Dreissena polymorpha) are an invasive mussel species that has established populations in various waterways in North America including the Ohio River. We hypothesized that common carp (Cyprinus carpio) and freshwater drum (Aplodinotus grunniens) are preying on zebra mussels in the Ohio River due to their pharyngeal teeth adapted for crushing mollusk shells. We also targeted channel catfish (Ictalurus punctatus) because they have previously been documented to consume zebra mussels in the Ohio River. This study uses gut content analysis to examine and identify freshwater drum, channel catfish, and common carp as biocontrols for zebra mussels. Of the fish sampled, three out of ten channel catfish, one out of seven freshwater drum, and three out of four carp contained zebra mussels. It is confirmed that all three fish species are predators of zebra mussels in the Ohio River, but inconclusive that predation alone can reduce densities.

New Fish Host-Mussel Identification for *Lampsilis cardium* Freshwater Mussel.

Maldonadao-Febres, Luz Y.[1], Yairimar Tardy-Lusino[1] and Christopher Lorentz[2]. [1]Department of Natural Sciences, Universidad del Sagrado Corazón, San Juan, PR. [2]Thomas More University

The Center for Ohio River Research & Education and Thomas More University Biology Field Station based in Kentucky, United States, through Empowering STEM at Sagrado (ESTEMS) project, develop a STEM Environmental research with the purpose of performing a comprehensive assessment of various fish species to ascertain their suitability as hosts for mussel rearing.

Freshwater mussels are one of the most endangered groups of organisms in North America. In the United States, about 70% of the freshwater mussel fauna are listed either as extinct, endangered, threatened, or of special concern (Williams et al., 1993). They are water quality indicators and have an important role in rivers and streams around the world by filtering water. The conservation of freshwater mussels has become an urgent imperative, not only for the well-being of aquatic ecosystems but also to preserve biodiversity. To achieve this, it is important to understand the complex relationship between mussels and their fish hosts. Our goal is to expand the database of known fish-hosts thorough evaluation of different fish species found in the Ohio River that still haven't been confirmed and determine their suitability for serving as hosts in the process of reproduction. Our results revealed previously undocumented host relationships between Lampsilis cardium and two of the selected fish species, as well as confirming one known host, contributing to the growing body of knowledge on freshwater mussel ecology.

Examining the Use of Macrophyte Species for Nutrient and Turbidity Removal.

Ortiz, Matthew[1], Nathaniel Gramza[1] and Christopher Lorentz[2]. Department of Natural Sciences, Universidad del Sagrado Corazón, San Juan, PR. [2]Thomas More University

Nutrient run-off from non-point sources, like farms, and turbidity pose significant threats to millions of people that rely on the Ohio River for drinking water, as well as those that inhabit native aquatic ecosystems. In this experiment, the ability of native plants and an invasive mussel to uptake run-off nutrients and decrease turbidity was investigated. For comparison, ten tanks were set up with American water willow, Common duckweed, and zebra mussels. The tanks were dosed with nutrients and tested every other day for nitrate, nitrite, phosphate, and Nephelometric Turbidity unit (NTU). It was observed that low-density water willow and duckweed were both able to take up nutrients and remove turbidity, with low-density water willow being the most effective at nitrate, phosphate, and turbidity removal and duckweed the most effective at nitrite removal.

Fish-Host Identification of the Wavy-Rayed Lamp mussel, *Lampsilis fasciola.*

Wimmers, Matthew and Christopher Lorentz. Center for Ohio River Research and Education, Thomas More University Biology Field Station

Freshwater mussels are declining across their range. Their complex lifecycle of needing a fish host to successfully reproduce may inhibit their success. Glochidia, mussel larvae need to attach to the gills of fish where they live for a couple weeks getting their nutrients until they mature and fall off into the sediment as juveniles where they live the rest of their life. Not all fish hosts are known for every species of mussel. This study aims to determine new fish hosts for Lampsilis fasciola (Wavy-rayed lampmussel). The known hosts for L. fasciola are largemouth bass (Micropterus salmoides), Smallmouth bass (Micropterus dolomieu), Longear sunfish (Lepomis megalotis), mottled sculpin (Cottus bairdii), bluntnose minnow (Pimephales notatus) and rock bass (Ambloplites rupestris). In this study, glochidia were extracted and directly introduced to the gills of nine different fish species. Starting 12 days after infestation, the bottom of the tanks were siphoned into a 100-micrometer screen where juveniles could be found under a microscope. Results reconfirm Micropterus salmoides and Micropterus dolomieu as known hosts. For new hosts Green sunfish (Lepomis cyanellus) and the hybrid (Lepomis macrochirus x Lepomis gibbosus) were confirmed, and a potential new host was confirmed in warmouth (Lepomis gulosus) as on day 5 after infestation encysted larvae were present on the gills. Further investigation into reconfirming hosts and confirming new hosts can be performed.

APPENDIX B: RESEARCH PRESENTATION ABSTRACTS

What Happens When a Major Urban WWTP Shuts Down for Several Days in Cincinnati?

Miller, Michael C.[1] and David Schmitt[2]. [1] Rivers Unlimited and Mill Creek Alliance (MCA), [2]Mill Creek Alliance and American Rivers

In the early morning of March 6, the 100 mgd WWTP at Gest Street blew on of its major transformers and the Sewage Plant shut down for 4+ days while struggling to establish emergency power and to reconnect a new transformer. Raw sewage began to flow out the Combine Sewer Outfalls into Mill Creek closest to the Ohio River and progressed upriver in subsequent days. Mill Creek Alliance staff and volunteers met to decide what to do after consulting with MSD. The MCA thought that dilution from USACE reservoir, Winton Woods Lake, might save the biota from disaster and got local and national USACE to allow Winton Lake to discharge 10' of water at 300mgs. And the staff and volunteers decided to measure E. coli and Conductivity to track the sources and concentration of sewage in the Mill Creek from River Mile 13 (SSO 700) to the mouth on March 7, 9, 11, 14 and 24th of March. The concentration of raw sewage from a valve at CSO05 and a control structure on the West Fork Creek were major sources. Apparently, the E. coli died off rather quickly once in the Creek, but the conductivity traces the history of release. E. coli maxed at Colilert dilution used at 50,000 cfu/100ml) at source points. Being early season after a large rainfall event at cool temperatures the public was not endangered. A nonprofit stepped up in a void to follow the results.

Restoration and Recovery in the Raccoon Creek Watershed.

Bowman, Jen and Amy Mackey. Ohio University Voinovich School of Leadership and Public Affairs

Raccoon Creek, a tributary to the Ohio River located in Southeast Ohio has endured over two decades of watershed restoration projects, resulting in tremendous biological recovery. By the mid-1900s many sections of the stream were nearly devoid of life due to impacts from unregulated, pre-law coal mining. Early surveys documented only 21 species of fish in the entire Raccoon Creek watershed, and one species at the mouth of Little Raccoon Creek (the longest tributary in Raccoon Creek). The first official restoration project was completed in the Raccoon Creek watershed in 1998 at Buckeye Furnace in Jackson County. Since that time, over 20 reclamation, treatment, and restoration projects have been completed in the watershed; successfully reducing acid, metal, and sediment loads, and improving habitat and water quality. Currently, 78 species of fish have been recorded in the Raccoon Creek Watershed and 34 species at the mouth of Little Raccoon Creek. The most downstream 40 miles of Raccoon Creek, from the low head dam at Vinton downstream to the confluence with the Ohio River now meet Exceptional Warmwater Habitat, the highest Aquatic Life Use designated to streams in Ohio, reserved for bodies of water with exceptional biodiversity, rare, and threatened species. Thank you to all of our partners who have made this amazing recovery possible

Three Rivers QUEST: Success in Collaboration.

O'Neal, Melissa and Rachel Pell. West Virginia Water Research Institute, West Virginia University

The West Virginia Water Research Institute (WVWRI), a program of the National Research Center for Coal and Energy at West Virginia University, has been actively researching water-related issues since 1967. When municipal water authorities were puzzled by the sudden increase of total dissolved solids (TDS) in late 2008, it was in the interest of WVWRI to find out what might be causing the changes in the water chemistry of the Monongahela River. While numerous programs monitored water quality, the data collected needed to be more consistent, or the studies did not include TDS. In response to the need for TDS data, routine monitoring on the mainstem of the Monongahela and the mouths of major tributaries began in 2009 with funding through USGS 104b and WVWRI.

In early 2010, the coal industry adopted WVWRI's voluntary discharge management plan, resulting in improvements to the Monongahela before it was listed as contaminated by PADEP in late 2010. In 2011, thanks to funding from the Colcom Foundation, WVWRI initiated the Three Rivers QUEST (3RQ) program to monitor the mainstem and mouths of major tributaries along the Allegheny, Monongahela, and Ohio Rivers. In 2014, USEPA used data sets collected by 3RQ to validate the delisting of sulfate contamination in the Monongahela River.

Since its initiation, 3RQ has collaborated with various watershed organizations to manage data through the 3RQs WATERS database and held routine roundtable meetings. Currently, 3RQ GAPS provides monitoring assistance to watershed groups to collect baseline data to secure funding for remediation projects. 3RQs Data Tool Map serves as a resource to provide users with easy access to data from various sources across state boundaries. Users can view layers of water quality data alongside historic or current coal mining, shale gas development, and much more.

The Role of State Revolving Funds in Implementing the Ohio River Basin Strategic Plan.

Trueman, Becca. Mississippi River Basin Watershed Coordinator, Quantified Ventures

The Ohio River Basin Strategic Plan thoughtfully consolidates challenges identified across the 15-state basin area into six succinct goals, highlighting the necessity for widespread systemic changes. Woven throughout each goal is the need to shift towards holistic planning and Nature-based solutions. It's well understood that when stakeholders combine efforts, we see mutually beneficial results that both sustainably address environmental issues and minimize capacity and resource gaps.

While hundreds of partners from the basin states have joined together in support of the plan, the reality is that the vast majority of land use management decisions happen at a municipal or county level. Bringing the Ohio River Basin Strategic Plan to ground level will require an intensive effort to understand local needs, connect with local decision makers, and offer options that justify local buy-in. The eligibilities and opportunities offered through the State Revolving Funds (SRFs) make this a potentially critical financial pathway implementers of the Oho River Basin Strategic Plan should be aware of when seeking to bolster local action.

SRF programs are utilized most often to provide loans for expansion and upgrades to gray infrastructure systems: drinking water, wastewater, and more recently stormwater systems. While these traditionally engineered systems are essential to restoration of the Ohio River, lesser known is that SRF eligibilities also include the nonpoint source practices that are part of landscape scale conservation and urban green infrastructure projects.

With the recent injection of funding through the Bipartisan Infrastructure Law, SRF programs nationwide are set to receive $44 Billion over the next 5 years, giving SRFs the potential to be the largest impact investor on the planet for Nature-based solutions. Now is the time for ORBA to capitalize on this once-in-a-generation opportunity to accelerate restoration of the Ohio River.

Three Rivers QUEST Beta Mapping Tool for the Upper Ohio River Basin.

Spirnak, Rachel and Melissa O'Neal. West Virginia Water Research Institute, West Virginia University

Three Rivers QUEST (3RQ), a program of the West Virginia Water Research Institute (WVWRI) brings together academic researchers, citizen scientists, and conservation groups to monitor important water quality data within the rivers, tributaries, and headwaters that drain into the Upper Ohio River. The heart of the 3RQ program is monthly water quality sampling within the Monongahela, Allegheny, and Upper Ohio River Basins, focused on total dissolved solids parameters. The resultant long-term water chemistry dataset, dating back to 2009, has proven valuable for researchers and watershed managers. Additionally, 3RQ provides local watershed-based groups with data management tools and networking opportunities. These groups provide water quality data they are already collecting for display through 3RQ maps to open possibilities for collaboration. In 2023, 3RQ launched the beta version of a free online mapping tool to compile environmental spatial data from government agencies, 3RQ and its member organizations, NGOs, and more in one convenient place. The 3RQ Beta Mapping Tool was developed for researchers, water managers, and watershed groups to easily find and utilize environmental spatial datasets across state lines within the Upper Ohio River Basin. Data are centered around water as well as land use and industry as they relate to water issues. Specifically, data categories include water resources, resource extraction, remediation, biological resources, and infrastructure. The tool includes layers in West Virginia, Pennsylvania, Ohio, and Maryland, as well as national datasets. Data layers are owned and maintained by the data sources and are updated automatically in the tool, where possible. This conference presentation will provide an overview of the data available through the 3RQ Mapping Tool and provide examples of its applications.

Sackett et ux. v. Environmental Protection Agency: Potential Impacts on the Protection of Water Quality in the Ohio River Basin.

Fitch, Eric J. Department of Biology & Environmental Science, Marietta College.

On May 25, 2023 the United States Supreme Court of the United States published their decision on Sackett vs. United States Environmental Protection Agency. Years earlier,the Sacketts had purchased property near Priest Lake Idaho and started to backfill the property ro build their dream home. It turned out that they were filling wetlands. They were ordered to restore them on pain of penalty. They sued EPA and it made it all the way to SCOTUS with considerable backing. The case allowed the Supreme Court to invalidate the Waters of the United States (WOTUS) which had been mostly in place for over 50 years. It designates among other things the geographic scope of application of Clean Water Act regulation. The Sackett decision, EPA decision greatly limited the range of wetlands that fall within the WOTUS removing 93% of previously covered wetlands.

This paper will will discuss the decision, its potential impacts on water quality of the Ohio and the whole nation. It will look at potential oportunites for restoring WOTUS to the pre-Sackett status.

SWAT Model Development to Reduce Nutrient in Tappan Lake and Atwood Lake Watersheds Using Various Best Management Practices.

Sharma, Suresh and Shuvra Bijukshe. Civil and Environmental Engineering, Youngstown State University

This study was conducted in the Atwood and Tappan Lakes watersheds of the Tuscarawas basin of Ohio. The flow, total nitrogen (TN), and total phosphorus (TP) loadings were monitored with the help of local stakeholders for a few years at various locations of the watershed to develop the Soil and Water Assessment Tool (SWAT). The multi-site SWAT model calibration and validation were accomplished with a reasonable model performance. In the next step, the scenario analysis was conducted in the SWAT model using various BMPs, including vegetative filter strips, grass waterways, fertilizer reduction, crop rotation, and cover crops to evaluate their performance in reducing TN and TP from the watershed. While BMPS in many studies are decided based on researchers' intuition, these BMPs were selected based on active consultation with the local stakeholders, who were engaged in the reduction of TN and TP loadings from the watersheds. Since the SWAT model calibration for TN and TP was not as good as the hydrologic model calibration, various scenarios of TN and TP reduction using BMPs were investigated for several years using both calibrated and uncalibrated SWAT models. We examined all the BMPs in 12 sub-watersheds of the Atwood and 10 sub-watersheds of the Tappan Lake watershed. The analysis indicated that the management practices of cover crops (rye) in combination with grass waterways with a 10% fertilizer reduction could minimize the TN and TP loading by as much as 88%, without significantly compromising the agricultural yield. However, a 10% fertilizer reduction without any BMPs could reduce TN and TP by just 9%. The cover crop (rye) including 10% fertilizer reduction with grass waterways seemed to be the most effective in reducing TN and TP, whereas the implementation of a filter strip led to a 70% reduction and was the next effective BMPs in reducing TN and TP loadings. In general, TN losses were reduced by 8% to 53%, while TP losses were reduced by 7% to 88%, depending on the BMPs used. By and large, the TN and TP reduction achieved through the calibrated model was not significantly different from the uncalibrated model, even though the reduction using the calibrated model was slightly higher for all scenarios than that of the uncalibrated model. The TN and TP loadings were highly sensitive to cattle grazing. When just 50% of the cattle were permitted to graze, the model predicted that there would be a 40% increase in total nitrogen and a 70% increase in total phosphorus in both watersheds. Our investigation revealed that monitoring the watershed at a small sub-watershed scale and calibrating the SWAT model for nitrogen and phosphorus is delicate.

Identification of Environmental Opportunities at USACE Locks and Dams on the Ohio River with the Sustainable Rivers Program.

Divers, Marion[1], Laura Mattingly[2], and Megan Wilburn[3]. [1]US Army Corps of Engineers Pittsburgh District, [2]US Army Corps of Engineers Louisville District, [3]US Army Corps of Engineers Huntington District

The Ohio River is of national ecological and socioeconomic significance, containing a diverse aquatic community (approximately 160 fish and 120 mussel species) and providing vital services (e.g., navigation, recreation, drinking water) to over five million people. Altered hydrology has been identified as an urgent threat to the ecological sustainability of the Ohio River by altering water quality, sediment transport and distribution, floodplain connectivity, and availability of/access to critical (e.g., spawning and rearing) habitats. In 2023, the Ohio River was recognized by American Rivers, a national non-profit organization, as the second most endangered river in the nation.

In 2022 and 2023, the U.S. Army Corps of Engineers (USACE) Lakes and Rivers Division, Pittsburgh (LRP), Huntington (LRH) and Louisville (LRL) Districts, through the Sustainable Rivers Program (SRP) worked collaboratively to develop partnerships and identify opportunities to maximize ecological sustainability through reservoir and navigation system operations on the Ohio River main stem. The SRP is a partnership between the USACE and The Nature Conservancy (TNC) that works to identify, refine, and implement environmental strategies at existing Corps water infrastructure. Through the Ohio River initiative, a broad spectrum of partners (local, regional and nationally focused conservation groups; regional infrastructure managers; academic institutions; natural resource organizations; federal agencies; and state agencies across Pennsylvania, Ohio, West Virginia, Indiana, and Kentucky) worked to identify specific opportunities to maximize ecological sustainability, provided recommendations for further study, and identified potential partners across the Ohio River system. Environmental opportunities identified by the districts include implementation of environmental flows (e-flows), conservation lockages in ecologically significant tributaries, restoration of key habitats within the Ohio River system, structural changes and retrofits to navigation and flood risk management structures, and others. This talk will provide an overview of the effort and highlight some recommendations and potential projects that resulted from it.

APPENDIX C: FIELD TRIP DESCRIPTIONS

Participants are responsible for their own transportation and should meet directly at the field trip location.

Greater Cincinnati Water Works Richard Miller Treatment Plant Tour
5651 Kellogg Avenue, Cincinnati, OH 45230
Minimum participants required: none
Maximum participants allowed: none

Greater Cincinnati Water Works serves about 1.1 million people in the Cincinnati, Ohio Area. About 900,000 of the area's residents are served by the Richard Miller Treatment Plant (RMTP) which draws water from the Ohio River. This 2.5 hour tour will show you the overall treatment process at the RMTP including Granular Activated Carbon and our new state-of-the-art ultraviolet disinfection facility. This cutting-edge drinking water treatment facility relies on much of the original early 1900s infrastructure combined with expanded and modern treatment technologies. GCWW relies heavily on multiple types of analytical and monitoring equipment to evaluate source water, various stages in the treatment process and water quality in the distribution system. You will see how online monitors and analytical equipment are used to ensure the drinking water is safe from the source to the tap. The tour will finish with a historical tour of the "Old River Station," the original 1907 pumping station complete with the original steam engines which moved water from the river up to the treatment plant.

Thomas More University Biology Field Station Tour with Boat Electrofishing Demonstration
8309 Mary Ingles Highway, California, KY 41007
Minimum participants required: 5
Maximum participants allowed: 15

This field trip will consist of an in-depth two-hour tour of the Thomas More University Biology Field Station facilities, with emphases on the mussel propagation aquaculture laboratory, managed in conjunction with the USFW and KYFW and the harmful algal bloom detection system. Pending weather and interest level, boat electrofishing on the mainstem of the Ohio River will also be offered. The Field Station is a 25-acre teaching and research facility situated along the banks of the Ohio River (RM451) in Campbell County, Kentucky, just upstream from Cincinnati, Ohio. It was the previous site of the U.S. Government Lock and Dam 35, built in 1919, and one of 51 wicket dams along the Ohio River. The Field Station includes classrooms, research and teachings labs, a conference center & lodge, four houses, an interpretive nature trail and a fleet of research boats. The main activities involve undergraduate research in the field of aquatic biology and K-12 STEM outreach programs.

USEPA Experimental Stream Facility Mesocosm/East Fork Watershed Cooperative Tour
1003 US-50, Milford, OH 45150
Minimum participants required: none
Maximum participants allowed: 30

The EPA's Experimental Stream Facility (ESF) and East Fork Watershed Study (EFWS) are

recognized tools for conducting eco-toxicological and watershed management R&D, respectively. An over-arching theme for research using the ESF/EFWS is to use monitoring, modeling, and new economic tools to cost-effectively reduce the impacts of excess nutrients in receiving waters. Inside the ESF is a one-of-a-kind stream mesocosm set-up for conducting dose-response studies on stream biotic communities to help develop, test, and validate criteria for aquatic life. The EFWS facilitates watershed-scale, system-level analysis. It is a collaborative effort among government and academic scientists; local, state and regional water resource assessment and management professionals; USDA conservationists, and drinking water treatment and waste water management operators and experts. The goal for the EFWS is to provide monitoring and modeling infrastructure for research developing better approaches to watershed management.

SD1 Green Building Tour and nearby Constructed Wetlands Tour
1045 Eaton Drive, Ft Wright, KY 41017
Minimum participants required: 5
Maximum participants allowed: none

For the first part of this tour, SD1 invites you to visit Public Service Park (PSP) for a ~ 1 hour guided tour. The park features environmental best management practices (BMPs) and cutting edge public educational programming. PSP is a national model for environmental outreach. This one-of-a-kind, innovative facility features the following educational tools and Best Management Practices (BMPs): vegetated roof, wetland classroom, storm water garden, retention and detention basins, vegetated bio-swales, watershed plaza, oil/water separator, porous pavements, cistern, urban forest, environmental art sculptures, Native American creek walk and more! For the second part, SD1 invites you to the Banklick Creek Regional Wetland and the recent bank stabilization project. The wetland provides natural water quality treatment for Banklick Creek, reducing the quantity of bacteria, sediment and nutrients in the impaired stream. It was funded in part with a $1.4MIL loan through American Recovery and Reinvestment Act of 2009. In recent times, a portion of the equilibrium basin for the wetland was at risk due to streambank erosion. Loss of the berm would not only discontinue the operations of the wetland but also lead to sediment loading to the stream network via sustained bank erosion. SD1 received a 319(h) Nonpoint Source grant to implement a bank stabilization project. The project restored ~ 430 linear feet of streambank as well as enhanced an existing riffle to stabilize the grade and improve aquatic habitat within Banklick Creek. The restoration was completed during the early part of 2018.