

Summer 2019

The Ohio Water Table

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A NEW WMAO WEBSITE!

We have launched a new Association Management System (AMS) to better administer member information and aid in our business practices. The conversion to this online member platform includes an upgraded website and an interactive member profile dashboard.

Additional features include an overview on WMAO activities, links to our division webpages, an event calendar, online registration for events, automated member renewals, email addresses for WMAO officers, directory of members, repository for WMAO publications, and a file drawer of relevant association documents. An informational email has been sent to all members with instructions on how to login to the member portal.

We encourage you to manage your data directly with any changes to contact information. Please add social media links, a biography and your picture in the 'standard member directory' to enhance our networking. Should you have any problems navigating the website or member profile, feel free to contact Dana Oleskiewicz at admin@wmao.org or 330-466-5631.



A screenshot of the Water Management Association of Ohio (WMAO) website. The header features the WMAO logo and the text "Water Management Association of Ohio" with the subtitle "The only organization dedicated to all of Ohio's water resources". The navigation menu includes links for Home, About Us, Divisions, Event Calendar, Conference, Scholarships, Publications, Join Us, and Documents. Below the menu, there are logos for OD\$O, OFMA, OLMS, OSWA, and OWPA. A sidebar on the left lists links for OD\$O, OFMA, OLMS, OSWA, OWPA, Events, Conference, Scholarships, Publications, and Member Directory. The main content area has a dark background with text about what WMAO does and a large image of a rock in flowing water.

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President's Column

Craig Smith, WMAO 2018-2019 President

I hope that, by now, you've all seen the news: our Fall Conference will be returning to Columbus. The 48th Annual WMAO Conference and Symposium will be November 13 and 14 at the Crowne Plaza Columbus North hotel and conference center. We should expect the usual - a great keynote address, informative presentations, opportunities to grow our networks, and time to catch up with friends - while expanding our understanding of the state of Ohio's water resources.

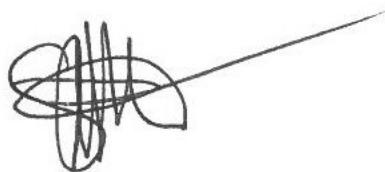
The conference theme – Water Weirding – fits this year perfectly. The last 18 months period has been the wettest in Columbus' history. Last fall was so wet that farmers were kept from harvesting crops; some didn't finish until January. June has brought daily precipitation records, river and stream flooding, and flash floods. Lake Erie water levels are expected to reach record highs (at least since we started keeping records). We've had roads and driveways washed out and freeways and streets repeatedly closed due to high water. Ohio's farmers have. Yet again, been unable to access their fields due to the saturated ground. Even well drillers have been idled as well – it's simply too wet for them to get their rigs where they need to be.

Our Fall Conference is more than its theme. It's our opportunity – your opportunity – to share what we have learned about managing our shared, critical resource. Despite the weird weather and all the inconveniences it's caused we've continued to do our work. We've continued with our research, completed projects, written reports, adopted innovative practices, implemented new and revised regulations, and discovered new threats. These are as important to a comprehensive understanding of the state of, and our collective role in, managing Ohio's water resources as the abnormalities that we're currently experiencing.

I've written before about how the work each of us does in our areas of expertise is interrelated. Finding these connections is why I look forward to our annual gathering. I'm in the "Ground Water Bin" and "Drinking Water Bin", but I always look forward to presentations on dam safety, stormwater management, and watershed management as well as the sessions on ground water and water treatment technologies. I always learn something that I can use when I return to my little cove of Ohio's Water World.

We've currently accepting abstracts for the 48th Annual WMAO Conference and Symposium. It doesn't have to be about Water Weirding or weird water. Just share your knowledge about managing Ohio's water resources with the rest of us.

"... (fall conference is) important to a comprehensive understanding of the state of, and our collective role in, managing Ohio's water resources..."



Water Weirding

Hottest hots, driest dries, wettest wets, windiest wind[s] -*David Orr, Oberlin College*

WMAO 48th Annual Meeting and Symposium

November 13 & 14, 2019

Crown Plaza - Columbus North / Worthington,
6500 Doubletree Ave, Columbus OH 43229

Keynote: Aaron Wilson, OSU Byrd Polar and Climate Research Center

Members - \$250

Non-members - \$300

(additional pricing listed [online](#))

Registration is now OPEN!

Conference sponsorships are available:

Luncheon Sponsor - \$1,000 * Exhibitor Prime - \$750

Exhibitor - \$550 * Event Sponsor - \$350

Door Prize Sponsor - \$125

For more information, visit wmao.org.

New Approach to River and Stream Monitoring in Ohio

By Kurt Keljo, OWPA Division Director

The Ohio EPA is proposing a change to its approach to sampling Ohio's rivers and streams. A factsheet, PowerPoint presentation and recorded webinar on the new approach are available on the Ohio EPA's website (<https://epa.ohio.gov/dsw/bioassess/ohstrat>). The agency is seeking feedback on this "Proposed Two-Pronged Approach to Surveying and Monitoring Aquatic Life in Ohio's Streams and Rivers." The comment period deadline is August 12, 2019.

Ohio has generally been considered a leader in water quality monitoring. Since 1998, the agency's approach has been to monitor ~400 sites each year for fish, macroinvertebrates and water chemistry. Based on a system whereby the state is divided into 98 watersheds, sampling has been distributed across four or five watersheds each year with the aim of obtaining a comprehensive assessment of each of these watersheds. Since 1978, more than 12,000 sites have been sampled across the state, with more than 28,000 fish, 14,500 macroinvertebrate and 88,000 water chemistry samples collected. This approach is time consuming, and gaps of 20+ years between watershed studies have been typical.

By changing its monitoring approach, the Ohio EPA hopes to collect data more regularly and better assess statewide trends. The new approach would have two components or prongs. One component would involve doing statewide surveys of statistically selected sites on headwater streams, wadeable streams and large rivers over a period of four years - the probabilistic prong. With regard to the other component, the state would be divided into 37 basins, combining some of the 98 watersheds into which the state had been divided previously, and these 37 basins would be sampled at locations based on priorities determined from previously collected data (rather than choosing sites on the basis of a statistical formula)—the targeted prong. The goal would be to sample the entire state in 12 years.



ODA Announces Updates on Western Lake Erie Basin Assistance Programs

Reynoldsburg, Ohio (Jun. 17, 2019) – The Ohio Department of Agriculture (ODA) is announcing the second sign-up period for programs in the Western Lake Erie Basin funded by the passage of Ohio Senate Bill 299. Signed in 2018, Ohio Senate Bill 299 provided \$23.5 million for soil and water conservation districts (SWCD) located in the Western Lake Erie Basin (WLEB) for nutrient management programs.

Two programs have been a success so far this year, the Ohio Working Lands Hay Buffer Program and the Ohio Working Lands Small Grains Program. ODA Director Dorothy Pelanda announced that there are funds remaining for a second round of program sign-ups.

The Ohio Working Lands Hay Buffer Program encourages producers in the WLEB to establish year-round vegetative cover on eligible cropland. The program promotes the conversion, establishment, and maintenance of forage/hay land on certain cropland acres. These buffers act as another line of defense to filter surface water while allowing participants to harvest forage from the established areas. During the first signup period, 4,075 acres were enrolled in the program.

The Ohio Working Lands Small Grains Program encourages producers in the WLEB to plant small grains such as wheat, barley, oats or cereal rye on eligible cropland. Participants must plant and harvest small grains, land apply manure, and plant a cover crop to receive a cost-share payment to help offset operating costs. The program supports the planting of small grains and cover crops for the conservation benefits and provides livestock producers with a longer season to land apply manure and nutrients. During the first signup period, 39,226 acres were in enrolled in the program.

Sign-ups for the Ohio Working Lands Hay Buffer and Small Grains Program will begin June 17.

Local soil and water conservation districts (SWCDs) will manage the program sign-up and verification of eligibility and crop establishment. Producers located in the WLEB and interested in these programs should [contact their local SWCD to learn how to sign up](#).

These buffers act as another line of defense to filter surface water while allowing participants to harvest forage from established areas.



Call for Abstracts

In 2019, OFMA is partnering with WMAO for a joint annual conference. OFMA is seeking presentations that focus on the following:

- National Flood Insurance Program (NFIP)
- Regulations
- Flood Insurance
- Flood Hazard Mapping
- Damage Assessment
- Flood Mitigation
- Structural Flood Control (Dams, Levees, etc...)
- Data, Engineering, & Modeling
- Geographic Information Systems (GIS)
- Water Resources Management
- Education & Outreach
- Green Infrastructure & Stormwater Management
- Coastal Floodplain Management
- Building Code
- Using Technology & Media for Floodplain Management

Deadline for submission is August 21, 2019

Visit www.ofma.org

NOAA, Partners Predict Large Summer Harmful Algal Bloom For Western Lake Erie

National Oceanic And Atmospheric Administration (NOAA) - <https://oceanservice.noaa.gov/hazards/hab/>

NOAA and its research partners are forecasting that western Lake Erie will experience a significant harmful algal bloom (HAB) this summer.

This year's bloom is expected to measure 7.5 on the severity index, but could range between 6 and 9. An index above 5 indicates blooms having greater impact. The severity index is based on bloom's biomass – the amount of algae – over a sustained period. The largest blooms occurred in 2011, with a severity index of 10, and 2015, at 10.5. Last year's bloom had a severity index of 3.6, while 2017's was 8.0.

Lake Erie blooms consist of cyanobacteria, also called blue-green algae, that are capable of producing the liver toxin microcystin that poses a risk to human and wildlife health. Such blooms may result in higher costs for cities and local governments that need to treat drinking water, prevent people from enjoying fishing, swimming, boating and visiting the shoreline, and harm the region's vital summer tourism economy. These effects will vary in location and severity due to winds that may concentrate or dissipate the bloom.

"Communities along Lake Erie rely upon clean, healthy water to support their community's well-being and economic livelihoods," said Nicole LeBoeuf, acting director of NOAA's National Ocean Service. "This forecast provides timely and trusted science-based information to water managers and public health officials so they can better anticipate blooms, mitigate impacts and reduce future outbreaks."

The size of a bloom isn't necessarily an indication of how toxic it is. For example, the toxins in a large bloom may not be as concentrated as in a smaller bloom. Each algal bloom is unique in terms of size, toxicity, and ultimately its impact to local communities. NOAA is actively developing tools to detect and predict how toxic blooms will be.

Bloom expected in late July

This year, the lake temperature has remained relatively cool due to the higher-than-average rainfall in the region, so the bloom is not expected to start until late July when the water temperature reaches 65 to 70 degrees F. This contrasts with 2018, when exceptionally warm weather at the beginning of June caused an early start. Calm winds in July, especially in western Lake Erie, tend to allow the algal toxins to concentrate, making blooms more harmful. The bloom typically peaks in the western part of the lake in September. Most of the rest of the lake will not be affected.

"This extremely wet spring has shed light on the movement of nutrients from the land into Lake Erie," said Christopher Winslow, Ph.D., director of Ohio Sea Grant and Stone Laboratory. "Despite the predicted size of this year's bloom, portions of the lake will be algae free during the bloom season and the lake will remain a key asset for the state. Ongoing research continues to help us understand bloom movement and toxin production, and remains vital to providing our water treatment facilities with the tools, technology and training they need to keep our drinking water safe."

The Lake Erie forecast is part of a NOAA ecological forecasting initiative that aims to deliver accurate, relevant, timely and reliable ecological forecasts directly to coastal resource managers and the public. In addition to the early season projections from NOAA and its partners, NOAA also issues HAB bulletins twice a week during the bloom season.



Gathering data, refining models

NOAA continues to expand the use of satellite data into its Lake Erie Harmful Algal Bloom Forecast System, which is helping improve the accuracy of bloom forecast products. The data comes from the European Union's [Copernicus Sentinel-3 satellite](#)[offsite link](#), which has instruments that measure coastal water color, and have proven to be especially useful for detecting and tracking algal blooms. NOAA is also [continuing to work with its academic partners](#) to refine and improve the models used to develop the forecasts.

"This spring brought regular, heavy rainfall to the Maumee River watershed which would normally carry a lot of nutrients into the lake," said Richard Stumpf, Ph.D., NOAA's National Centers for Coastal Ocean Science's lead scientist for the seasonal Lake Erie bloom forecast. "However, due to the amount of rain this year, farmers were unable to plant their fields which reduced the nutrient concentration. That combined with higher than normal lake levels, presents an opportunity to test the accuracy of our models."

Nutrient load data for the forecasts came from Heidelberg University. The various forecast models are run by NOAA's NCCOS, the University of Michigan, North Carolina State University, LimnoTech, Stanford University, and the Carnegie Institution for Science. Field observations used for monitoring and modeling are done in partnership with NOAA's Ohio River Forecast Center, NOAA's National Centers for Coastal Ocean Science, NOAA's [Great Lakes Environmental Research Laboratory](#)[offsite link](#), NOAA's [Cooperative Institute for Great Lakes Research](#)[offsite link](#), [Ohio Sea Grant](#)[offsite link](#) and Stone Laboratory at The Ohio State University, University of Toledo and Ohio EPA.

NOAA's mission is to understand and predict changes in the Earth's environment, from the depths of the ocean to the surface of the sun, and to conserve and manage our coastal and marine resources.

State Science Day 2019 WMAO Awards

By Rick Weber, Chair, WMAO State Science Day Committee

The 2019 State Science Day was held at The Ohio State University in French Field House, on Saturday May 11. Twenty-five students requested to be judged for the two WMAO awards: 18 were in the lower 7th - 9th grade category, and 7 were in the upper 10th - 12th grade category. The Peter G. Finke Water Management Award in each grade category includes a \$250.00 check, a plaque, recognition in WMAO's "The Ohio Water Table" publication, and an invitation to the WMAO Annual Conference in November. Kurt Rinehart, Peter Soltys, and Rick Weber did the judging this year for WMAO.

The WMAO 2019 State Science Day awardee in the lower grade category is **Soham Santosh Joshi**, a 9th grade student at The Columbus Academy located in Gahanna. Soham's project was entitled "Mechanism Leveraging E-Waste to Enhance Water Condensation through Effective Use of Solid State Magneto-Caloric Thermal Cooling." His project was incubated from several trips to India where he noticed water rationing. He researched the problem and discovered that many large cities in poorer countries have interrupted water supply issues. Ironically, these very cities happen to be located in areas with high humidity. He reasoned this untapped humidity, if captured by condensation, could provide a water resource to areas of water shortage.

Traditionally fog nets and condensation towers have been used as water condensation devices, but require a specific combination of climatic and topographical conditions to be efficient. They are frequently large in size, and often prove impractical for densely populated urban areas. Soham concluded that a refrigerant system would have to be used to create condensation from available humidity. He researched four different types of refrigerant systems: compression, absorption, evaporative, and thermoelectric. Soham decided to construct his condenser using a thermoelectric cooling system because it requires no hazardous chemicals, is cheap to construct, has practically no maintenance cost, and is very efficient.



Rick Weber congratulating Soham Santosh Joshi on his winning project at 2019 State Science Day.

Soham used a Peltier thermos-cooling module and CPU cooling fans from discarded computers (e-waste) to build a solid-state refrigeration unit. A glass tank was used to collect the condensation. A Raspberry Pi 3 was used to run the python script that programmed a temperature and humidity sensor to report data in real-time. To increase surface area, cobalt metal-organic cones were placed in the tank. 9-volt batteries were used to power the CPU fans and the Peltier cooling unit. Soham had a successful testing of his prototype proving that a device which can be used to harness humidity into a viable source of potable water could be effective, portable, eco-friendly, and inexpensive to manufacture. Soham developed an excellent project, and researched his subject thoroughly.

The WMAO 2019 State Science Day awardee in the upper grade category is **Emily A. Kruze**, a sophomore at Bloom Carroll High School located in Carroll. Emily's project was entitled "Testing Local Water Sources for Microplastic Pollution and its Effects on Agriculture." She devised her project from a growing world-wide concern: an over abundance of plastic in the global environment. Emily specifically researched microplastics (plastic particles <5mm in length) and the effect microplastics have on human activity. Her primary objective was to discover plastic particles in seven local waterways and the effect those concentrations have on the growth rate of



Peter Soltys and Kurt Rinehart offer to Emily Kruze from Bloom Carroll High School a WMAO \$250 scholarship.

dry. The weight of each sample was computed using an analytical balance to subtract the weight of the crucible from the weight of the dried sample in the crucible. The solids from the crucibles were placed in individual petri dishes. The petri dishes were placed under a microscope to visually quantify the plastics.

The water in the glass jars, residual from pouring the samples through the mesh screens, was transferred to a 500mL beaker, treated with hydrogen peroxide, and heated until no organic matter was visible. Salt was added to each sample to increase the density of the aqueous solution. The beakers were heated once again to dissolve the salt, covered with aluminum foil, and left to settle 24 hours. A microscope slide and cover slip was weighed. Microplastic particles were skimmed from the surface of the solution in the beakers and placed on the microscope slide then covered with the coverslip. The slides were viewed under a microscope to verify microplastics, then weighed to determine the weight of the microplastics on the slide. This weight was added to the plastic weight from the crucibles and divided by the water sample volume (128mL) to determine the mass of the plastic particles per mL of water.

Knowing the mass of microplastics in each of the seven different waterway samples, Emily conducted the second part of her project: the effect of plastic on agriculture. For this procedure Emily started 800 soybean plants in 50-seed starting trays. The trays were placed on a heat mat and placed under a condensation cover for two days to allow the seeds to germinate. After germination, the plants were watered with 5mL of water every other day. Each 100 plants, or two seed trays were watered using water from one of the seven separate water sources. Two seed trays were watered using distilled water. After three weeks the plants were uprooted, cleaned of the potting soil, and dried overnight. The following day each plant was weighed and measured in centimeters from root to shoot. The plants were then cut at the soil line. The roots and shoots of each plant were measured and weighed separately. All data was recorded in a notebook and a spreadsheet was composed to compare the plastic per mL of each of the separate water sources with the growth rate of each soybean tray.

Through a multitude of testing and analysis Emily's hypothesis was shown to be supported. After careful observation, microplastics were detected in all 7 of the sources of water. She also observed that the water source which contained the largest amount of microplastics had the least soybean germination and growth rate. Emily demonstrated a thorough understanding of her project, composed an excellent report, and made effective use of the scientific method. Emily's science teacher at Bloom Carroll High School is Mr. Joe Carter

soybean plants. Her hypothesis then, was that there will be detectable levels of plastic in all seven water samples collected, and plants grown with the least amount of plastic particles in their water source will have noticeably higher growth rates. Emily set out to prove her hypothesis by following two procedures: plastic analysis and plastic effect on agriculture.

The plastic analysis procedure began by collecting water samples from seven different waterways. A measurement of 128mL of each water sample and a distilled water control was individually poured through a stack of mesh screens measuring 125, 250, and 500 microns. The residual water at the bottom of the stack was placed in individual glass jars, while the solids on the screens were placed into a weighed crucible and placed in an oven to

Research Highlights from State of Ohio Water Resources Center



Figure 1: MS student Brindha Murugesan (University of Cincinnati) is optimizing a bench-scale membrane bioreactor system with the carbon nanotube composite membrane.

respectively. As shown in Figure 2, the CNT composite membrane was able to treat wastewater for 9-10 days without cleaning, while a commercial polytetrafluoroethylene (PTFE) membrane in the same setting could be operated only for 6-7 days before cleaning/replacement. Furthermore, the membrane was effectively recovered from fouling using electric heating. During this period, any physical damage of the CNT composite membrane was not found by the electric heating. The results allow for development of novel engineering solutions for the mitigation of membrane fouling and/or recovery from membrane fouling that eventually increase performance of MBR systems and also reduce HABs' risks to public health and the environment.

The Ohio Water Resources Center is a federally authorized center situated at the Ohio State University. We fund state relevant water related research. Dr. Soryong Chae, Assistant Professor at the Department of Chemical and Environmental Engineering at the University of Cincinnati completed an Ohio Water Resources Center funded project via OWDA subaward. This project titled **“Design of a self-cleaning membrane-assisted bioreactor for enhanced removal of nutrients from wastewater”** aims to fabricate a self-cleaning membrane for the efficient use in wastewater treatment.

Due to the continuously increasing occurrence of HABs in Ohio's lakes and rivers and the inefficient or impractical technologies for the elimination of nutrients, there is a critical need to develop an effective solution for a satisfactory removal of nutrients from wastewater sources in order to achieve clean and safe drinking water supplies and protect human health. Dr. Chae and students build a bench-scale membrane bioreactor (MBR) with self-cleaning carbon nanotube (CNT) membrane (Figure 1). They fed the MBR with synthetic wastewater to investigate organic compounds, total nitrogen and total phosphorous removal and evaluate the membrane durability and fouling potential when heating is used for membrane cleaning. Typical removal efficiencies of chemical oxygen demand, total nitrogen, and total phosphorus by the MBR during 60 days of operation were 95~96%, 83~84%, and 63~65%,

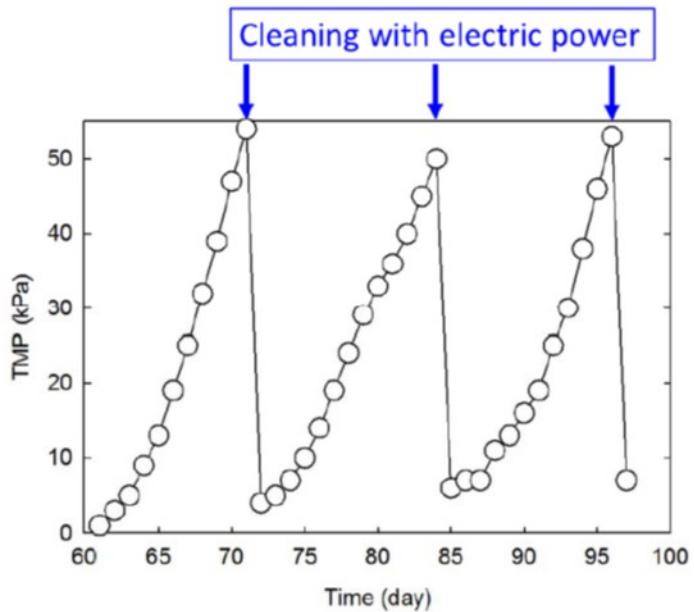


Figure 2: Changes in carbon nanotube membrane fouling (transmembrane pressure) during the experimental period.

Researcher Profile: Dr. Soryong Chae received his Ph.D. from Korea Advanced Institute of Science and Technology (KAIST) in 2004 and he pioneered research in the application of nanotechnology for membrane, water and energy. His research interest includes environmental implications and applications of engineered nanomaterials; membrane technology for drinking water production; and MBR for municipal and industrial wastewater recycling.



A Collaborative Approach to the Issues Facing Ohio's Water

H2Ohio is the water quality initiative Governor DeWine introduced to invest in targeted, long-term solutions to ensure clean and safe water in Lake Erie and throughout Ohio.

Through collaboration among the Ohio Department of Natural Resources, Ohio Environmental Protection Agency, Ohio Department of Agriculture, and Ohio Lake Erie Commission, H2Ohio will address critical water quality needs and support innovative solutions to some of the state's most pressing water challenges.

Ohio Governor Mike DeWine, State of the State, March 5, 2019:

"We have so much to appreciate. And we need to support and expand efforts that are working to preserve and protect our state's natural wonders—from Lake Erie to all our lakes and rivers. But, at the same time, we still face some significant challenges.

Water is vital to us wherever we live. From aging infrastructure to failing septic systems to nutrient pollution to threats of lead contamination, communities throughout Ohio face different and unique water problems.

The Western Lake Erie Basin has been especially hard hit by algae blooms. We remember the 2014 water crisis when half a million Toledo residents couldn't use their water. And, we've heard from charter boat captains who have said that during blooms, they have to travel farther and farther out into the water because the Lake was so thick and green, it was almost like pea soup!

Our water problems have accumulated over many years, and it will take a dedicated, long-term commitment to achieve real solutions to protect Ohio's water."

WATER MANAGEMENT ASSOCIATION OF OHIO

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The Water Management Association of Ohio (WMAO) is the one organization dedicated to all of Ohio's water resources.

VISION: To be recognized statewide as the go-to community for people who manage and safeguard Ohio's water resources.

MISSION: To support Ohio's water resource professionals with essential information, education, and networking opportunities

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