Ohio River Valley Water Sanitation Commission Annual Report 2021

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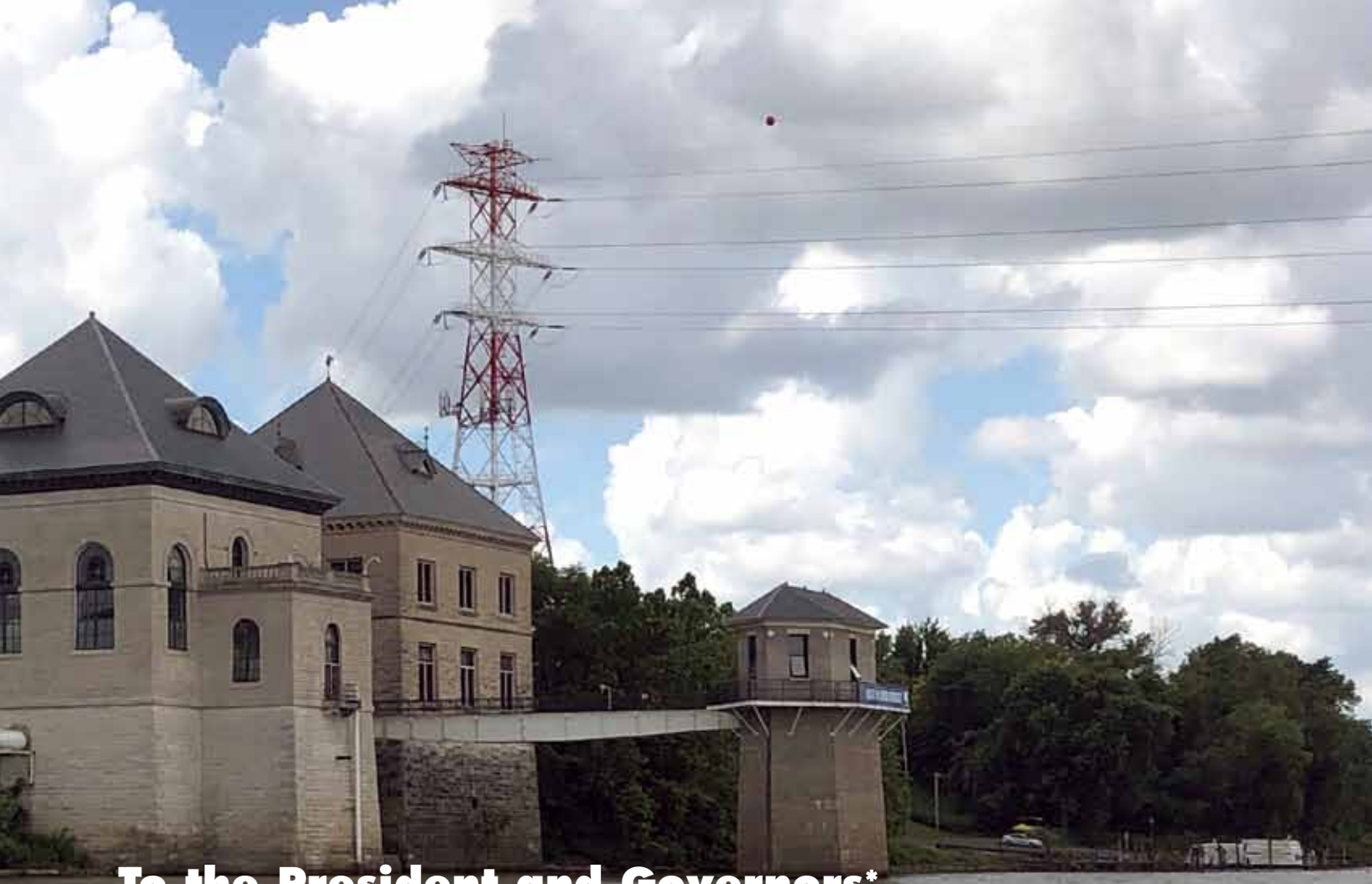

To the President and Governors*

The Ohio River Valley Water Sanitation Commission (ORSANCO) is an interstate water pollution control agency created in 1948 by the State of Illinois, the State of Indiana, the Commonwealth of Kentucky, the State of New York, the State of Ohio, the Commonwealth of Pennsylvania, the Commonwealth of Virginia, and the State of West Virginia with approval of the Congress of the United States. The Commissioners of ORSANCO respectfully submit the following fiscal report of activities for 2021 to:

The Honorable J. B. Pritzker
Governor of Illinois

The Honorable Eric Holcomb
Governor of Indiana

The Honorable Andy Beshear
Governor of Kentucky

The Honorable Andrew M. Cuomo
Governor of New York

The Honorable Mike DeWine
Governor of Ohio

The Honorable Tom Wolf
Governor of Pennsylvania

The Honorable Ralph S. Northam
Governor of Virginia

The Honorable Jim Justice
Governor of West Virginia

and

The Honorable Joe Biden
President of the United States

*As of June 30, 2021

Chairman's Message

To remain indifferent to the challenges we face is indefensible. If the goal is noble, whether or not it is realized within our lifetime is largely irrelevant. What we must do therefore is to strive and never give up.

Dalai Lama

Over the past year, and since the COVID pandemic began, so much of our everyday lives, including our ability to meet our goals in achieving clean water, has been anything but normal. Through these challenges, ORSANCO staff, along with our many supporting partners and organizations, have continually demonstrated an unprecedented ability to rise above challenging circumstances and maintain high quality work in achieving our water quality goals.

For an organization where field work and direct personal interactions with all stakeholders are important to its mission, ORSANCO staff has met the challenge through virtual work, meetings, and continued data compilation and trends analyses. During these uncertain times when many work places and plans were put on hold, ORSANCO continued its work on various projects, including the completion of a Mercury Analysis Report and ORSANCO's Biennial Assessment of Water Quality Conditions, the continuation of Harmful Algal Bloom (HAB) studies, and planning various activities with the Ohio River Basin Alliance (ORBA). ORSANCO has continued to address the important issue of fluorinated organic compounds (PFAS) that are both toxic and largely non-biodegradable in surface and ground water. Staff will begin sampling for this important study, in collaboration with various ORSANCO partners, during the upcoming 2021 field season. Staff also organized successful virtual Technical and Commission meetings as well as Mini-Sweep events in place of its annual Ohio River Sweep cleanup.

And now, at the end of this 2021 fiscal year, ORSANCO staff is prepared and ready to resume activities in this new normal; reopening its headquarters in Cincinnati for office staff and resuming field sampling and regular in-person meetings, such as the upcoming Technical and Commission meetings to be held in-person in Pittsburgh this fall.

We have not given up during these challenging times, and ORSANCO will continue to strive, and never give up, on the mission and noble goal of the Commission to protect and preserve water quality now and for many lifetimes to come.

ORSANCO: Working Together to Protect the Ohio River and its Uses

Citizens in the Ohio River Basin use the river in various ways, and ORSANCO must protect these uses and help to improve water quality for the citizens of the Ohio River Valley. The Ohio River is a source of drinking water for over five million people, a major transportation route for coal and other energy products, and a natural resource for many plants and animals. ORSANCO works along with many other state and local agencies and organizations to provide safe drinking water, protect aquatic life, advise fish consumption, and guide citizens with decisions about recreational activities in and around the river.

Evaluating the Ohio River for its Beneficial Uses: ORSANCO's 305(b) Report

Every two years, ORSANCO completes an assessment of Ohio River Water Quality Conditions (305(b) report). This report utilizes ORSANCO's monitoring results to assess the degree to which the Ohio River's beneficial uses are maintained. The assessments are guided by a 305(b) Coordinators Work Group composed of the states' representatives. The report is utilized by the states in developing their state-wide lists of impaired waters.

Four beneficial uses are assessed for the Ohio River including *public water supply, aquatic life, fish consumption,* and *contact recreation*. Each of these beneficial uses have various monitoring data and criteria that are used to determine if that particular use is met, or alternatively, impaired. New assessments were not established in 2021, but assessment methodologies and new water quality data continue to be considered by the 305(b) Coordinators Work Group for the next report, which is scheduled for release in 2022.

Protecting Drinking Water

Emergency Response

The Ohio River is a vital, natural resource that supplies drinking water to over 5 million people daily, supports a diverse aquatic ecosystem, and provides recreational opportunities for swimmers, boaters, and anglers. The Ohio River, however, is also a working river, providing the necessary water resources to support industries for manufacturing, energy, natural gases, and fuel production. Moreover, the Ohio River is a major corridor for the transportation of a variety of different materials, including fuels and natural resources, chemicals, aggregates, and commodities such as corn, grains, and soybeans. This mode of transportation is a cost-efficient mechanism for commercial navigation of goods to other parts of the country. However, with the substantial industrial and commercial uses of the river, the threat for releases and discharges of pollutants that contaminate the river is considerable, which could make the river unsuitable for its intended uses, including drinking water production, habitable environment for native aquatic and vegetative species, and recreational activities.

ORSANCO has served a critical role in emergency spill response communications since 1958 by providing notification of spills and other incidents that could adversely affect water quality to local, state, and federal emergency response agencies, drinking water utilities, and industries that may be impacted by a chemical release. The "HazAlert" system was created in 1958 by ORSANCO's Water User's Advisory Committee, where it was required that oil releases and other potential toxic chemicals were called into ORSANCO Headquarters via a specific telephone line. ORSANCO staff kept a detailed listing of these incidents and also performed visual surveillance operations by boat, plane, and vehicle multiple times a year. This was the precursor to ORSANCO's modern Spills Notification and Tracking System.

Today, staff maintains a 24/7, 365 day notification system, and incident reports come into ORSANCO from the National Response Center or through direct calls from agencies or citizens. Information is evaluated to determine the potential threat to Ohio River users and communicated to agencies and utilities as appropriate. The vast majority of spills that occur every year are minor and have little to no impact on water quality. Significant spills, however, do occur from time-to-time, coming from a variety of different sources with a variety of different pollutants. When spills occur, water quality monitoring and rapid analysis is critical for drinking water utilities to have access to in order to make the best water treatment management decisions and ensure that the public water supply is safe to use for drinking water purposes. ORSANCO is a key player in this response activity, since many contract and private labs may not be able to provide a quick turnaround time as the spill is still traveling downstream. Any potential contact recreation and aquatic life impacts are also addressed.

ORSANCO staff also works with spill response entities in the Ohio River Basin to simulate emergency response activity for potential source water contamination events. Agencies involved in these collaborations include local 911 responders, medical professionals, health department officials, state environmental and public health agencies, private industry, and the US Coast Guard.

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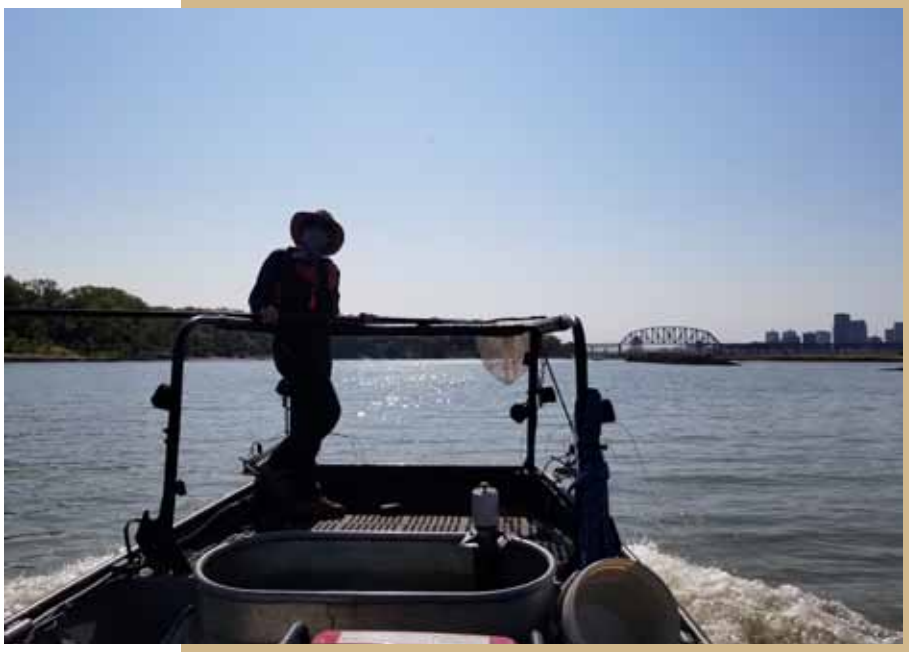

Organics Detection System

The Organics Detection System (ODS) is a voluntary, cooperative effort involving water producers, industries, and ORSANCO to monitor volatile organic compounds (VOCs) in the Ohio River main stem and in its four tributaries. The primary purpose of ORSANCO's ODS Network is to screen river (surface) water samples for VOCs to determine water quality conditions as a protective measure for drinking water supplies. Benefits of the ODS include routine daily analysis of river water samples, remote access to each ODS site for real-time water quality data reviews, spill plume profiling and tracking, and a coordinated communications network to relay water quality disturbances to upstream and downstream sites during spill or unreported release events.

History of ORSANCO's Organics Detection System

ORSANCO's first monitoring system was comprised of "Robot Monitors" at 13 fixed locations along the Ohio River. This essential surveillance system was able to monitor up to ten parameters including dissolved oxygen, temperature, chloride, hydrogen, and pH; however, it was unable to adequately detect other spills, discharges, and releases of chemical contaminants (such as phenols and petroleum oils) that could potentially impact water quality. These robot monitors were able to transmit and "auto relay" information to ORSANCO headquarters on a continued and routine basis and served as ORSANCO's first river wide network for several years.

In 1979, ORSANCO's Early Warning Organics Detection System (EWODS) was created in response to a 70 ton spill of carbon tetrachloride into the Kanawha River (WV) that went undetected for over a week and contaminated several drinking water facilities. The EWODS was designed utilizing purge and trap instrumentation and gas chromatographs (GCs) to detect the presence of select volatile organics which were installed at seven locations along the Ohio River. These host sites operated the instrumentation five days a week under the EWODS program. New ODS host sites were added, as funding and support became available, to provide more coverage along the Ohio River and tributaries to the Ohio. From the late 1990's until 2010, ORSANCO had 15 ODS monitoring stations. With the last renovation and upgrade in 2016, ORSANCO was able to add two more ODS sites (Ashland, KY & Charleston, WV) for a total of 17 active ODS stations; these stations can be found along the Ohio, Allegheny, Monongahela, Kanawha, and Elk rivers in the Ohio River Basin.

ORSANCO's Current Organics Detection System

ORSANCO still uses Purge and Trap technology, paired with GCs and GCMS instrumentation, as it remains the most efficient way to determine the presence of (or confirm the absence of) VOCs in surface water. The addition of autosamplers has given ODS operators more freedom as the instrumentation can operate unattended for periods of time (such as overnight and during weekends), and when a spill event occurs, many samples can be added and analyzed at one time. In addition, Mass Spectrometer Detectors have the ability to conclusively identify compounds and contaminants based on the mass of particular atoms at the molecular ion level.

During routine monitoring, river water samples are collected, processed, and analyzed up to four times a day at select ODS stations using purge and trap technology and gas chromatographs. The system is calibrated to identify 30 common volatile organic compounds (VOCs) and provide concentration amounts. And, with mass spectrometer detectors at eight ODS stations, ORSANCO's ODS network has the capability to detect and identify the presence of thousands of volatile contaminants qualitatively. The 17 ODS stations within the Ohio River Basin provide a network of water quality monitoring and information. ORSANCO works closely with local drinking water utilities and industries, and the operation of this valuable system is only possible through the desired continued collaboration of this integrated river wide sentinel with ORSANCO ODS staff.

River water samples (at intake depth) are collected at intervals during a 24-hour period and screened for the presence of VOCs. Fortunately, the vast majority of these samples do not show signs of contamination of volatile organics. When a VOC is detected at or above the program thresholds, ORSANCO will notify downstream water utilities (not just ODS host sites, but any of the drinking water producers along the Ohio River) and state and federal water quality

and emergency response agencies as necessary. These entities can then respond to the detection based on their respective emergency response plans. However, non-detection or absence of VOCs serves as an indicator that the river water meets its intended designated use (for volatile organics), which is the overall goal for this program and ORSANCO's source water protection efforts.

The success of the ODS is due to the voluntary partnerships between the water utilities, water users, and ORSANCO. The ODS has been highly effective in detecting and tracking numerous volatile-related spills and discharges since its inception in 1978. The ODS has remained one of ORSANCO's flagship programs and has had recognition from around the world. This invaluable monitoring network serves as part of overall source water protection programs implemented by multiple water utilities and water users.

Spotlight: Rengao Song, Ph.D., Former Director of Water Quality and Research, Louisville Water Company

Dr. Rengao Song has been a supporter of ORSANCO, the Water Users Advisory Committee, Source Water Protection, and ORSANCO's Organics Detection System (ODS) for many years while he was with Louisville Water Company in Louisville, KY. Rengao retired from Louisville Water at the end of October 2020 after more than 20 years of dedicated service to Louisville and its surrounding communities.

Rengao was an active member of the Commission's Water Users Advisory Committee, contributing to the committee's understanding of Ohio River resources, impacts on drinking water production and drinking water quality, and improvements to achieve better water quality monitoring. He encouraged collaboration, brainstorming, and discussion among utilities to share and exchange ideas for the benefit of all utilities along the entire river.

For ORSANCO's ODS, Rengao was the lead for ORSANCO's Next Generation Renovation Workgroup, which was developed to discuss instrument upgrades, broaden analytical capabilities and monitoring strategies, and improve water quality data and information dissemination to Ohio River utilities.

During significant spill events in the Ohio River Basin, Rengao offered his insight and expertise to smaller utilities on treatment techniques and options, provided guidance in sample collection and analytical monitoring, and performed extra sample analyses to provide detail on time of travel estimates and plume profiling on several contaminants over the years.

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Rengao has received many awards and honors throughout his career, including one as co-author on a paper that won the 2020 Samuel Arnold Greeley Award, the highest research paper award from the American Society of Civil Engineers. He also won the best paper award from the Journal of American Water Works Association. In all, he's published more than 200 peer-reviewed papers and/or conference proceedings.

As the Director of Water Quality and Research at Louisville Water, he has been a mentor and advisor to graduate and research students in the field of environmental science and engineering. Early this year, in a tribute to his efforts, Louisville Water and the KY/TN section of the American Water Works Association (AWWA) started a scholarship for graduate students in his honor called "The Rengao Song Scholarship for Water Science and Technology".

The following quote provides a small glimpse into Rengao's character:

"Knowledge is never contained in one person. It grows from the relationships we create between each other and the world, and still it is never complete."
Paul Kalanithi, *When Breath Becomes Air*

ORSANCO extends congratulations on Rengao's retirement and much success in his new ventures.

Protecting Aquatic Life

ORSANCO's aquatic biologists work to ensure that the Ohio River is capable of maintaining healthy populations of fish and aquatic life. They also partner with many different agencies to generate data, complete projects, and attain their goals of maintaining a healthy Ohio River watershed and protecting the aquatic life that depends on the integrity of the habitat and waters in the Ohio River Basin.

Ohio River Fish and Macroinvertebrate Indices

In 1993, ORSANCO developed and implemented an assessment technique to compare fish and environmental data sampled from the various navigational pools of the Ohio River. In 2003, ORSANCO developed the Ohio River Fish Index, which was subsequently modified in 2008 to become the mORFIn (modified Ohio River Fish Index). Using the collected data, the index assigns scores to rate the relative condition of fish communities among the Ohio River pools. Similarly, after over a decade of research, ORSANCO recently completed an index that uses information from macroinvertebrate populations encountered at each sampling site to assess water quality conditions. Assessments of the pools sampled in 2018 marked the fourth year that both the fish index (mORFIn) and the Ohio River Macroinvertebrate Index (ORMIn) were used in conjunction with each other to assess the biological condition of the Ohio River.

Each year, ORSANCO biological crews collect data from two to three navigational pools using a random, probability-based design that selects 15 sampling locations within each pool. Fish are captured, identified, measured, and inspected for deformities, eroded fins, lesions, or tumors prior to release.

Likewise, macroinvertebrates are collected from the same 15 sites and sent to a contractual laboratory for identification. The data obtained are converted into multiple metrics (e.g. diversity, abundance, pollution tolerance, etc.) that are added together for each site and compared to previous results in order to calculate mORFIn and ORMIn scores.

Due to COVID-19 pandemic restrictions and associated social distancing requirements, all boat-based surveys requiring staff to operate for extended periods within six feet of one another were prohibited. The Biological Water Quality Subcommittee (BWQSC), an oversight group of representatives from state and federal agencies within the Ohio River Basin, agreed to postpone annual electrofishing and macroinvertebrate surveys until 2021 given these sampling restrictions.

Fish Tissue Collections

With the postponement of 2020 biological surveys, staff reallocated sampling efforts to fish tissue collections. These type of collections can be completed with two socially-distanced crew members and thus would not violate COVID-19 restrictions. This was somewhat fortuitous given that a small amount of data resulted from limited collections in 2018 and 2019 due to scheduling conflicts with ORSANCO's NRSA surveys. This data gap was further exacerbated by lost sampling time in the spring of 2020 when all field activities were suspended due to the pandemic. Once travel was allowed, biologists collaborated with state and federal partners to collect necessary data from 14 of the 18 Ohio River pools prior to the end of 2020. Relying on day trips, this multi-agency effort resulted in 91 sample collections, far exceeding the minimum amount required for completing future assessments.

In 2021, an adjusted pool survey schedule was approved by the BWQSC that looks to mitigate the effect of pandemic delays with a temporary return to four annual pool surveys in 2021 and 2022. Priority has been placed on completion of probabilistic surveys in Dashields, Hannibal, Markland, and McAlpine pools in 2021. Additionally, biologists will sample the full suite of fixed stations, collect fish tissue samples on behalf of the Indiana Department of Environmental Management, and investigate new ways to quantify aquatic vegetation on the Ohio River with assistance from the USEPA.

Protecting Fish Consumption

Tissue Contaminants Program

Every year, ORSANCO collects composite fish fillet samples from species that are thought to be commonly consumed from the Ohio River main stem for contaminant analysis. These samples are sent to a contract laboratory and are analyzed for mercury, methylmercury, polychlorinated biphenyls (PCBs), pesticides, and other contaminants. Resulting data are reviewed by ORSANCO staff and are then posted online at www.orsanco.org and shared with members of the Fish Consumption Advisory Workgroup (FCAW), which comprises members of regulatory agencies representing each of the six main stem states.

Fish Consumption Advisories

The most recent 10 years of fish tissue data are separated by river segment, species, and size (where appropriate) and compared to Ohio River Fish Consumption Advisory Protocol (ORFCAP) concentration thresholds, which were derived from a consensus of the FCAW and are unique to the Ohio River, to determine appropriate proposed consumption advisory categories.

These proposed advisories are then discussed with the FCAW and, upon reaching consensus, are updated in state publications and on a website hosted by ORSANCO (www.orsanco.org/fca) that sums up the approved advisories and breaks down the listings by species, state, and river segment. The site includes links to individual state pages and provides information on the health benefits of consuming fish as well as tips on how to properly prepare fillets. The site details information about the FCAW, specific contaminants, and how to follow advisories.

At present, all six main stem states defer to a unified protocol to issue ORFCAP-suggested consumption advisories for the Ohio River, greatly enhancing the consistency of information relayed to the public.

Assessing the Fish Consumption Use of the Ohio River for Mercury

The 305(b) section of the Clean Water Act requires reporting the condition of waterbodies with regard to designated uses of the river, including fish consumption. A contaminant in fish flesh that may be responsible for impairing this designated use in some waterbodies is methylmercury, for which ORSANCO analyzes regularly. To assess fish consumption, ORSANCO biologists calculate trophic (food chain) level average fish tissue concentrations on a pool by pool basis, incorporating estimated national consumption rates using USEPA published guidance. To ensure that an updated data set is available to meet reporting requirements, samples in three or four pools are analyzed annually.

Protecting Recreational Use

ORSANCO monitors water quality for the safety of people who live in the Ohio River watershed during the spring, summer, and fall when people engage in recreational activities such as fishing, boating, skiing, and swimming.

Contact Recreation Bacteria Monitoring

ORSANCO assesses whether the river is suitable for contact recreation based on bacteria data collected from urban areas with combined sewer systems. ORSANCO also uses bacteria data from longitudinal surveys at over 200 sites along the Ohio River. Using these data provides a more accurate picture of water quality because bacteria levels fluctuate frequently depending on local or regional weather conditions. During the contact recreation season of April through October, Ohio River bacteriological conditions are often suitable for swimming and other contact recreation activities except during significant rain events and periods of high river flow. This is largely due to the multi-billion dollar investments that wastewater utilities have made to improve wastewater discharge water quality. Based on these data, ORSANCO is able to classify sections of the Ohio River as being impaired for contact recreation caused by *E. coli* bacteria. Beginning in April, ORSANCO staff was able to conduct routine monitoring for the 2021 recreation season. A weekly Ohio River Water Quality Report is published online at www.orsanco.org/weekly-ohio-river-water-quality-report.

Although sections of the river may be unsafe for contact recreation at times, due to the Ohio River's significant water quality improvements, many events take place in or around the Ohio River. Two major river events on the Ohio River near Cincinnati include the Great Ohio River Swim and Paddlefest, the largest paddling event in the nation. ORSANCO has provided bacteria monitoring for these events and others, due to the probability that a large number of people may come into contact with the river. Due to COVID concerns in 2020, the Great Ohio River Swim was cancelled, and Paddlefest was held virtually with an event called "Paddle for a Purpose". In 2021, Paddlefest is scheduled for Saturday, August 7th and the Great Ohio River Swim is scheduled for Sunday, August 29th. ORSANCO staff will be available to provide bacteria monitoring for those two events in 2021.

Ohio River Recreation Trail

ORSANCO has also partnered with the Ohio River Recreation Trail (ORRT) to connect people and communities to opportunities for adventure on and along the Ohio River. The vision of the volunteer-led ORRT steering committee is to create a 274-mile land and waterway self-guided adventure trail that connects people to opportunities for outdoor adventure, recreation, and discovery on and along the Ohio River from Portsmouth, Ohio to West Point, Kentucky.

The ORRT will serve to promote tourism and economic development, facilitate education about the valley's unique history, culture, and beauty, and promote environmental awareness and safety, respecting lands and waters with a "Leave No Trace" ethic. The trail can be enjoyed from either land or water by paddlers, power boaters, cyclists, motorists, hikers, and more.

Investigating Current Water Quality Issues

Development of an Ohio River Ambient Monitoring Plan for PFAS

Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals that includes PFOA, PFOS, and many others. There is evidence that exposure to PFAS can lead to adverse human health effects. PFAS has been detected in the Ohio River, and there are known contaminated sites near the river as well. The Commission is developing a monitoring plan to: 1) characterize ambient conditions for PFAS in the Ohio River, which can be repeatable in the future to track changes over time; and 2) provide information on how PFAS is distributed in the Ohio River water column at selected sites.

Twenty monitoring sites have been randomly selected, which are located outside the direct influence of any particular point source discharge. These sites will be sampled under two separate flow/seasonal conditions. Each of the twenty sites will be sampled using a flow-weighted, cross-sectional sampling technique to more accurately reflect the entire water column, which is beneficial for use in great flowing rivers such as the Ohio.

ORSANCO is working cooperatively with its federal partners, USEPA, and the United States Geological Survey (USGS). The USEPA has provided its contract laboratory to complete all of the analytical work at no expense to ORSANCO. The USEPA has also provided invaluable consultation on the use of its sampling method for collecting PFAS samples. The first round of sampling was initiated in June 2021, and the second round of sampling is scheduled for fall 2021.

Harmful Algal Blooms

Algae are present in the Ohio River throughout the year. During optimal conditions, some algae may rapidly proliferate causing a "bloom." During a bloom, the algal concentration may go from a few thousand cells per milliliter (cells/ml) of water to hundreds of thousands or even millions of cells/ml. Algal blooms are most common in the summer, although they may

occur at any time of the year. On the Ohio River, the conditions that allow these blooms to occur are typically low and slow flow, clear water, and warm water.

Sampling on the Ohio River has identified over 300 different species of algae. These algae are divided into eight taxonomic divisions, with the most common being diatoms (Bacillariophyta), green algae (Chlorophyta), and blue-green algae (Cyanobacteria).

Cyanobacteria can produce toxins which can be harmful if ingested. For this reason, an algal bloom which consists primarily of cyanobacteria is considered a Harmful Algal Bloom (HAB). These toxins can affect people and animals who ingest them, either through recreation, such as swimming, or in drinking water.

Ohio River drinking water utilities report algal blooms to ORSANCO, who, in turn, notifies downstream water utilities. Treatment information, if available, is also passed on to assist the downstream utilities in the development of treatment strategies. ORSANCO's Source Water Protection Program serves to protect drinking water interests along the Ohio River and major tributaries. ORSANCO uses and evaluates all available information to develop the best protection strategies and promotes the use of the Ohio River as a quality source for drinking water.

On August 19, 2015, ORSANCO received an NRC report of a paint-like green material on the Ohio River at Pike Island Locks and Dam (ORM 84.2), which covered 100 X 200 feet. This was quickly identified as the blue-green algae *Microcystis aeruginosa*. Over the next month, this bloom expanded to cover the Ohio River from Pike Island Locks and Dam to Cannelton Locks and Dam (ORM 84.2 to 720.7). Below Cannelton Locks and Dam, there were intermittent patches of the bloom but not a continuous coverage. No illnesses were reported as a result of this bloom and no toxins were detected in finished drinking water.

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Since 2015, ORSANCO has responded to numerous reports of algal blooms, both on the Ohio River and on tributaries. These incidents have been reported by citizens, by the U.S. Army Corps of Engineers (USACE), and by ORSANCO staff. ORSANCO has coordinated with five States and two federal agencies to respond to these reports. Although these blooms were reported, no HABs were identified on the Ohio River.

In September 2019, an algal bloom was observed by KY Department of Water personnel in Russell, KY (ORM 327.6). The bloom was intermittent both temporally and spatially, but was observed as far downstream as J.T. Myers Lock and Dam (ORM 846.0) and persisted until early November. The densest portion of the HAB was between Maysville, KY and Louisville, KY. The states of Ohio, Kentucky, and Indiana issued recreation advisories for the Greenup, Meldahl, Markland, and McAlpine pools. No illnesses were reported due to this HAB and no toxins entered the finished drinking water of any utility.

Real Time Risk Characterization Tool for HABs on the Ohio River (HAB App)

In partnership with USEPA, ORSANCO has developed an online GIS based tool to predict the occurrence of HABs on the Ohio River (HAB App). The tool uses flow data from the U.S. Army Corps of Engineers (USACE) gauges to compare the current flow to that experienced in 2015 and 2019 when HABs occurred.

The tool displays the probability of a bloom occurring and persisting and shows relevant water quality data from eight locations on the river. The HAB App has been made available to state and federal water managers as well as drinking water utilities.

Review of Bimonthly and Clean Metals Ambient Monitoring Network

A work group of main stem states was established to review and make recommendations on ORSANCO's Bimonthly and Clean Metals Monitoring Programs. These are ORSANCO's fixed station, ambient monitoring network, collecting samples for conventional parameters, nutrients, and metals, once every other month at 16 main stem stations and 14 tributaries. The data are used to make beneficial use assessments for long-term trends as well as provide information for the states' integrated lists of waters requiring Total Maximum Daily Loads. ORSANCO's Bimonthly Monitoring has been in place for over 40 years, while Clean Metals Monitoring has been in effect since the 1990's.

The work group met multiple times in 2021 and developed a number of recommendations to improve the monitoring network. Recommendations were developed regarding the addition of several water quality parameters to all stations, as well as the addition of four new stations. These recommendations will be implemented in the Commission's Fiscal Year 2022 program and budget.

Public Information, Education, and Outreach

ORSANCO participates in various river-related events and activities throughout the Ohio River Basin to provide the public with educational opportunities to learn more about the Ohio River and the quality of this great natural resource.

Life Below the Waterline

Since 2002, ORSANCO's 2,200-gallon mobile aquarium has put local fish species on display at over 100 events throughout the Ohio River Basin in portions of all eight Compact states, reaching hundreds of thousands of people in the process. The consistent message conveyed from ORSANCO staff during these events is that the Ohio River main stem and other local waterways support much more diverse and healthy fish populations than perceived by the public and are therefore resources worth enjoying and protecting.

The aquarium is often displayed at educational events for children, various festivals, and other celebrations generally located in cities situated on the banks of the Ohio River. In 2020, however, concerns associated with the coronavirus pandemic and the emphasis on data collection in a shortened field season led to the cancellation of all events scheduled for the calendar year. ORSANCO's Life Below the Waterline Mobile Aquarium program remains suspended until further notice for 2021 due to the ongoing COVID-19 pandemic. Interested parties may still submit application materials with the understanding that no events will be scheduled until authorized by the Commission in the interest of public safety.

Although River REACH floating classroom programs were canceled, staff developed engaging virtual field trips for Cincinnati Public Schools, Community Christian Academy, the Art Academy of Cincinnati, and the Civic Garden Center's Green Girls in STEM program. FORE also conducted the virtual trips at local creeks and ponds using smart phones.

FORE was also able to provide in-person, socially-distanced testing programs for children attending Cincinnati Parks' summer camps and a Pond Exploration program for Girl Scouts of Southwest Ohio. They also partnered with Hamilton County Soil and Water Conservation District to host a Pond Management field course for farmers and landowners as well as FORE's first-ever Lake Ecology 101 class. This program got high school students in canoes on Doe Run Lake, where they spent the day analyzing the lake alongside a scientist from the Kentucky Division of Water.

Foundation for Ohio River Education (FORE)
The Foundation for Ohio River Education (FORE) is ORSANCO's non-profit education foundation. Since 2004, FORE has taught people of all ages in the Ohio River Basin to become environmental stewards through hands-on programs that get people on the water and engaged in preserving the cultural ecological, and economic value of the Ohio River watershed.

Like many organizations throughout the country, FORE had to find new ways to carry out its mission through hands-on experiences within the local community.

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FORE continued to produce DIY Creek Exploration videos designed to introduce students to macroinvertebrate collection and pollution tolerance tests. The videos were also aired on CPS TV, a public television station launched for students in Cincinnati Public Schools.

FORE also started an interactive "Morning Macroinvertebrate" feature on social media and partnered with the Stroud Research Center to provide free downloads of our Water Quality mobile app, which includes a digital macroinvertebrate identification guide.

FORE was honored to help plan the 2020 Ohio River Basin Summit, which was held virtually at the University of Louisville. At the summit, the Ohio River Basin Strategic Plan was launched. The plan is a multi-state initiative by the Ohio River Basin Alliance (ORBA) designed to restore, protect, and bring new economic and recreational opportunities to the entire Ohio River watershed.

FORE also supports the RiverWatchers volunteer monitoring program for the Ohio River and selected tributaries throughout the Ohio River Basin. The program was originally founded in 1992 by ORSANCO, but it is now supported by FORE. The program is comprised of students and citizens who are concerned about water quality issues in the Ohio River Basin.

Since the program began, thousands of volunteers have collected water quality data from various sites along the Ohio River or one of its tributaries. Participants collect samples and use chemical test kits to evaluate the health of local waterways in the Ohio River Basin. Results are sent to ORSANCO where they are evaluated and entered into a database. This volunteer monitoring data provides valuable insight to the health of local waterways, while also providing students and citizens with a real, hands-on science experience.

Participating schools include:

- *Warren Co. Conservation District (PA)*
- *Woodland Hills School District (PA)*
- *Cincinnati State and Technical Community College (OH)*
- *Meigs High School (OH)*
- *New Richmond High School (OH)*
- *Leon Elementary School (WV)*

RiverWatchers Spotlight:
A History of RiverWatching in Woodland Hills
By: Cathie Pearson, Gifted Support Teacher, Woodland Hills Academy

Elementary students in the Woodland Hills School District in Pittsburgh, Pennsylvania have been participating in ORSANCO's River Watchers program for over 25 years. Our students have benefited from classroom visits from ORSANCO's Education Specialists, where they learn about factors that affect water quality in Western Pennsylvania and Pittsburgh's three rivers. In addition, they learn how to conduct water quality tests and analyze the data they collect. Along with ORSANCO, we have formed a community partnership with the Wilkinsburgh Penn Joint Water Authority. The water authority assists with the collection of our water samples from mile marker 9.2 on the Allegheny River five to eight times each school year and our students tour the water treatment facility each year. Our students also participate in benthic macroinvertebrate studies in local streams and sail aboard Rivers of Steel's Explorer Riverboat to conduct water quality analysis and plankton studies on all three of Pittsburgh's rivers. Through their experiences, they have become stewards for the rivers in Pittsburgh and waters all over the world.

They have also been engaged in the development of many projects to help protect local and global waterways.

The 2020-2021 school year presented unique challenges for myself and the Woodland Hills RiverWatchers. Due to the global pandemic, Woodland Hills students participated in virtual learning for most of the year. Our students were unable to travel to water testing sites or conduct water quality tests themselves. To keep the program going, I traveled to the river each month with colleagues and made videos as we conducted each water quality test. The videos were shared with the students. They were delighted to see many of their teachers participating in water quality analysis! Our students analyzed the data as usual and used Google Sheets to graph the data for each parameter over the course of the school year. Since they could not sail on the Explorer Riverboat, I filmed a virtual field trip for them from the boat so that they could experience our rivers' ecosystems. Although different, our students experienced another successful year as RiverWatchers. We are very grateful to participate in ORSANCO's RiverWatchers Program!

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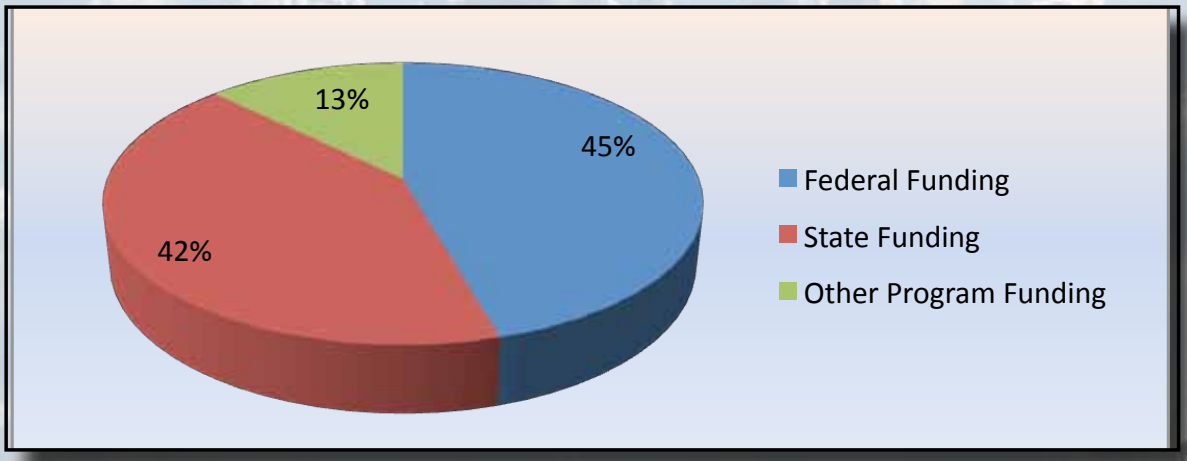
Ohio River Sweep

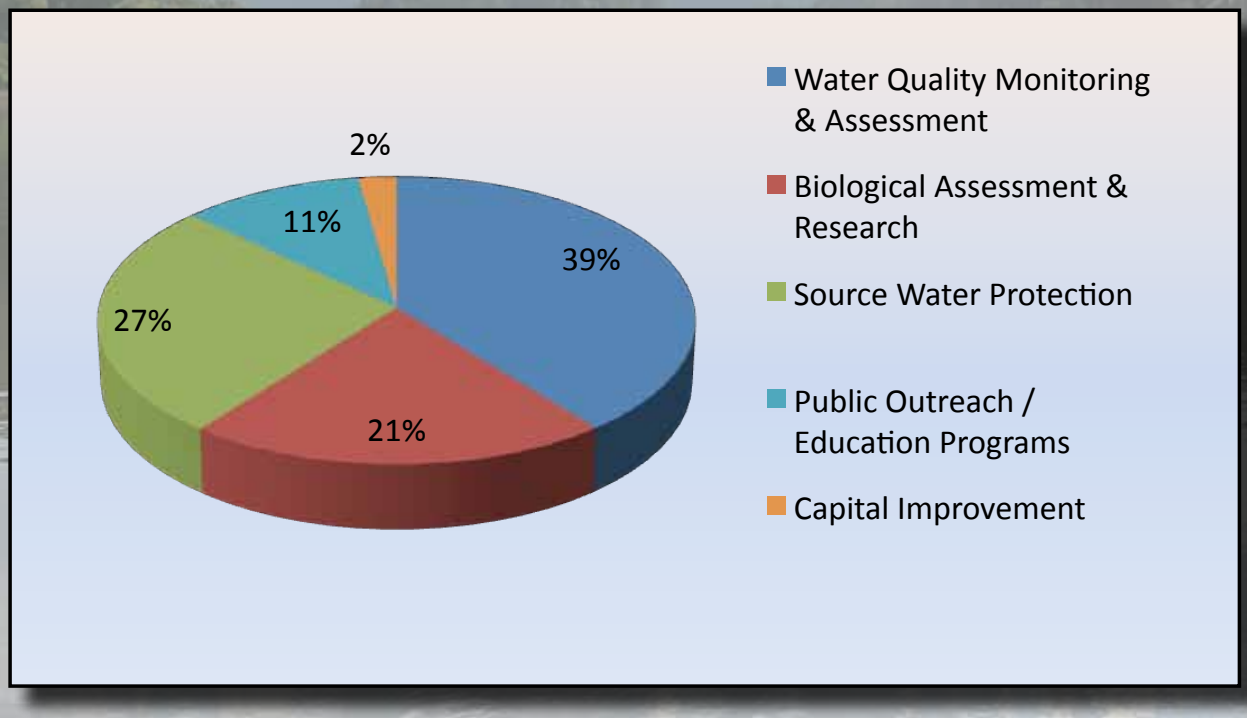
The Ohio River Sweep is an annual volunteer cleanup of the Ohio River that was created in 1989 by ORSANCO, the Ohio Department of Natural Resources, and the KY Energy & Environment Cabinet and is now a collaboration between ORSANCO and FORE. The 2020 Ohio River Sweep successfully adapted to a challenging year and was able to continue its goal of removing litter from the Ohio River watershed by creating "Mini-Sweep" events. The Mini-Sweep format allowed an opportunity for smaller cleanup events in many local communities, while also protecting the entire Ohio River watershed as a valuable natural resource. Mini-Sweeps continued in 2021 because of its adaptability with ongoing coronavirus safety concerns. In 2020, 75 Mini-Sweep events were held in five states, with over 750 volunteers removing a total of 25,000 pounds of litter from the Ohio River watershed.

2021 Resources Overview



Budgeted Resources by Major Source

• Federal Funding • State Funding • Other Program Funding



Budgeted Expenditures by Major Program Area

• Water Quality Monitoring & Assessment
• Biological Assessment & Research • Source Water Protection
• Public Outreach / Education Programs • Capital Improvement

*Audited financial statements for 2021 will be available in February 2022.

ORSANCO Staff

Richard Harrison, P.E., Executive Director & Chief Engineer

Tracey Edmonds, Administrative Assistant

Technical Programs

Jason Heath, P.E., Technical Programs Director

Sam Dinkins, Technical Programs Manager

Ryan Argo, Technical Programs Manager

Stacey Cochran, Environmental Scientist III

Greg Youngstrom, Environmental Scientist III

Emilee Harmeling, Environmental Scientist I

Jamie Tsiominas, Environmental Scientist/Organics Detection System

Lila Xepoleas Ziolkowski, Analytical Chemist, Quality Assurance

Rob Tewes, Senior Biologist

Bridget Borrowdale, Aquatic Biologist

Daniel Cleves, Aquatic Biologist

Bridget Taylor, Environmental Scientist II

Administrative Programs & Human Resources

David Bailey, Director of Administration & Human Resources

Adam Scott, Data Systems Administrator

Donna Beatsch, Data Processing/ Accounting Specialist, Part-time

Joe Gilligan, Comptroller

Nick Guthier, Accountant

Lisa Cochran, Communications Coordinator

Melissa Mann, Public Information/ Education Specialist

Matt Glazer, Building Maintenance, Part-time

FORE

Heather Mayfield, Executive Director

Staff Milestones

Sam Dinkins – 25 years
Tracey Edmonds – 25 years
Melissa Mann – 15 years
Matt Glazer – 10 years
Richard Harrison – 5 years

Members of the Commission

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Vice Chairman
Michael P. Wilson
New York

Secretary/
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Toby Frevert
Illinois

Executive Director
and Chief
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Indiana Dept. of
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Laurie Stevenson
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Ohio
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Watershed
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Council

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Lou Ann Jessee-
Wallace
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Harold Ward,
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Secretary, West
Virginia DEP

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George
Elmaraghy

Federal
Tom FitzGerald
Director, Kentucky
Resources Council

Federal
David Miracle,
Environmental
Manager, Nucor

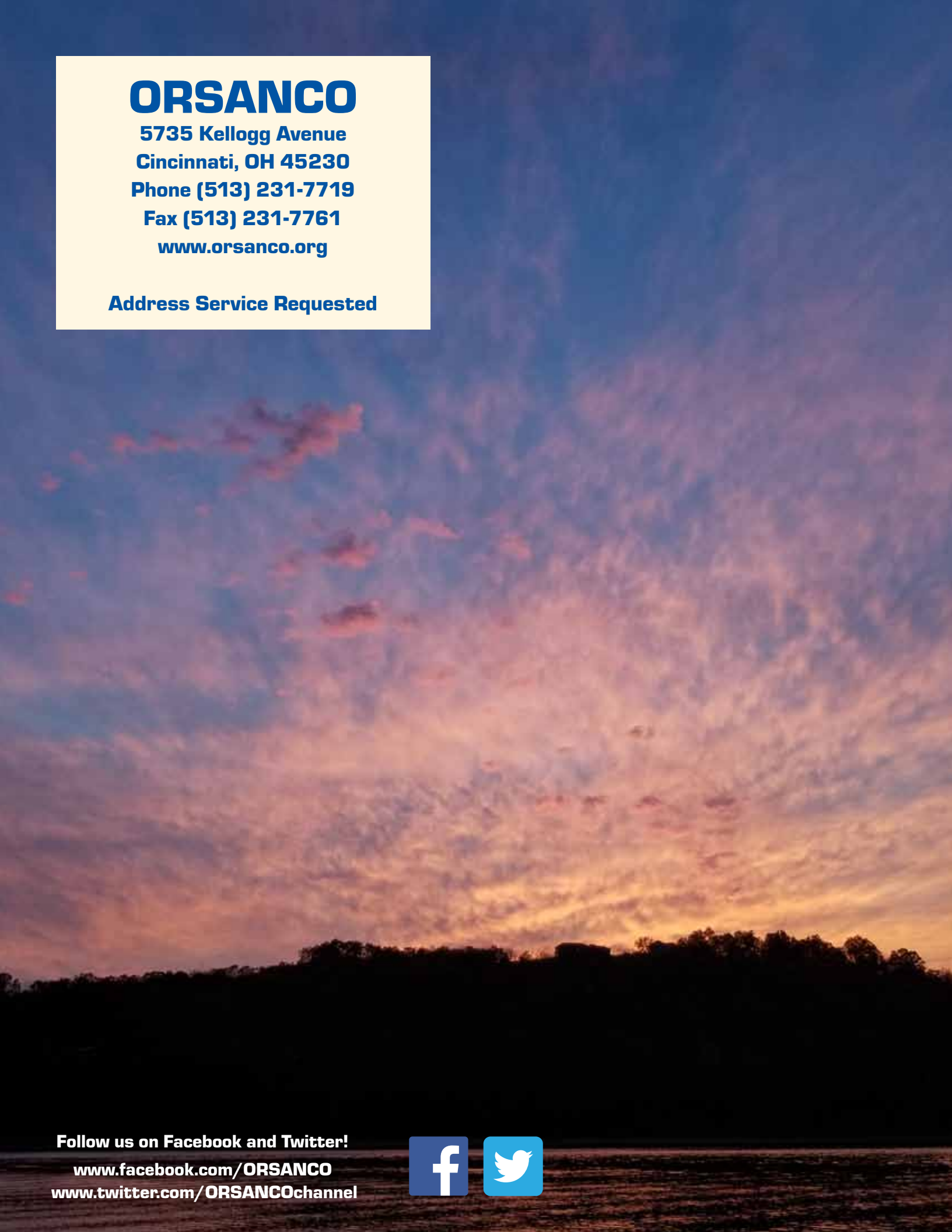
*As of June 30, 2021. A current list of ORSANCO's Commissioners is available at www.orsanco.org.

Special Recognition:

At the end of June 2021, **Chairman Duritsa** completed 17 years of service as a Pennsylvania member of the Commission. In addition to his most recent term as Chairman in 2020-2021, Commissioner Duritsa also served as Chairman in 2011-2012. Over the course of his service to the Commission, he has served in numerous leadership roles, including Chair of the Technical Committee, Water Resources Committee, and the Research Committee. In addition to his service as an ORSANCO Commissioner, Chuck served as Director of the Southwest Regional Office for the Pennsylvania Department of Environmental Protection from 1988 until his retirement in 2004. He has also served on multiple boards such as the Westmoreland Conservation District, the Ohio River Basin Consortium for Research & Education, the Turtle Creek Watershed Association, among many others.

In September 2020, **Ron Lovan** completed his service to the Commission, serving as a Kentucky Commissioner to ORSANCO since 2012 and as Chairman in 2016-2017. He has served on numerous ORSANCO Committees, including his time as Chair of the Audit and Nominating Committee. Ron is the current President and CEO of the Northern Kentucky Water District. He has management and administrative responsibility for the largest water district in Kentucky, which serves approximately 300,000 people and operates three water treatment plants. Ron is involved with many professional associations and activities and has also been active in numerous community and volunteer organizations.

In 2021, **Austin Caperton** (WV) completed his term on the Commission, and **Spencer Bruce** (KY) and **Harold Ward** (WV) were appointed to the Commission. ORSANCO would like to welcome Spencer and Harold to the Commission and would like to thank Chuck, Ron, and Austin for their dedicated years of service. We wish them the best of luck in their future endeavors.



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