Ohio River Valley Water Sanitation Commission Annual Report 2019

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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 2019 to:

The Honorable J. B. Pritzker
Governor of Illinois

The Honorable Eric Holcomb
Governor of Indiana

The Honorable Matt Bevin
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 Donald Trump
President of the United States

*As of June 30, 2019

Chairman's Message

For over 70 years, the Ohio River Valley Water Sanitation Commission has been active and instrumental in improving water quality throughout the Ohio River Basin. During my first term as Chairman in 1994, I reflected upon the many ways that ORSANCO strives to improve water quality for future generations. I recognized several of ORSANCO's programs that still flourish today. Many of these programs, including fish population surveys, bacteria monitoring, the biennial assessment of water quality conditions, pollution control standards, emergency response, the Ohio River Sweep, and many others, still exist and are a priority to the Commission's activities today.

I also reflected upon new partnerships with organizations such as the US Coast Guard and US National Park Service and continuing partnerships with the states, federal agencies, local governments, and various other agencies – and these fundamental relationships continue to guide ORSANCO in a combined effort to protect water quality with various resources and the knowledge of many scientific professionals throughout not only the Ohio River Basin, but across the entire nation.

During my second term as Chairman in 2003, I reflected upon ORSANCO's many outreach activities to connect people who use the river with this great natural resource. Programs such the Ohio River Sweep and the Life Below the Waterline mobile aquarium continue to successfully engage people who live in the Ohio River Basin. The Ohio River Sweep includes 3,000 miles of shoreline in multiple locations with thousands of volunteers. In 2015, ORSANCO extended beyond the Ohio River Valley with a winning photo for the National River Cleanup Photo Contest taken during the Commission's Ohio River Sweep event. This contest is sponsored by American Rivers, a nationwide organization to protect, restore, and conserve clean water for people throughout the United States. The Commission again extended its reach to other watersheds in 2018 for a partnership with

Shedd Aquarium in Chicago, IL in the Illinois River Basin. Programs such as these would not be possible without the support and cooperation of our partners and many other agencies in the Ohio River Valley.

Over the years, it has also been a challenge to improve water quality and maintain great quality of work with less financial resources. Yet, ORSANCO continues to provide quality research and expand upon new programs and studies without sacrificing already existing programs that are essential. This mission continues with excellence due to a close relationship and multiple partnerships with the states and other organizations that can continue to provide support and advise the Commission so that ORSANCO's mission continues into the future.

Some of our future challenges for 2019 include a possible Per- and Polyfluoroalkyl Substances (PFAS) study on man-made chemicals that persist in the environment and accumulate over time, a continuing mercury study, implementing recent revisions to ORSANCO's Pollution Control Standards, and ongoing improvements to the Organics Detection System. This nationally recognized monitoring network involves the cooperation of ORSANCO and drinking water utilities to monitor and detect volatile organic compounds in the river and ultimately protect our drinking water supply from potential spills along its entire length.

It is with these efforts, in many areas and together with many partners, that ORSANCO will be able to continue its work to improve water quality in the Ohio River Basin for our community now and for future generations to come.

ORSANCO States: 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, federal, 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.

Pollution Control Standards

ORSANCO's Pollution Control Standards outline specific uses for the Ohio River and establish certain criteria to ensure that the river is capable of supporting these uses. The Commission approved revisions to its Pollution Control Standards for Discharges to the Ohio River in June 2019. This revision was approved after significant consideration and public outreach. Six webinars and four public hearings were held to gather public comments over the course of 18 months.

The 2019 Revision was substantially different than proposals being considered by the Commission during its two earlier reviews in 2018. The approved 2019 Revision:
1.) maintains ORSANCO's Pollution Control Standards for the Ohio River consistent with current utilization and achieves heightened efficiency in program activities of the Commission and its member States;
2.) provides needed flexibility for member States to utilize the PCS in their environmental programs as needed to protect the Ohio River and achieve the goals of ORSANCO's Compact and the Clean Water Act;
3.) ensures ORSANCO's role in water quality protection is consistent with its Compact;
4.) preserves the PCS to guide Commission activities when addressing future water quality issues within the mainstem Ohio River;
5.) allows the Commission to focus on its area of strength associated with its science, assessment, and source water protection programs, while its member States and the US EPA focus on their strengths associated with water quality standards development and implementation for the Ohio River as mandated by the federal Clean Water Act; and
6.) recognizes that Ohio River water quality consistency among member States is best achieved through utilizing the Commission's PCS as the baseline for maintenance of the protective uses for the Ohio River as established in its Compact.

The Commission's action demonstrates its commitment to work with its member states, as well as its responsiveness to public comments, to protect the water quality of the Ohio River. Along with previous revisions, the 2019 Revision helps support river-wide protection of the Ohio 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. The next 305(b) report will be published in 2020.

Results from the 2018 assessment indicated that: 1.) the entire river fully supports the public water supply use; 2.) the entire river is impaired for fish consumption due to dioxin and PCBs, but fully supports fish consumption for mercury; and 3.) approximately two-thirds of the Ohio River is impaired for contact recreational use.

Protecting Drinking Water

Emergency Response

The Ohio River is a vital natural resource that supplies drinking water to millions of people every day, 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 and energy production and a cost-efficient, commercial navigation system. With the industrial and commercial use of the river comes the potential for accidental releases of pollutants that can contaminate the water and make it unsuitable for other uses.

ORSANCO serves a critical role in emergency spill response communications by providing notification of spills and other incidents that could adversely affect water quality to state and federal emergency response agencies and to drinking water utilities that may be impacted by a release. 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. The 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. When spills occur, water quality monitoring and analysis is critical to the drinking water utilities in order to make the best water treatment management decisions and ensure the public water supply is safe to use for drinking water purposes.

In October 2018, ORSANCO collaborated with Greater Cincinnati Water Works and Northern Kentucky Water District to conduct a dye study in the Ohio River to help protect drinking water resources and respond to spill events. The study was conducted to better understand the flow dynamics in the river and provide valuable information to more effectively respond to spills or other contamination events.

ORSANCO staff also worked with spill response agencies in Huntington, WV to simulate emergency response activity for potential source water contamination events. Agencies that were involved in this collaboration included local 911 responders, medical professionals and health department officials, WVDEP, WV National Guard, WV Department of

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Health and Human Resources, WV Department of Homeland Security & Emergency Management, and the US Coast Guard.

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 on the mainstem and four Ohio River tributaries in the Basin. The primary purpose of ORSANCO's ODS Network is to monitor water quality conditions for the protection of 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 monitoring from ORSANCO headquarters, 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 riverwide network for several years.

In 1979, ORSANCO's Early Warning Organics Detection System (ODS) was created in response to a 70 ton spill of carbon tetrachloride into the Kanawha River in West Virginia that went undetected for over a week and contaminated several drinking water facilities. This system used purge and trap instrumentation (newly marketed by Tekmar) and gas chromatographs (GCs), which were installed at 7 locations along the Ohio River, to detect the presence of select volatile organics. New ODS host sites were added as funding and support became available to provide more coverage along the Ohio River and its tributaries and, up until 2010, ORSANCO had 15 ODS monitoring stations. Purge and trap technology, paired with GCs and gas chromatography mass spectrometry (GCMS), remains the most efficient way to determine the presence of (or confirm the absence of) VOCs in surface water.

ORSANCO's Current Organics Detection System

During routine monitoring, raw river water samples are collected, processed, and analyzed up to six 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 with mass spectrometer detectors at eight ODS stations, ORSANCO's ODS network has the capability to detect the presence of thousands of volatile contaminants. The current 17 ODS stations within the Ohio River Basin provide a network of water quality monitoring and information sharing for the protection of public water systems in the event of releases or spills. ORSANCO works closely with local drinking water utilities to detect VOCs by the ODS to help ensure the quality and safety of the Ohio River as a source of drinking water. The operation of this valuable system is only possible through the collaboration of the drinking water utilities and other partners who operate their respective systems on behalf of the ODS network.

River water samples are continually screened for the presence of VOCs. Fortunately, the vast majority of these samples do not show signs of contamination of volatile organics. Non-detection or absence of VOCs serves as an indicator that the river water meets its intended designated use, which is the overall goal for source water protection efforts. However, if a VOC is detected at or above the program thresholds, ORSANCO will notify downstream water utilities and state and

federal water quality and emergency response agencies as necessary. These organizations will then respond to the detection based on their respective emergency response plans.

In December 2017, a new monitoring station was added to the ODS network along the Elk River in Charleston, West Virginia. There are now 17 operating ODS stations; these stations are located along the Ohio, Allegheny, Monongahela, Kanawha, and Elk rivers in the Ohio River Basin. 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 spills and discharges since its inception in 1978. The ODS has remained one of ORSANCO's flagship programs and has achieved 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.

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 to maintain a healthy Ohio River watershed and protect 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.

In 2018, ORSANCO biological crews assessed Emsworth and Pike Island pools and will be sampling R.C. Byrd and Smithland pools in 2019.

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Over the years, the various pools have generally ranked from "fair" to "very good" for fish. To date, after two complete cycles plus eleven pools completed in the third cycle, no pools have ranked as "poor" or "very poor."

Special Studies

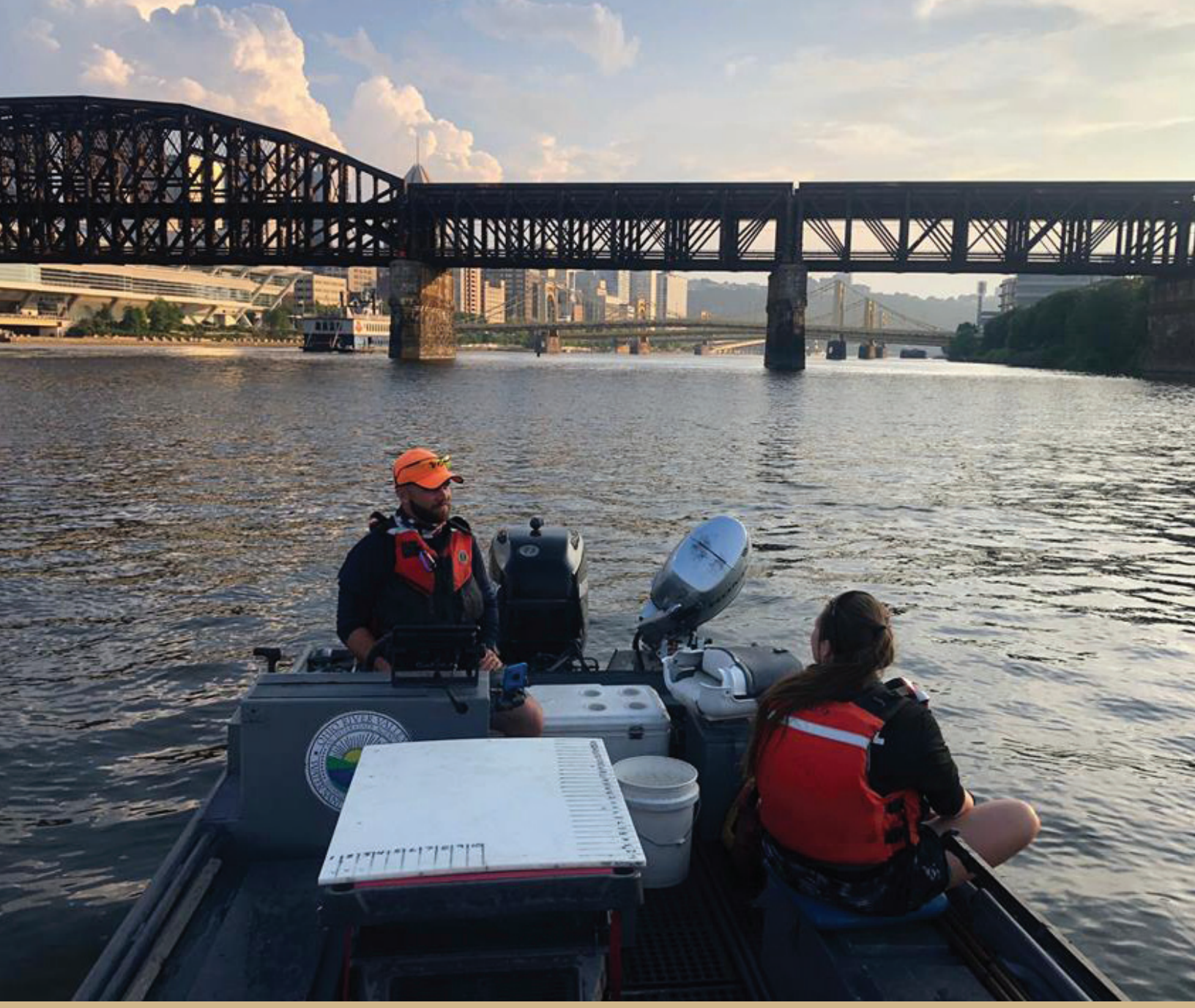
Two Ohio River navigational pools were surveyed during the 2018 field season (traditionally, ORSANCO aquatic biologists sample and assess three pools per year). The Biological Water Quality Subcommittee (BWQSC) ranked potential studies to utilize the resources formerly assigned to the third pool survey. The studies with the highest priorities involved increasing research efforts within the currently scheduled pools to improve the accuracy and efficiency of the annual assessments and support programmatic needs of ORSANCO's state and federal partners.

One project involved placing additional macroinvertebrate samplers in the Pike Island Pool near Steubenville, OH on behalf of Ohio EPA. A second project required crews to place additional macroinvertebrate samplers in the Emsworth Pool near ALCOSAN (Allegheny County Sanitary Authority) on behalf of Pennsylvania DEP for a special permit study.

Collaboration

During the winter and spring months, ORSANCO aquatic biologists work with many other entities to lay the groundwork for initiatives to collect much-needed monitoring information from the Ohio River during the next field season.

In 2019, a cooperative agreement between ORSANCO and the U.S. Army Corps of Engineers, Louisville District, will allow for the collection of sediment chemistry, enhanced water chemistry, and macroinvertebrate data from fixed station sites in the middle and lower Ohio River. These data will allow for better understanding of biological response to environmental condition gradients. In addition, biologists continue to collaborate with Loyola University on fish stomach content analysis. Loyola University staff are examining stomachs from fish used in ORSANCO fish tissue analyses for tiny particles of plastics (microplastics), a growing



concern in worldwide waterways. Additionally, biologists will be partnering with federal and state agencies to collect fish tissue information to increase ORSANCO's dataset for the next 305(b) report and fish consumption advisory use assessment.

National Rivers and Streams Assessment (NRSA)

In 2019, ORSANCO aquatic biologists will continue participation in a US EPA initiative to assess the nation's rivers and streams. As part of the larger National Aquatic Resource Survey program, whose goal is to assess all waterways (lakes, wetlands, estuaries, etc.), ORSANCO staff will lend their expertise to sample waterways within the basin states of Pennsylvania, West Virginia, Kentucky, and Ohio. In 2018, 60 events were surveyed for numerous parameters including water chemistry, fish and macroinvertebrate assemblages, nutrients, fecal bacteria, algae, and instream and riparian habitat conditions. In 2019, the remainder of ORSANCO's project responsibility (38 events) will be sampled. These data are collected by ORSANCO on behalf of the basin states, and the data will be given to US EPA for assessment and later release to the general public. The NRSA data will also provide ORSANCO with additional information to consider when investigating basin-level issues and their potential influence on mainstem Ohio River conditions.

Protecting Fish Consumption

Tissue Contaminants Program
Every year, ORSANCO collects composite fish fillet samples for contaminant analysis from species that are thought to be commonly consumed from the Ohio River mainstem. 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 mainstem states.

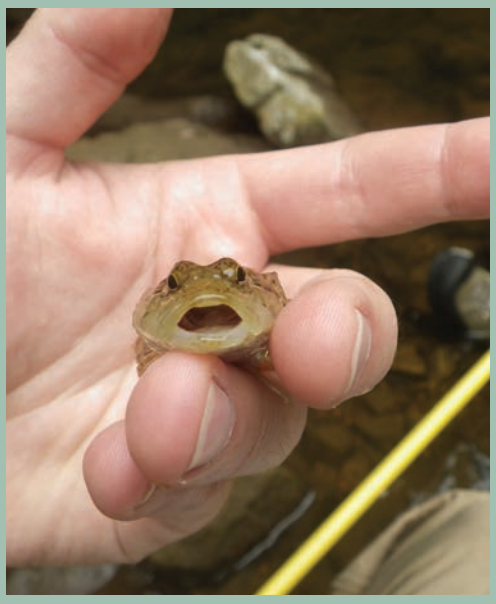
Fish Consumption Advisories
The most recent 10 years of fish tissue data are separated by river segment, species, and size (where appropriate) and compared to Ohio River Fish Consumption Advisory Protocol (ORFCAP) concentration thresholds, which are derived from a consensus of the FCAW and are unique 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 mainstem 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, 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 US EPA 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 bacteriological 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. It also uses bacteria data from longitudinal surveys conducted between 2003 and 2008 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. Although all sections of the river may be unsafe for contact recreation at times, as a testament to the Ohio River's significant water quality improvements, it is now the home to Paddlefest, the nation's largest annual paddling event, as well as the Great Ohio River Swim. Because of the unpredictability of the weather, ORSANCO has also provided monitoring for certain events, such as triathlons, that bring large numbers of the public in contact with the river. In 2018, the Great Ohio River Swim was cancelled due to unfavorable weather conditions; however, ORSANCO staff provided water quality monitoring for the annual Paddlefest event.

Investigating Current Water Quality Issues

Mercury Studies

Mercury Ad Hoc Committee

In June 2015, the Commission established an Ad Hoc Committee on Mercury Studies to address scientific information needs concerning mercury for the Ohio River. The committee was assembled to identify the information needs surrounding the impacts of mercury on Ohio River water quality and fish contaminants and to make recommendations to the Commission for further study needs. The committee is composed of ORSANCO Commissioners, selected experts in the field of the environmental impacts of mercury, and representatives of the Commission's Technical Committee. In October 2016, the Ad Hoc Committee made a recommendation to the Commission regarding a need to study mercury from a basin-wide standpoint, which was endorsed by the Technical Committee and accepted by the Commission. The approved study is to complete a mercury mass loadings analysis of in-stream, point source, and atmospheric loading sources for the Ohio River and its major tributaries. The study is designed to be highly efficient, utilizing existing studies to estimate mercury loads in the Ohio River and major tributaries, and using available discharge monitoring data and atmospheric monitoring network data to estimate loads from point sources.

ORSANCO has already completed in-stream annual mercury loads, based on year-long, monthly monitoring surveys at four Ohio River locations and fifteen major tributaries that account for approximately eighty-five percent of the inflow to the Ohio River. Staff has begun generating point source annual mercury loads for the basin using discharge monitoring report data, as contained in US EPA's national database, and the states are currently reviewing those data. In addition, a comprehensive report is available for the atmospheric loading component of the project. The outcome of these efforts will be to estimate how much mercury in the Ohio River is contributed from the major tributary watersheds and to understand the extent of mercury loads in the Ohio River contributed by point sources. This study will allow for a better understanding of the future management needs regarding water pollution control in the Ohio River Basin.

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Nutrient Reduction Activities

Nutrient Trading Program

The Electric Power Research Institute (EPRI) is leading an effort to develop an interstate water quality trading program for the Ohio River Basin. Partners in the effort include American Farmland Trust, ORSANCO, the University of California at Santa Barbara, and the Ohio Farm Bureau. The project partners are facilitating "pilot trades" of nutrients between point and nonpoint sources, marking the first trades in what could provide a model for dischargers to comply with emerging requirements in many watersheds facing high nutrient levels.

Water quality trading programs in the United States have been confined by political boundaries, while many pollutants, notably nutrients, are problems on a watershed scale. Some regions, such as the Chesapeake Bay, have allowed cross-state trading; however, even the Chesapeake Bay Nutrient Trading Program has limited participation due to conflicting rules between the states surrounding the bay.

The Ohio River Basin Trading Project is the first trading project designed from its inception to be interstate in nature. During the pilot phase of the project, three states (Ohio, Kentucky, and Indiana) agreed to allow an agricultural best management practice (BMP) in one state to offset the permit limit in another state. The Pilot Trading Plan 1.0 for the Ohio River Basin Interstate Water Quality Trading Project was signed on August 9, 2012 by the Commissioners of the agricultural and permitting agencies of each of the states. The first trades under this agreement were completed on March 11, 2014.

The Trading Project has funded over 35 projects in Ohio, Kentucky, and Indiana. These projects have resulted in the removal of over 100,000 pounds of nitrogen and phosphorus from the Ohio River Basin. The first credits generated from these projects were sold to Duke Energy, American Electric Power, and Hoosier Energy.

In 2015, the Trading Project was awarded the US Water Prize. The Water Prize honors individuals, institutions, and organizations that have made an outstanding achievement in the advancement of sustainable solutions to our nation's water challenges. The latest round of funding has been awarded to farmers, bringing the total to over $1,000,000 in awards for nutrient reduction projects.

Nutrient Criteria Development

Excessive nutrients have long been an issue in our nation's waterways, and the Ohio River is no exception. To resolve this issue, ORSANCO staff have been working toward defensible nutrient criteria for the Ohio River for over a decade using nutrient, planktonic algae, and chlorophyll-a (an indicator of algae production) data collected from locations in the lower section of the river. However, this approach failed to develop a causal relationship, which is a required step in developing criteria. During the stressor identification portion of the macroinvertebrate index (ORMIn) development, certain metrics exhibited a response to ambient nutrients. Tying a biological response to excessive nutrients is a common approach taken by other agencies to establish nutrient criteria. However, this approach is difficult for macroinvertebrates since they do not directly respond to excess nutrients, but rather to the ambient conditions resulting from eutrophication, namely fluctuating and depressed concentrations of dissolved oxygen.

In 2014, ORSANCO purchased 60 continuous dissolved oxygen loggers to obtain information that was previously unavailable. Since then, these loggers have been placed alongside the macroinvertebrate samplers in the Belleville, Markland, McAlpine, Olmstead/Open Water, Montgomery, Racine, JT Myers, Willow Island, Greenup, Cannelton, Newburgh, Meldahl, and New Cumberland pools in

the Ohio River. Additionally, water samples were obtained for nutrient and chlorophyll-a analysis at each of these sites. ORSANCO staff are currently analyzing the data from this paired study, and early indications are promising that defensible nutrient criteria may be considered utilizing this approach.

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.

When ORSANCO staff or its partners identify algal blooms, ORSANCO notifies downstream water utilities and other appropriate agencies. 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 L&D to Cannelton L&D (ORM 84.2 to 720.7). Below Cannelton L&D, 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.

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, the U.S. Army Corps of Engineers (USACE), and 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.

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.

The Foundation for Ohio River Education

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

FORE reached 5,500 people in the Ohio River Basin through 71 programs in 2018. Programs included the River REACH floating classroom, as well as professional development trainings for teachers, classroom programs, summer camps, and outreach programs in partnership with local parks, universities, and other non-profit organizations.

FORE kicked off a new initiative in Fall 2018 called Students in the STREAM. Students in the STREAM is a multi-disciplinary curriculum that was developed to help students in urban environments understand their connection to the small streams and watersheds found near their schools. The curriculum engages students not only in monitoring often-overlooked urban streams, but it also includes an extensive classroom curriculum that helps students map and assess land use activities in their watershed. They also assess how their watershed affects the Ohio River. The curriculum incorporates Science, Technology, Reading, Engineering, Art, and Mathematics (STREAM) disciplines and includes professional development for teachers. FORE also provides materials and support, through the Ohio River Sweep

program, for classes to conduct small clean-up events at their creek or in their schoolyard. FORE kicked off the Students in the STREAM program with two pilot schools located in Cincinnati, OH. The program was supported by Duke Energy and the Mayerson Philanthropy Project from Northern Kentucky University (NKU), which also nominated Students in the STREAM for a Social Justice Community Learning Award.

Even with record flooding in 2018, FORE worked with 24 schools to teach over 1,000 students on the Ohio River aboard the award-winning River REACH floating classroom program. In addition to schools, FORE also conducted the floating classroom program for special groups such as Girl Scouts and college students attending NKU's Protecting Water Resources class. FORE also partnered with NKU to develop a summer camp for the English Learner's Foundation. FORE also offered water testing and macroinvertebrate activities as part of the summer camp programs for Cincinnati Parks and the Boone County Conservation District.

Last fall, FORE co-hosted the Ohio River Basin Consortium for Research and Education (ORBCRE) 2018 Symposium and Ohio River Basin Alliance (ORBA) Summit with Thomas More University and ORSANCO. The event featured over 40 speakers on topics that ranged from Ohio River fish and wildlife to infrastructure and climate change. FORE's Director, Heather Mayfield, was also elected to the ORBA Steering Committee during the summit. She will also co-lead ORBA's Research and Education Work Group with Thomas More University.

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.

RiverWatchers includes groups in six Ohio River Basin states. These groups are comprised of students and citizens who are concerned about water quality issues.

Since the program began, thousands of volunteers have collected samples from the Ohio River and its tributaries to test for water quality. Outfitted with chemical test kits, a basic knowledge of water quality, and a desire to learn more about the effects of pollution on rivers and streams, participants collect samples and conduct tests to evaluate the health of local waterways in the Ohio River Basin. Data collected from the samples are submitted to ORSANCO where they are evaluated and entered into a database.

Participating schools include:

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

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 mainstem 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. ORSANCO also extends its reach to other watersheds outside the Ohio River watershed. In the summer of 2018, ORSANCO partnered with the Shedd Aquarium in Chicago, IL. The Shedd Aquarium featured species found in Lake Michigan to highlight the diversity and beauty of the Great Lakes ecosystem.

In 2019, the aquarium is scheduled to be displayed at the following events in the Ohio River watershed and beyond:

Event/Location

- Ohio State Biological Museum Open House: Columbus, OH
- Great Miami Riverway Summit: Troy, OH
- Children's Water Festival: Dayton, OH
- Delaware Parks World of Water Event: Columbus, OH
- Inland Waterways Festival: Marietta, OH
- ALCOSAN Open House: Pittsburgh, PA
- Subaru Outdoor Experience: Dayton, OH
- BBQ on the River: Paducah, KY

Ohio River Sweep

The Ohio River Sweep is a volunteer cleanup of the Ohio River organized by ORSANCO since 1989. This annual event brings together people and organizations to improve the Ohio River by removing litter from over 3,000 miles of shoreline in multiple locations along the Ohio River and its tributaries. The primary goal of the Ohio River Sweep is to remove litter from the Ohio River. Litter continues to be a problem in the Ohio River Basin and many other watersheds throughout the nation. The Ohio River Sweep provides an opportunity for volunteers to remove tons of litter, especially single-use plastics, from the watershed. The Ohio River Sweep coordinates communities to improve a global problem, such as plastics in the ocean, on a local level. In their nearby communities, Ohio River Sweep volunteers remove plastics from rivers before they travel downstream and reach the coast.

Volunteers from six states, from Pittsburgh, PA to Cairo, IL, participate in the cleanup, which connects thousands of people to their watershed. The event is easily accessible to many audiences in the Ohio River Valley, including young people, families, and community organizations. The Ohio River Sweep allows volunteers to experience hands-on, environmental stewardship in an easily-accessible, local event.

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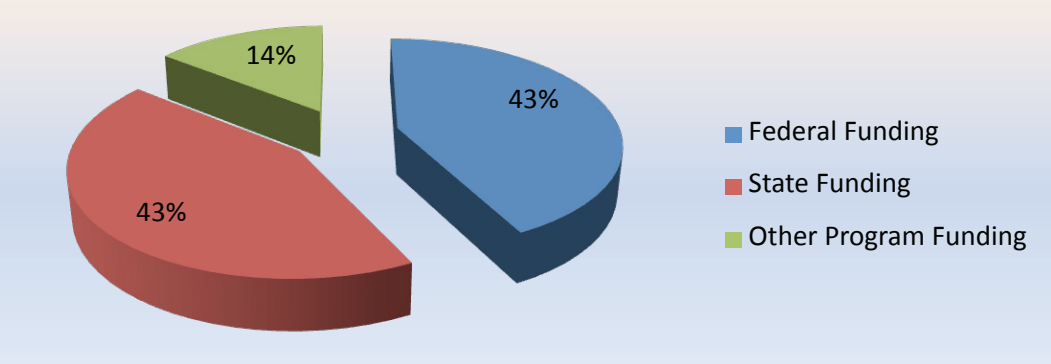
In conjunction with the Ohio River Sweep, a student poster contest is held to promote awareness of the event and the need for volunteers. One grand prize winner is selected, and the winning artwork adorns promotional materials and advertisements for the event. A T-shirt design winner and one winner from each grade level are also recognized.

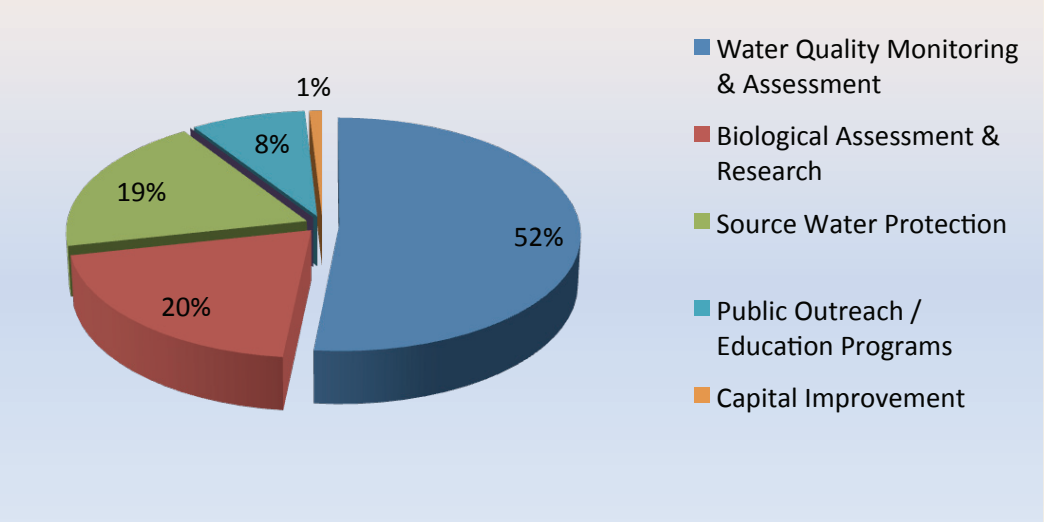
The 2019 Ohio River Sweep poster winner was Marilyn Snedaker from Cincinnati, OH, and the T-shirt design winner was JoLeigh Young from Moundsville, WV. Student works of art depicted on both the poster and T-shirt are created in an effort to encourage young people to understand the importance of their role in managing a great resource such as the great Ohio River.

2019 Resources Overview



Projected Resources by Major Source

• Federal Funding • State Funding • Other Program Funding

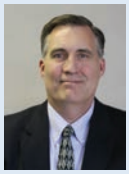


Projected Resources by Major Program Area

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

*Audited financial statements for 2019 will be available in February 2020.

ORSANCO Staff



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

Tracey Edmonds, Administrative Assistant

Technical Programs

✲ Jason Heath, P.E., BCEE
Technical Programs Director

Sam Dinkins, Technical Programs Manager

✲ Ryan Argo, Technical Programs Manager

✲ Stacey Cochran, Environmental Scientist III

Greg Youngstrom, Environmental Scientist III

Jamie Tsiominas, Environmental Scientist/Organics Detection System

Bridget Taylor, Environmental Scientist II

Lila Xepoleas Ziolkowski, Analytical Chemist, Quality Assurance

Rob Tewes, Senior Biologist

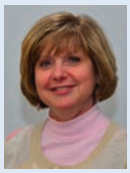
Bridget Borrowdale, Aquatic Biologist

Daniel Cleves, Aquatic Biologist

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

Lisa Cochran, Communications Coordinator

Melissa Mann, Public Information/ Education Specialist

Matt Glazer, Building Maintenance, Part-time

FORE

Heather Mayfield, Executive Director

✲ Staff Milestones

Jason Heath – 30 years
Stacey Cochran – 15 years
Ryan Argo – 10 years

ORSANCO recently welcomed new staff members to the Commission. Danny Cleves and Bridget Borrowdale were hired last spring as full-time aquatic biological staff, and, most recently, Jamie Tsiominas and Bridget Taylor joined our team as environmental scientists. Jamie will help manage ORSANCO's Organics Detection System, and Bridget (Taylor) will assist in the data management of ORSANCO's routine monitoring programs. All of these new faces keep the Commission's work going in many new places, supporting our goal to protect water quality now and for many generations to come.

Members of the Commission

Chairman
Ronald R. Potesta
President, Potesta and Associates
West Virginia

Vice-Chairman
John Kupke
Indiana

Secretary/ Treasurer
Charles Duritsa
Pennsylvania

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

Illinois
Toby Frevert

Illinois
John Kim, Director, Illinois EPA

Indiana
Joseph H. Harrison, Jr.
Massey Law Offices, LLC

Indiana
John Kupke

Indiana
Bruno Pigott
Commissioner, Indiana Dept. of Environmental Management

Kentucky
Jenean Hampton
Lieutenant Governor

Kentucky
C. Ronald Lovan, P.E., President/CEO, Northern Kentucky Water Dist.

Kentucky
Charles G. Snavely
Secretary, KY Energy and Environment Cabinet

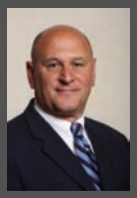
New York
Douglas E. Conroe
Executive Director, Chautauqua Lake Association Inc.

New York
Basil Seggos
Commissioner, New York Department of Environmental Conservation

New York
Michael P. Wilson

Ohio
Stuart F. Bruny

Ohio
Laurie Stevenson
Director, Ohio Environmental Protection Agency



Ohio
John M. Hoopingarner
Executive Director, Muskingum Watershed Conservancy Dist.

Pennsylvania
Charles Duritsa

Pennsylvania
Patrick McDonnell
Secretary, Pennsylvania Department of Environmental Protection

Pennsylvania
Davitt Woodwell
President, Pennsylvania Environmental Council

Virginia
Lou Ann Jessee-Wallace
Virginia Water Control Board & Owner of Design Printers

Virginia
David Paylor
Director, Virginia Department of Environmental Quality

West Virginia
Austin Caperton
Cabinet Secretary, Department of Environmental Protection

West Virginia
David Flannery
Steptoe & Johnson, PLLC

West Virginia
Ronald R. Potesta
President, Potesta and Associates

Federal
George Elmaraghy

Federal
Tom FitzGerald
Director, Kentucky Resources Council

*As of June 30, 2019. A current list of ORSANCO's Commissioners is available at www.orsanco.org.

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