

National Water Monitoring News



Highlights

- National Council Highlights
- Collaboration Through Partnerships
- State Partnerships
- Volunteer Monitoring
- Tools and Technology
- Upcoming Conferences and Workshops



Citizen Scientist Midge Eliassen prepares to make a Secchi Disk measurement on Lake Sunapee, New Hampshire. (Photo submitted by Kathleen Weathers.)



The National Water Quality Monitoring Council brings together scientists, managers, and citizens to ensure information about the quality of our water resources is accurate, reliable, and comparable. The Council fosters collaborative and cost-effective approaches to improve and advance the science of water-resources monitoring.





National Water Quality Monitoring Council

Working together for clean water



Words from the Council Co-chairs

Welcome to the 16th edition of the National Water Quality Monitoring Newsletter

Greetings Friends, Members, and Supporters of the Council,

We are pleased to share this newsletter full of information on water quality monitoring. There are articles from states and tribes, volunteer and citizen science organizations, federal agencies and academia. They cover the spectrum of water resources, including coastal, lakes, rivers and streams, ground water and wetlands, and of protection goals such as drinking water, recreation and biological integrity. Articles cover advances in tools and technologies for monitoring, assessment and data sharing. At the end, readers find links to conferences coming up this year. We hope you enjoy reading this edition and as always appreciate your feedback and contributions!

We are pleased to let you know preparations are underway for the 11th National Monitoring Conference that will be held March 25-29, 2019, in Denver, Colorado. We are excited for this opportunity to gather a diverse group of water-quality stakeholders, including federal, state, tribal and local water professionals, non-profits, academia, and volunteer citizen scientists, for a week of stimulating presentations, state-of-the-art trainings and collaboration. Listed in the callout box below is information about the call for abstracts for platform and poster presentations -- as well as the call for proposals for workshops, short courses, and panel discussions. Please check the [11th National Monitoring Conference website](#) for updates, or contact one of the Conference Planning Committee co-chairs (Lareina Guenzel (guenzel.lariena@epa.gov), Tim Oden (toden@usgs.gov), or Marie DeLorenzo (marie.delorenzo@noaa.gov) with your conference questions.

Best Regards,

Gary Rowe, USGS Co-Chair
glrowe@usgs.gov

Susan Holdsworth, EPA Co-Chair
holdsworth.susan@epa.gov

CALL FOR ABSTRACTS

11th National Monitoring Conference
March 25-29, 2019, Denver, Colorado

The NWQMC is [requesting abstracts](#) for oral presentations, posters, and extended sessions covering topics related to rivers and streams, lakes, wetlands, coastal waters and estuaries, groundwater, and drinking water.
Abstracts are due August 15, 2018



National Council Highlights

Welcome to the NWQMC!

Ed Sherwood, Watershed and Wetlands Representative

Ed Sherwood is the Executive Director of the Tampa Bay Estuary Program (TBEP). Ed received his B.S. degree in Marine Biology from the University of West Florida in 1999 and his M.S. degree in Marine Fisheries & Ecology from the University of Florida in 2003. He has worked previously as a fisheries biologist with the Florida Fish and Wildlife Conservation Commission and as an environmental projects manager with the Environmental Protection Commission of Hillsborough County. Previously as the TBEP's Senior Scientist for 10 years, he was responsible for the technical assessment and analysis of the program's projects to protect, restore, and sustain the Bay's ecosystems. His roles included grant proposal preparation; estuarine monitoring design, implementation and interpretation; developing future bay management objectives; database quality control; environmental impacts review; and statistical and geo-statistical analysis. Currently as TBEP's Executive Director, Ed is responsible for maintaining the strong partnerships forged through the TBEP, while continuing the Bay's science-based, community-focused restoration and recovery strategies. He has worked on a number of research projects within the Tampa Bay watershed focused on estuarine water quality, fisheries, and habitat resources.



Liz Smith, EPA Region 7 Representative

Elizabeth entered the water quality monitoring field during graduate school, working at the Central Plains Center for Bioassessment at Kansas University. After completing her PhD, she accepted a position at Kansas Department of Health and Environment, where she has been since 2005. She helped establish the Stream Probabilistic Monitoring Program and is currently its manager. Her position includes fieldwork, macroinvertebrate identification, water chemistry monitoring, and stream assessment. Elizabeth is also the general editor of the Integrated Water Quality Assessment for the state of Kansas. She holds a B.S. in Organismal Biology and a PhD in Entomology from University of Kansas. Liz is an avid reader and lazy gardener who also enjoys hiking, camping, and live music. She lives in Lawrence with her son Felix, two cats, and about a dozen fishes.



Jeremy Zumberge, EPA Region 8 Representative

Jeremy Zumberge has been a supervisor within the Watershed Protection Program of the Wyoming Department of Environmental Quality for 16 years. His primary responsibilities involve overseeing a team of scientists that evaluate the chemical, biological, and hydrogeomorphic condition of Wyoming waters, including intermittent and perennial streams, wetlands, and larger rivers, and provides data collection and analysis support to water quality standards, TMDL, and watershed planning programs. He is a member of the Corps of Engineers Wyoming Interagency Review Team and associated technical development team responsible for overseeing stream and wetland mitigation banking and developing a standardized function-based approach for calculating appropriate mitigation for adverse impacts to streams authorized by Department of the Army permits issued in the state. In the past, he has managed the 401 certification program and served on several interagency water quality workgroups. He has a B.S. degree in Environmental Studies from Bemidji State University and an M.S. degree in Water Resources Science from the University of Minnesota.



Farewell to Our Outgoing Member!

Wendy Norton, Executive Secretary of ACWI, Retired



Wendy began working for U.S. Geological Survey (USGS) in 1981 in the bureau budget office. She eventually transitioned into a program analyst position, where she assisted with

initial cost estimates and justifications for the National Water Quality Assessment Program; she interacted frequently with chiefs of Water offices across the country and wrote budget newsletters for Water field managers, explaining the impact of Congressional action on the USGS annual budget request. Wendy also wrote budget justification proposals and answered questions about the USGS Water programs from the Department of the Interior (DOI), Office of Management and Budget, and Capitol Hill. Since 2008, Wendy served as Executive Secretary for the Advisory Committee on Water Information (ACWI). Several new workgroups were formed under ACWI during her tenure, including a group devoted to the issue of Water Resources Adaptation to Climate Change, an *ad hoc* group convened to assess options for stabilizing and growing the water data collection programs in an era of shrinking budgets. Wendy was also much involved with several ACWI subcommittees, including the National Water Quality Monitoring Council (NWQMC).

Ask DatAbby



Quality of Data or Data Quality?

Dear DatAbby: Everyone keeps talking about quality of data, telling us to prove the quality of our data so others can use it and to provide all this extra information with our results. I know our data is of sound quality, or sufficient quality for the decisions we need, but how do I prove to others the quality of my data? Signed: *Confused Bob*

Dear Confused Bob: Quality is a loaded term because it means different things to different people and changes with context. In the context of generating data, the more information you provide about the data, called meta-data, the more another user can discern if your data is appropriate for their use, which may or may not be the same as the original data purpose. Meta-data includes information such as data objectives, date and time of sample, location description (elevation, county, latitude/longitude, driving directions, etc.), parameters measured and units of measure, and type of equipment. Additional information contained in quality assurance and control plans tells other users the methods and protocols used to ensure the data is of sufficient quality to fulfill their objectives. That includes information such as methods used in the field and laboratory, detection limits, reporting limits, etc. When data generators provide meta-data, it informs all users of the quality of the data generated for the stated data objectives and enables others to use this dataset appropriately and effectively for similar or other uses. That is how your data set can leave a legacy of use into the future, making a difference long after you might be done with it.

When an entity makes available sufficient meta-data along with actual results, they are generating a high-quality data submission and a valuable asset. A low-quality data submission does not contain meta-data and is not an asset beyond its first use. Data sets with associated meta-data may be used repeatedly, have a longer life span, and become an asset to managers and the community. Determining if a data set has a high or low data quality submission is easy and objective; either the meta-data is there or it is not. Whereas determining if a set of data is of sufficient quality for a range of uses, for example education, baseline condition, efficacy monitoring or compliance objectives, is more of a subjective assessment. A particular data set may be low data quality for some decisions and high data quality for others. If the data submitter provided meta-data then the user will have sufficient information to discern appropriate utility of the data set.

I hope I have decreased your confusion and provided clarity on data quality for decisions versus the value of providing high quality data submissions! Sincerely, *DatAbby*

No data management question is too small or big for DatAbby, send your questions via barb.horn@state.co.us.



To Publish or Not to Publish?

The question of whether to publish data to a common data repository or hub often shows up like this:

“Seeking input on water quality database design. Our volunteer data lives in an Excel spreadsheet with a separate file for each lake. We have longed to create a database and are finally in the process of making this happen. Should we also send our data to a national repository?”

A resounding YES! In fact, regardless of what entity you represent, if you are NOT publishing all relevant data to a collective data hub, you are losing resources, leverage, opportunities and impact. This is also true also if you are not using all possible available relevant data, in addition to your own, to inform your decision-making activities.

Why publish data? What’s the big deal?

It is time to shift our mindsets from “data for a purpose right now” to “data as an asset,” valuable long beyond its original purpose and used repeatedly for generations

How do I make my data an asset?

To turn data into an asset you must do two things. First, provide all relevant meta-data another user would need to understand why and how data was collected, including all sampling and analytical methods, units of measure, and quality assurance protocols. This allows other users to use your data appropriately (see DatAbby advice column). Second, publish your data to a valid common data portal or

hub. Publishing the data makes them discoverable and gives them a life span to make an impact for generations.

Some entities need to get their data organized locally. Others effectively manage local data but are not publishing or making data discoverable. Still others who have published data are not leveraging the opportunities for doing so. Each of these groups require different resources and amounts of effort for their data to become discoverable. All need to publish.

Where should I publish my data?

The Water Quality Portal (WQP) is an Environmental Protection Agency, U.S. Geological Survey, National Water Quality Monitoring Council service that includes a collective data repository for chemical, physical habitat and biological data from all waterbody types; methods to get data into and out of the repository; and tools to query, subset, display and visualize the data. The WQP contains data from USGS, the Department of Agriculture, and EPA’s STORET/Water Quality Exchange (WQX).

STORET/WQX includes thousands of data sets from federal, state and other agencies, industry, tribal governments, academia, and volunteer monitoring groups. Submitting your data to STORET/WQX makes it available through the WQP. For more information on the WQP go to acwi.gov/monitoring/waterqualitydata.html



Do you have water-quality monitoring topics or issues you would like to see in the next edition of the newsletter or covered in a webinar? Are there topics you would like the National Water Quality Monitoring Council to address in coming months and years? If so, feel free to reach out and let us know about your ideas.

Please contact us by emailing NationalMonitoringCouncil@gmail.com with “Suggestion Box” in the subject line, or visit our website to submit a suggestion. We will do our best to address concerns and issues that are raised by our audience.



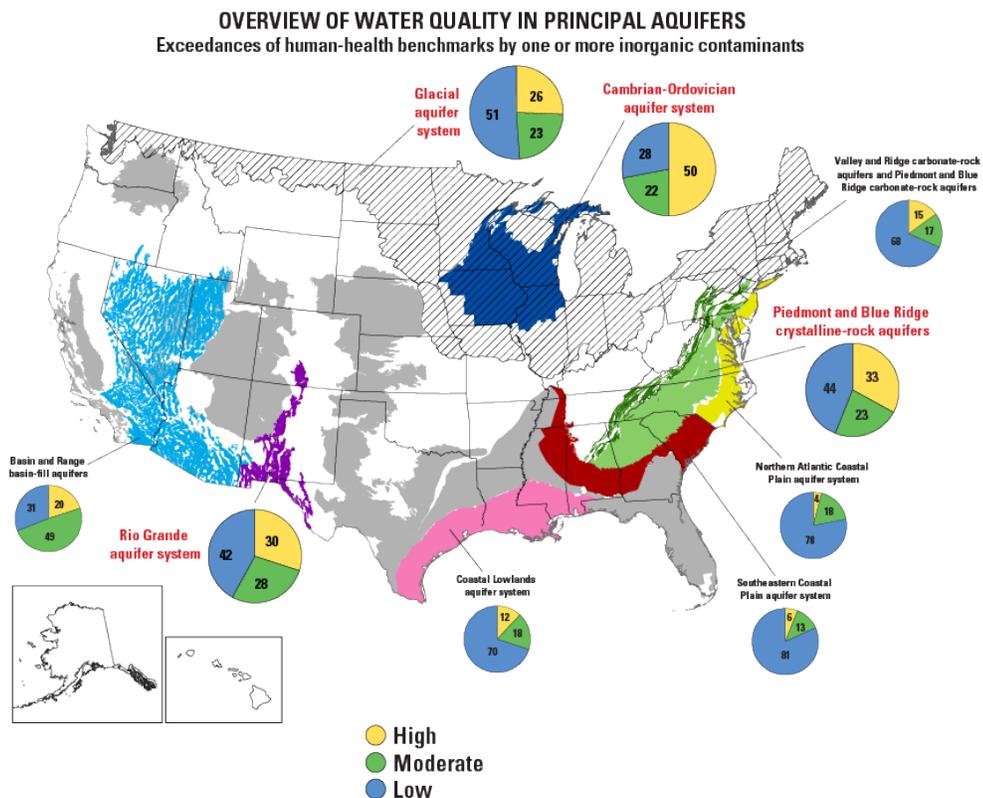
Groundwater Quality in Four Principal Aquifers Nationwide

Federal Partnerships

New USGS assessments of groundwater quality in four Principal Aquifers add to the five previously sampled and published in 2012–13. Almost 400 deep public-supply wells were sampled within the Rio Grande aquifer system (southwestern U.S.), the Glacial aquifer system (northern U.S.), the Cambrian-Ordovician aquifer system (north central U.S.), and the Piedmont and Blue Ridge crystalline-rock aquifers (eastern U.S.). Groundwater samples were analyzed for hundreds of water-quality constituents.

One or more inorganic constituents exceeded a human-health benchmark in 26 to 50 percent of samples collected from the four aquifers. However, organic contaminants rarely occurred at concentrations that approached human-health benchmarks. Trace elements, such as arsenic, fluoride, and manganese, were the constituents that most frequently exceeded a human-health benchmark—these trace elements have a geologic source. Radioactive constituents, also from geologic sources, exceeded human-health benchmarks in a small percentage of samples in the Rio Grande aquifer and Glacial aquifer system, but exceedances were higher in the Piedmont and Blue Ridge crystalline-rock aquifers and the Cambrian-Ordovician aquifer system. Nitrate was the only inorganic constituent from manmade sources that exceeded its human-health benchmark, and those exceedances occurred in just 0 to 2 percent of samples collected from the four aquifers.

About 140 million people—almost one-half of the Nation’s population—rely on groundwater for drinking water. Regional assessments of groundwater quality are one component of the [NAWQA Project’s](#) ongoing efforts to assess, understand, and forecast the quality of the Nation’s groundwater. For more information, contact Bruce Lindsey (blindsey@usgs.gov).



Water quality now has been evaluated in nine Principal Aquifers. Four new fact sheets describe the four Principle Aquifers with the larger pie charts and red text.



Scientists Identify Causes of High Radium Levels in Key Midwestern Aquifer

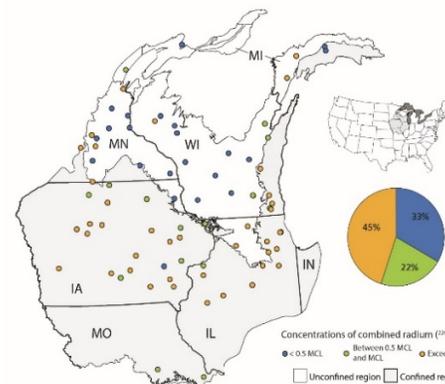
USGS scientists have shed new light on processes that happen deep underground.

These processes — which cause radium to leach from aquifer rocks into groundwater — are responsible for high concentrations of naturally occurring radium in groundwater from the Cambrian-Ordovician aquifer. This aquifer provides more than 630 million gallons of water a day for public supply to parts of Illinois, Iowa, Missouri, Michigan, Minnesota, and Wisconsin.

A newly published USGS study helps explain how radium isotopes make their way into the Cambrian-Ordovician aquifer and where concentrations are highest. The study, part of the USGS National Water Quality Assessment Project, reports that older water confined by a shale layer contains greater amounts of dissolved minerals and is lower in dissolved oxygen than newer, less confined water. High mineral, anoxic conditions favor the leaching of radium from the surrounding rock.

The groundwater tested came from public supply wells, before treatment and distribution. Radium can be removed from drinking water through treatment to limit the health risks it poses. Private wells were not tested during this study; however, more than half a million people get their drinking water from private wells that tap the Cambrian-Ordovician aquifer. These homeowners might consider having their water tested for radium.

For more information on this study, contact Paul Stackelberg (pestack@usgs.gov).

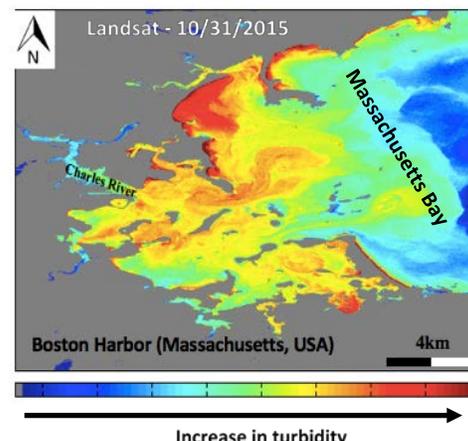


Untreated groundwater from public-supply wells in the confined region of the Cambrian-Ordovician aquifer was more likely than wells in the unconfined region to contain combined radium at levels above the Maximum Contaminant Level (MCL) for drinking water of 5 picocuries per liter. Low concentrations of dissolved oxygen and high concentrations of dissolved minerals are among the factors that cause radium to leach from the aquifer rocks into the groundwater.

Remote Sensing Workshop Overview

We are entering an era where daily satellite observations of the color of water in nearshore coastal and inland freshwater systems are possible, cloud cover permitting. Satellite sensors can provide information on the concentrations of the constituents that give rise to these colors, including chlorophyll *a*, total suspended solids dissolved organic matter, turbidity and water clarity. While not ideally designed for such applications, satellite observations provide very valuable information on relative spatial and temporal variations of near-surface turbidity/clarity.

In September 2017, a 1-day workshop at NASA's (National Aeronautics and Space Administration) Goddard Space Flight Center (GSFC) introduced the potential capabilities of a satellite-based, near-real-time water quality monitoring tool. The workshop brought together more than 340 environmental specialists, economists, scientists, industry representatives, and legal advisors from state and federal agencies and the private sector. Attendees identified the need for automated, near-real-time processing of Landsat-Sentinel imagery, robust anomaly detection algorithms, and support for ongoing implementation and calibration and validation efforts. The workshop further aimed to identify the next steps to make such a near-real-time system a reality, with input and guidance from end users. The goal is an on-line tool that uses satellite-based products to inform decision makers about potential hazards, such as algae blooms and spills, but does not require users to obtain, process and manage raw satellite data. The NASA GFSC team is currently developing a prototype system for select regions where strong partnerships have been established.



A Landsat-8-derived near-surface turbidity map. Varieties of physical/biological phenomena (e.g., swirls, resuspension events) can be inferred from space. This map pinpoints potential biogeochemical hot spots that require further investigations through field sampling.

All workshop presentations are available at the [meeting website](#). For more information, contact Nima Pahlevan (nima.pahlevan@nasa.gov).



A Snapshot of Algal Toxins in Our Nation's Waters

Algae are an essential part of the food web, but high levels of nutrients like phosphorus and nitrogen can contribute to large, unsightly algal blooms. Blue-green algae, also known as cyanobacteria, are a type of photosynthetic bacteria which can produce toxins – such as microcystins - that are harmful to pets, people and wildlife in high concentrations. Many state water-quality agencies or local public health agencies monitor for these algal blooms when they occur in public recreational waters.

The EPA, in partnership with states and tribes, conducts a nationwide sampling of our nation's water which provided a snapshot of algal toxin presence across the country. Microcystin was detected in 39% of the nation's lakes though less than 1%, about 1000 lakes, had levels that could pose moderate or high risk for recreational exposure. The National Lakes Assessment (NLA), included two other indicators relevant to potential human health risk associated with recreational exposure to algal toxins. Using the World Health Organization benchmarks for chlorophyll-*a* and cyanobacteria, 49% and 38% of lakes sampled presented moderate to high risk conditions for exposure to

cyanotoxins. The NLA found that the percent of lakes with detectable levels of microcystins increased by 9.5% between 2007 and 2012, but the analysis did not show a similar change in the percentage of lakes exceeding the microcystin threshold for moderate or high risk. The National Wetland Condition Assessment (NWCA) detected microcystin in 12% of the nation's wetland area, but less than 1% were at levels of concern. Future algal toxin results from the National Rivers and Streams Assessment and National Coastal Condition Assessment will be available in the future.

The algal toxin results presented above were gathered by the National Aquatic Resource Surveys (NARS), a collaboration between EPA, states, and tribes. For more information on the NARS please visit www.epa.gov/national-aquatic-resource-surveys where you can view the full reports, factsheets and [infographics](#), explore the results for different regions or subpopulations through interactive data [dashboards](#) and download the raw data.

Academia and Other Water Organizations

Living Lakes Canada Recognizes Inadequate Data



Scene from Living Lakes Canada

A [recent report](#) found inadequate Columbia Basin water data for managing and protecting the Columbia Basin region's water resources in response to climate change. In response to that report, a two-day conference was convened in Invermere, British Columbia by Living Lakes Canada, Columbia Basin Trust, the Columbia Basin Watershed Network and Selkirk College and attended by 120 water experts, residents and guests. The goal of the conference was to envision a Water Monitoring Framework that would coordinate water data collection within the Basin as well as the development of a Columbia Basin Water Data Hub, a digital access point to store the region's open access water data in a way that supports decision-making across all levels.

Scientists, government officials, industry staff, community groups, First Nations, and technology experts presented best practices examples of water monitoring initiatives, water data hubs and community-based water monitoring from across Canada and the United States. A shared understanding about water monitoring frameworks and water data storage needs was coupled with broad agreement that a Framework and an open access Data Hub were needed and that now is the time to move this forward.

For the 3-page Executive Summary, visit: www.livinglakescanada.ca/wp-content/uploads/2018/02/Water-Data-Hub-Executive-Summary.pdf For the full Conference Summary, visit: www.livinglakescanada.ca/wp-content/uploads/2018/02/Columbia-Water-Data-Hub-2017-Conference-Summary-FINAL.pdf

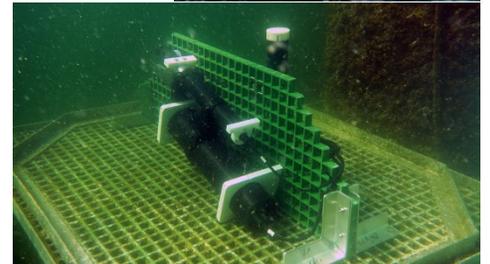
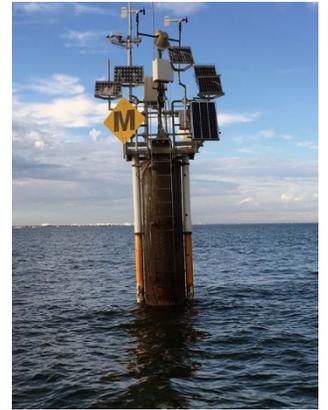


Monitoring Station for Ocean Acidification Deployed: Equipment to Help Scientists Explore Role of Seagrasses in Shielding Marine Life from Climate Change Impacts

Bucking global trends, pH levels in Tampa Bay are going up instead of down, an anomaly that research led by the USGS links to the bay's expanding seagrass meadows. The high rate of photosynthesis found in seagrasses may serve to buffer changes in ocean chemistry that affect hard-shelled organisms most vulnerable to acidity caused by rising carbon dioxide levels in the atmosphere.

About one-quarter of the carbon dioxide released when fossil fuels are burned winds up in the ocean. As pH levels drop in response, the shells and skeletons of corals, mussels, clams, scallops, oysters and crabs can literally dissolve. This phenomenon has been dubbed "osteoporosis of the sea." However, scientists suggest, abundant seagrasses may serve as a climate change refuge for hard-shelled organisms.

The new monitoring station installed near Port Manatee, FL will help researchers better understand pH trends and the potential mitigating benefit of healthy seagrasses. Sensors and sampling gear on the station will measure dissolved oxygen, pH, temperature and salinity. The station is a partnership between Tampa Bay Estuary Program (TBEP), the USGS, EPA, and the University of South Florida College of Marine Science. Another station is slated for installation in nearshore Gulf of Mexico waters to tease out local trends from broader regional trends. [Click here](#) to learn more about the relationship between seagrass and pH levels in Tampa Bay, or check out [TBEP's Climate Change actions](#).



Understanding the Fate of Microbial Contaminants in Complex Stormwater Flow Regimes in Coastal NC



UNC-IMS graduate student Matthew Price collecting stormwater samples in Beaufort, NC for National Estuarine Research Reserve System (NERRS) 2018 study. (Photo courtesy of Matthew Price, UNC-IMS)

The combined effects of increasing development, sea level rise, adverse stormwater quality, and aging infrastructure pose serious problems in coastal mitigation strategies. However, the environmental impacts related to these interactions in coastal systems are poorly understood.

A three-year project in the coastal town of Beaufort, NC seeks to address the ecological influence of storm and groundwater runoff on environmentally sensitive estuarine systems including the Rachel Carson Reserve (RCR), a diverse preserve of tidal flats, salt marshes and maritime forests. One of the primary goals is to measure the microbial and physical components of coastal receiving waters to help identify potential sources of fecal contamination as measured by fecal indicator bacteria (FIB) such as *E. coli*, and further characterized using microbial source tracking. Furthermore, we wish to identify whether coastal water dynamics can serve as a predictive component of receiving water quality.

In an effort to identify the source of contamination, quantitative PCR and digital droplet PCR have been used to test for markers of human and bird fecal contamination in samples collected using automated samplers at strategic locations. Results have already demonstrated that coastal stormwater discharge along the mid-Atlantic coastal plain are complex. Data show periods where the high tides will prevent stormwater from flowing, even during strong rainfall events, causing a pulse of contamination to be released upon the drop in the tidal stage. Discharge dynamics from coastal stormwater are more complex than that of typical stormwater. Local coastal towns are using information from this study to address potential sources of fecal contamination and provide solutions to ultimately help preserve water quality in the surrounding water bodies connected to the Rachel Carson Reserve. For more information on this study contact Matthew Price (mtprice@live.unc.edu) or Rachel Noble (rt noble@email.unc.edu).



Monitoring for Harmful Algal Toxins in Recreational Waters Protects both Human and Pet Health

Since 2010, the Indiana Department of Environmental Management (IDEM) has been monitoring for cyanobacteria and microcystin, cylindrospermopsin, anatoxin-a, and, in 2018, saxitoxin at select swimming beaches that the Indiana Department of Natural Resources (DNR) owns or operates. IDEM scientists identify and enumerate the cyanobacteria, and conduct the ELISA toxin analysis.

In 2012, during Indiana's severe drought, four dogs were sickened and two died after swimming in and ingesting water from a small, isolated cove at Salamonie Lake, an Army Corps of Engineers reservoir that has a DNR recreation area that IDEM samples. The consensus among the veterinarians involved in the case was that the dogs succumbed to microcystin poisoning. The cove where the dogs swam was not near the IDEM sampling site; however, microcystin had been found the week prior to the dogs' exposure at the IDEM site and follow-up sampling a week after the dogs were exposed showed the toxin in small amounts as well.

Since that time, the Indiana DNR developed the Fort Benjamin Harrison State Park Dog Park. One of the park's amenities is a small lake that the Indiana DNR wanted to open to dogs. Because

of the Salamonie Lake poisonings, the Indiana DNR asked if IDEM would consider sampling the Dog Park Lake to determine if it is safe for dogs to swim. IDEM sampled the Dog Park Lake weekly from May to October 2017. In order to make the sampling program useful, IDEM needed toxin thresholds to apply to canine exposure and based their criteria on the California Environmental Protection Agency's Office of Environmental Health Hazard Assessment action levels for microcystin, anatoxin-a and cylindrospermopsin and Oregon Harmful Algal Bloom Surveillance Program's Public Health Advisory Guidelines canine value for saxitoxin. A warning to dog owners occurs whenever any cyanotoxins are detected. Based on California and Oregon action levels, lake access will be locked and dogs will be prohibited from swimming at the values of 0.8 µg/l microcystin, any detection of anatoxin-a, 1.0 µg/l of cylindrospermopsin, or 0.02 µg/l of saxitoxin. Iowa DNR notifies dog owners of the status of the lake with signs at the site and through a Facebook group and also provides potable water for drinking and a wash station for the dogs. In 2017, no microcystin or anatoxin-a were detected, and minor detections of cylindrospermopsin occurred in August and September.

New Water Monitoring and Analysis Group in the Minneapolis-St. Paul Metro Area

There's a new resource for water professionals in the Minneapolis-St. Paul metro area. The Twin Cities Water Monitoring and Data Assessment Group (TC-WaMoDaG) is a partnership of public sector water resource practitioners collaborating to establish and promote standard practices for water monitoring, analysis, and data stewardship in the Twin Cities metro area. The goal of the group is to facilitate the production of quality information for the effective management, protection, and improvement of water resources. TC-WaMoDaG will host two events per year, provide a website with an online discussion forum, and co-sponsor workshops and trainings.

Fifty-nine water professionals attended the group's kickoff event on December 6, 2017, with city, county, soil and water conservation district, watershed, tribe, state, and federal agency representation. Nineteen professionals gave brief presentations on their monitoring and assessment program's purpose, outcomes, and challenges. The overlapping priorities and shared challenges identified in the presentations will guide the group's programming going forward. If you are a Twin Cities public sector water practitioner, please join the TC-WaMoDaG. Visit sites.google.com/view/tc-wamodag or contact Emily Resseger (emily.resseger@metc.state.mn.us) to learn more.

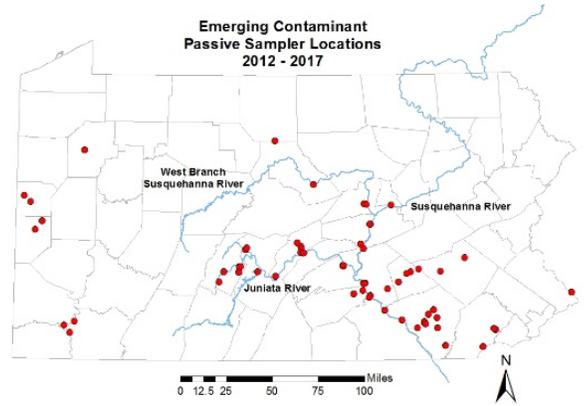


TC-WaMoDaG water professionals listen to a colleague present on their monitoring program (Credit: Emily Resseger)



Pennsylvania's Emerging Contaminants Sampling

Pennsylvania Department of Environmental Protection (DEP) has undertaken sampling of emerging contaminants, including many endocrine disrupting compounds (EDCs), throughout the state. Beginning in 2012 with four sites sampled for total estrogenicity, the program has grown to 27 sites per season in 2018. Currently, all sites are sampled with passive water samplers called polar organic chemical integrative samplers (POCIS) and semipermeable membrane devices (SPMDs) for hormones, total estrogenicity, pharmaceuticals, pesticides, wastewater compounds, polycyclic aromatic hydrocarbons (PAHs), and poly-brominated diphenyl ethers (PBDEs). In addition, sediment has been tested at many sites for hormones, wastewater compounds, and pesticides. Water grab samples are analyzed for pesticides and total estrogenicity, or compounds likely to act as hormones and affect estrogen-receptors.



Approximately 70 sites have been tested for one or more of the chemical suites and matrices listed above. Compounds are ubiquitous throughout the state. The hope is that the extensive sampling with years of data will help explain patterns at sites, upstream versus downstream targeted areas, and overall presence and concentrations of these compounds.

For more information on this project, contact Amy Williams at amywilli@pa.gov.

NEW! Wild Rice – Psin Story Map

The Prairie Island Indian Community's (PIIC) Land and Environment Department is excited to share a story map about its progress in working to restore wild rice to its lands and waters! This interactive, online way of story-telling can be viewed [here](#). Wild historically grew along the upper reaches of the Mississippi River. Dakota people traveled without boundaries to harvest from abundant wild rice beds, and lakes were clean enough for the rice to grow. The desire to create better shipping lines along the Mississippi brought about the installation of lock and dams, flooding much of the wetland areas where the wild rice grew.



Increased urbanization and industrialization all over Minnesota has contributed to poorer water quality in the river and backwater lake systems. High nutrient levels in the river, especially sulfate, hinder the growth of wild rice. Minnesota is trying to better regulate and enforce sulfate levels in protection of wild rice. The PIIC is hopeful that these protections can assist in a resurgence of rice throughout the state as water gives life to this food source.

For more information on other great projects happening in southeastern Minnesota, visit the [Prairie Island Land & Environment Facebook page](#) or contact Leya Charles, Water Resources Specialist, at leya.charles@piic.org.



Volunteer Monitoring News

Statewide Volunteer Monitoring Program Thrives in Oklahoma

Oklahoma Conservation Commission's (OCC) Water Quality Division includes the water quality education program known as Blue Thumb, now in its 25th year. While the program started with humble beginnings in the city of Tulsa in 1992, it quickly expanded to Oklahoma City and then statewide, when it was absorbed by the OCC. Blue Thumb's mission is stream protection through education. One of the two primary methods to accomplish that goal is through volunteer monitoring.

Last year, the program saw 12,000 volunteer hours logged by citizen scientists across the state. Nearly 80 sites, with a wide variety of creeks and small rivers, are monitored actively by volunteers who conduct monthly chemical tests.

They sample for dissolved oxygen, nitrate/nitrite, pH, chloride, ammonia-nitrogen and orthophosphate phosphorus. Volunteers also assist Blue Thumb staff with fish collections in the summer and benthic macroinvertebrate collections in both the summer and winter. There were 139 biological collections in 2017, with volunteers involved in most collections. Along with the chemical tests and biological sampling, volunteers also record stream site observations and assess the stream's physical habitat every time they visit their creek. 2017 was a year of growth for the Blue Thumb program, with a record number of workshops held to train new volunteers to monitor their local waterways, with nine such trainings held across the state, attended by 115 new volunteers. Many of them are now actively monitoring a stream in their community.

Blue Thumb is funded by grant money from the EPA. The volunteers, some of whom have been monitoring for 20 years, are passionate about their role as the eyes and ears of their creek. For more information about the program, please visit the website at www.bluethumbok.com or our Facebook page at www.Facebook.com/bluethumbok



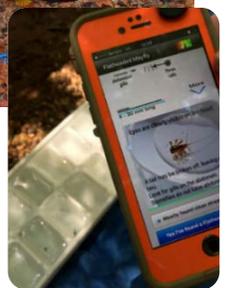
New volunteers at a training in Oklahoma City learn how to perform a dissolved oxygen test.

CREEK CRITTERS: Share the Excitement of Making New Discoveries

CREEK CRITTERS, an app released by the Audobon Naturalist Society (ANS), is designed to engage people in improving the health of their local streams by building on the excitement generated when people learn about stream habitat and associated macroinvertebrates.

Several thousand people have joined ANS and its partners throughout the Washington DC metropolitan area, following the app's user-friendly interface for finding and identifying "critters," and generating stream health reports based on their findings. Program participants take follow-on actions by independently assessing other stream sites, training to become volunteer monitors, participating in stewardship projects and advocating for their local streams.

For more information about this tool for engaging and educating groups, and for recruiting people to your citizen monitoring program, contact Gregg Trilling (gregg.trilling@anshome.org) or visit anshome.org/creek-critters/.



The Blackfoot Watershed Adopt-A-Stream Program: Second-Year Success and Thirsty for More

Working to maintain the uniquely intact ecosystem along the southernmost boundary of the vast Bob Marshall Wilderness Complex in Montana, the Blackfoot Challenge (Challenge), in partnership with the Clearwater Resource Council (CRC) and the Southwest Crown Collaborative, completed the second year of their Blackfoot Watershed Citizen Science Adopt-A-Stream program in 2017. This program engages youth and local citizens in monitoring stream flow and water quality, and provides insight into how resource management decisions might impact public lands. With the help of these volunteers, the Challenge and CRC collect data from 35 headwater streams in the Blackfoot watershed. A suite of physical and chemical parameters is measured and help to aid U.S. Forest Service restoration efforts in headwaters important for fisheries (especially threatened bull trout), recreation, and agriculture.

The Challenge and CRC developed curricula that integrate aquatic ecology, hydrology, nutrients in water, and climate change effects into classroom lessons. The lessons are designed for students to investigate water monitoring techniques, learn how to graph and analyze the data, and interpret implications on ecosystem health.

Continued monitoring remains a top priority for the Challenge, CRC, and local community members. While only two years into the Adopt-A-Stream program, the benefits reach well beyond the value of the data itself -- the increased connection both youth and adult community members will develop in maintaining healthy water resources on their landscape is invaluable. For more information on this project please visit www.blackfootchallenge.org or contact our Water Program Coordinator, Jennifer Schoonen, at jennifer@blackfootchallenge.org.



Local students take a stream flow measurement with guidance and explanation from Challenge.



Citizen Science volunteer, Martha Swanson, takes a stream sample to be analyzed for turbidity.

Charlotte Harbor Aquatic Preserves Celebrates 22 Years of Volunteer Water Quality Monitoring



Volunteer water quality monitor, Karl, waits for his multiparameter instrument to stabilize during calibration. He monitors a site in Matlacha Pass Aquatic Preserve, located in southwest Florida.

The Charlotte Harbor Aquatic Preserves (CHAP) office protects more than 170,000 acres of Florida's finest estuaries. The preserves' Water Quality Monitoring Network (CHEVWQMN) is a volunteer-based program made up of 80 volunteers and partnerships with various agencies to consistently monitor water quality within CHAP's five aquatic preserves, Estero Bay Aquatic Preserve and their tributaries. Since 1996, trained citizen scientists have collected water quality information on the first Monday of every month at sunrise. A total of 46 sites are monitored each month for 19 field and lab parameters which are crucial to characterizing estuarine health. This snapshot of water quality across the area enables resource managers to identify background conditions, assess status and trends, and identify areas of concern.

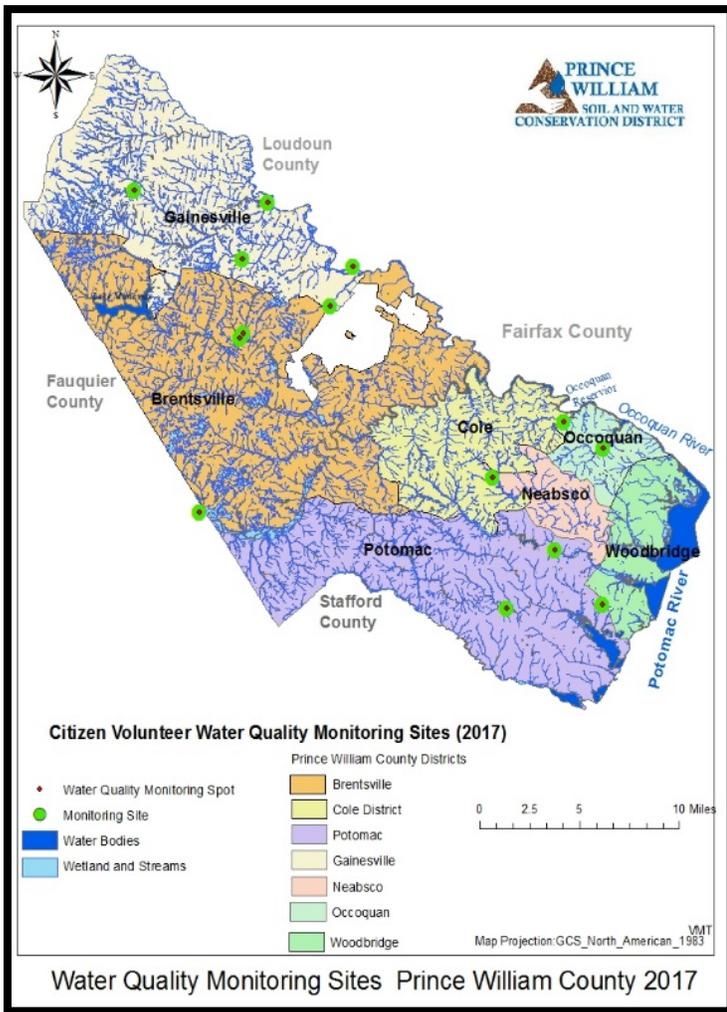
The data is managed by CHAP staff, presented at various functions, and uploaded into the user-friendly [Water Atlas website](#) as well as the EPA's Storage and Retrieval database (STORET) for use in the Total Maximum Daily Load impaired water bodies program. Along with the public education component of the program, the regulatory use of the CHEVWQMN data is important to water quality issues being addressed by the state and partnering stakeholders.

Volunteers are the backbone of the CHEVWQMN program, providing reliable and consistent water quality information. Volunteers range in age and backgrounds, from artists to chemists. To date, volunteers have contributed over 50,000 hours to this program. Regional support in managing 80 volunteers across three counties involves the use of partnerships with the Charlotte Harbor Environmental Center, Estero Bay Aquatic Preserve and the Charlotte Harbor National Estuary Program.

For more information on the CHEVWQMN program, please visit the [DEP website](#) or contact the program coordinator, Arielle Taylor-Manges at: Arielle.taylormanges@dep.state.fl.us



2017 Water Quality Awareness Milestone- Prince William County, Virginia



The Prince William County Soil and Water Conservation District manages Prince William County's (Virginia) citizens' volunteer water quality programs, consisting of the water quality monitoring (biological and chemical) and the Adopt-A-Stream (cleanup) programs. Greater water quality awareness in the County has led to an increase in the number of monitoring sites, from 3 sites in 2014 to 14 sites in 2017. In 2017, the Adopt-A-Stream program registered over 25,000 pounds of trash collected across the County, of which 5,000 pounds came from the Annual Upper Occoquan River Cleanup event alone. These results earned Prince William County a 2017 Potomac Champions Awards from the Alice Ferguson Foundation (The Potomac Watershed spans parts of Washington DC, Maryland, and Virginia).

In 2018, the Soil and Water District has identified the need to upgrade the volunteer water quality monitoring equipment. As more students and youth groups get involved in the water quality program, they not only have the opportunity to enjoy and appreciate the beauty of nature, but are exposed to some of the challenges impacting their local streams. These include trash/litter, floatables and pollution. This exposure and experience allows these future leaders to ponder some of the challenges awaiting them and Prince William County in the future, which is especially critical as Prince William County is one of the fastest urbanizing counties in the Washington DC Metro area.

Today, the Adopt-A-Stream program not only cleans up streams, but has inspired residents to adopt stormwater ponds, lakes, portions of the Occoquan River and Belmont Bay for cleanup this spring of 2018. For more information on ongoing efforts, please visit the County's [website](#).



Citizen volunteer monitoring event educating kids (Cub Scout troop 964) on water quality awareness.



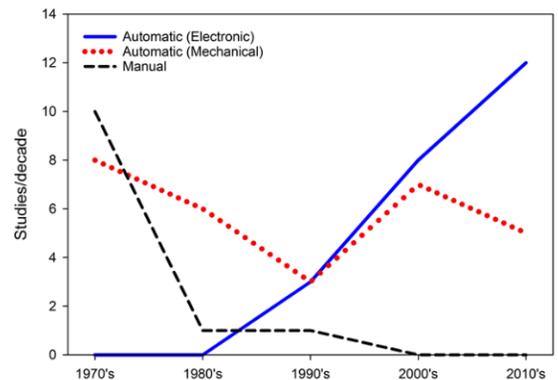
Tools and Technology

Measuring Edge of Field Water Quality: Past, Present, and Future

Well-designed edge of field (EOF) monitoring is a critical tool for quantifying how landscape management changes influence water quality. However, measuring water quality at smaller scales (field to headwater streams; ~0.01 to 250 hectares) can be difficult, time consuming, and expensive. A recent [article](#) conveys decades of collective wisdom to those who manage, design, implement, or operate water quality monitoring programs, particularly at smaller scales.

The need for EOF data appears to be increasing (see graph), likely due to increased pressure to demonstrate the water-quality benefits of conservation expenditures, evaluate long-standing and innovative practices, and address high-profile water quality impairments and concerns. Thus, practical improvements, enhanced in situ sampling, and lower cost systems are driving current research. At the same time, enhanced understanding and communication of the “quality” or uncertainty of the data is increasingly important in modeling and decision making.

With these needs in mind, this manuscript sets the stage for recent developments and summarizes how those developments advanced the science of EOF monitoring. In addition, current research and a glimpse into the future are presented. Although focused on EOF, many of the findings are also applicable at the small stream scale. For more information, contact Daren Harmel at daren.harmel@ars.usda.gov.



Manual sample collection and collection of samples by mechanical automated samplers were relied upon in the 1970s and 1980s. Beginning in the 1990s, the use of electronic (programmable) automated samplers increased substantially to address issues with manual sampling such as short runoff duration and remote site locations.

Nutrient Sensor Challenge looking for Demonstrated Users

In March, the U.S. Environmental Protection Agency (EPA) with four federal partners launched the next phase of a technology-accelerating water quality challenge calling for demonstrated use of nutrient pollution sensors. The Nutrient Sensor Action Challenge builds on the 2014 Nutrient Sensor Challenge, which helped facilitate the development of affordable, high-performing, continuous nutrient sensors and analyzers. In August 2017, the federal partnership launched Stage I of the Nutrient Sensor Action Challenge, which called for plans showing how these sensors could be deployed and collected data could be used to enable improved state and local nutrient management decision making. Stage I closed in September 2017 with five winning entries.

Stage II of the Challenge is now open. Competing teams will deploy and collect data from two or more nutrient sensors for at least 3 months. Teams will also demonstrate how local communities can use the collected data to improve nutrient management decisions. Stage II teams will be competing for a share of \$100,000 in prizes.

The Nutrient Sensor Action Challenge is a collaboration between EPA, the USGS, the United States Department of Agriculture (USDA), the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA)-led U.S. Integrated Ocean Observing System (U.S. IOOS®). For more information on the Nutrient Sensor Action Challenge: www.epa.gov/innovation/nutrient-sensor-action-challenge.



Award-Winning Web Toolkit Aids Freshwater Stewardship

WikiWatershed®, a free online toolkit, is helping individuals learn about and protect their watersheds. Designed for scientists, teachers, students, conservation workers, municipal decision-makers, and ordinary citizens, WikiWatershed includes six tools: Model My Watershed®, Runoff Simulation, EnviroDIY™, Monitor My Watershed®, Leaf Pack Network®, and Water Quality Mobile App.

Model My Watershed, one of these tools, allows users to analyze their local watersheds, land cover, and soil data; watch what happens when they change the land uses or implement conservation practices; and determine effects to hydrology and water quality. Access to USGS river gauge data, stream network overlays, different satellite and map overlays, precipitation, and other data are embedded into Model My Watershed. It also features a corresponding high school curriculum that has been piloted in five states.

Stroud Water Research Center developed WikiWatershed with team members from Azavea, the University of Washington Applied Physics Laboratory, the Concord Consortium, Meliora Design, Utah State University, the Academy of Natural Sciences of Drexel University, and Millersville University. The toolkit received the 2017 Governor's Award for Environmental Excellence from the Pennsylvania Department of Environmental Protection for its promotion of environmental stewardship. WikiWatershed has been funded in part by National Science Foundation and William Penn Foundation grants and is available to the public for free, thanks in part to donations.



Upcoming Conferences and Workshops

Society for Freshwater Science Annual Meeting

The goal of the 64th Annual Meeting of the Society for Freshwater Science (SFS) taking place May 20-24, 2018 is to focus the SFS community on navigating and understanding boundaries. Positioned on a river linking lakes, and encompassing an international border, the city of Detroit also has its own history of socio-cultural diversity, boundaries, and divisions, providing a rich, heterogeneous geographic and cultural context for our gathering. The meeting's program will emphasize frontiers of freshwater science focused on crossing habitat boundaries and linking disciplines, increase participation and perspectives connecting nations and cultures to address freshwater challenges, and guide SFS toward a more purposeful relationship between science and society to improve translation of the SFS community's science, education and service into action



Canadian Water Resources Association National Conference

The Canadian Water Resources Association's 71st National Conference will be held May 28-June 1, 2018 in Victoria, British Columbia, with a focus on "Our Common Water Future: Building Resilience through Innovation." This conference will bring water resource professionals and others together to help chart the path to that safe, sustainable and resilient water future with themes that include agriculture, ecosystems, hydrology, planning, and watershed management.



Association for the Sciences of Limnology and Oceanography (ASLO) Summer Meeting



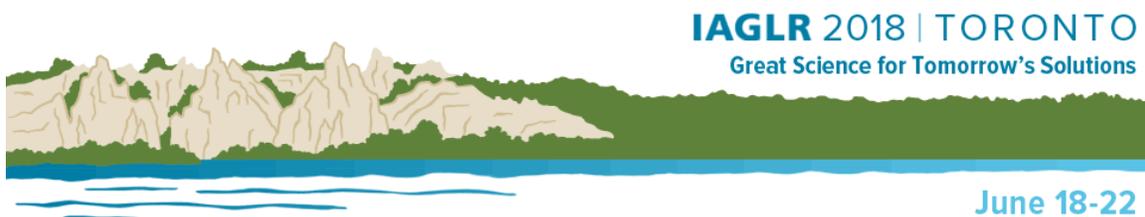
ASLO's Summer Meeting theme is "Water Connects!" Water connects everything and everyone! Water transcends and connects all spheres: the lithosphere, atmosphere, and biosphere – from fresh to salty, from microscopic to macroscopic. Water connects us to each other and to resources – across cultures and society, across politics and international boundaries. However, these elements are too frequently studied in isolation. This meeting will encourage attendees to bring their knowledge, curiosity, and creativity to connect with each other and share their passion for water. The meeting will be held June 10-15, 2018 in Victoria, British Columbia.

American Water Resources Association Annual Conference and Exposition

The AWRA Annual Conference and Exposition, held in Las Vegas, Nevada, June 12-14, 2018, is set to inspire and connect the water sector with innovative solutions and new insights to help solve our global water challenges. This year AWWA is co-partnering with the California/Nevada Section to produce an outstanding conference. Don't miss your chance to soak up the knowledge of hundreds of water industry thought leaders providing guidance on the future of our water.

International Association for Great Lakes Research Conference

Hundreds of scientists and other professionals from a wide variety of disciplines will attend IAGLR's Annual Conference on Great Lakes Research, held in Toronto from June 18-22, 2018. First held in 1953, the conference alternates each year between a Canadian and United States site. The program includes technical sessions with both oral and poster presentations, plenary sessions with internationally recognized keynote speakers, a trade show, and workshops on a variety of topics.



Universities Council on Water Resources and National Institutes of Water Resources Conference

The Universities Council on Water Resources and National Institute of Water Resources Joint Conference will be held June 26-28, 2018 in Pittsburgh, Pennsylvania. A preliminary conference program is available on their website.

Ecological Society of America Annual Meeting

The 2018 Ecological Society of America Annual Meeting will focus on extreme events, ecosystem resilience, and human well-being. Hosted in New Orleans, the meeting will take place August 5-10, 2018.



National Environmental Monitoring Conference

The **National Environmental Monitoring Conference (NEMC)**, held August 6-10, 2018 in New Orleans, Louisiana, is the largest conference focused on environmental measurements in North America. The conference brings together scientists and managers from federal and state agencies, the regulated community, academia, and laboratory and engineering support communities. NEMC features presentations, posters, training, exhibits, and networking opportunities.

Tribal Lands and Environment Forum: A National Conversation on Tribal Land and Water Resources



The 8th annual Tribal Lands and Environment Forum (TLEF) will be taking place at the Spokane Convention Center in Spokane, Washington, August 13-16, 2018.

This year's Forum will feature special trainings, field trips, and breakout sessions focused on our conference theme: A National Conversation on Tribal Land and Water Resources. Topics highlighted at the forum include solid/hazardous waste management, brownfields, UST/LUSTs, Superfund sites, and emergency response. Tribal water program topics – water quality, drinking water, and habitat restoration (including wetlands, streams and fisheries) will also be included with breakout sessions, trainings and field trips.

American Fisheries Society 148th Annual Meeting

The Mid-Atlantic Chapter invites you to attend the **148th Annual Meeting of the American Fisheries Society** – Communicating the Science of Fisheries Conservation to Diverse Audiences. The meeting will take place in Atlantic City, New Jersey from August 19-23, 2018. There is plenty to see and do in this exciting city. From beaches and boardwalks, to fishing and amusement parks, Atlantic City has something for everyone. The video below highlights some of the fun activities that AC has to offer and includes a message from AFS Past President (and New Jersey native) Joe Margraf.



**COMMUNICATING THE SCIENCE OF FISHERIES
CONSERVATION TO DIVERSE AUDIENCES**
AUGUST 19-23, 2018



Editorial Board

Alice Mayo, U.S. Environmental Protection Agency, mayio.alice@epa.gov

Martha Clark Mettler, Indiana Department of Environmental Management, mclark@idem.in.gov

Candice Hopkins, U.S. Geological Survey, chopkins@usgs.gov

Dan Sullivan, U.S. Geological Survey, djsulliv@usgs.gov

Marie DeLorenzo, NOAA, marie.delorenzo@noaa.gov

Sheri Alcalde, U.S. Geological Survey, salcalde@usgs.gov

Larry Willis, Virginia Department of Environmental Quality, larry.willis@deq.virginia.gov

Nancy Schuldt, Fond du Lac Environmental Program, nancyschuldt@fdlrez.com

Layout by Kim Martz, U.S. Geological Survey, kimmartz@usgs.gov

To submit an article, conference announcement, publication, or photo for our Fall 2018 Newsletter, contact chopkins@usgs.gov.

