

11th NATIONAL MONITORING CONFERENCE



Working Together for Clean Water

March 25-29, 2019

Denver, Colorado



Welcome to the 11th National Monitoring Conference

The National Water Quality Monitoring Council is thrilled to welcome you to Denver to share advances in water quality monitoring with colleagues from across the U.S. and beyond our borders. We have an outstanding program packed with opportunities to learn, to share, and most importantly to interact with people dedicated to answering questions with data. Examples of topics featured in the concurrent and sessions include:

- Building monitoring networks through partnerships
- Biological assessment tools and applications
- Data management, analysis and visualization
- Groundwater monitoring and modeling
- Microplastics in atmospheric deposition and aquatic environments
- Nutrients and algal toxins
- Turning data into assets, policy, and decisions
- Urban waters, stormwater and BMP effectiveness

We hope you take advantage of over 300 oral presentations, 130 posters and numerous panels, workshops, field trips and networking sessions. Plus, we're calling on you to:

- Be inspired by the **plenary speakers** on Tuesday morning and Thursday lunch.
- Participate in the **Networking Block** to meet people with similar interests and participate in after-hours **networking**, both scheduled and improv.
- Explore **exhibits** throughout the week and speak with vendors and representatives about what their products and services offer your monitoring programs. Be sure to attend the **Exhibitors Reception** on Tuesday evening.
- Visit **demonstrations** of the Water Data Portal, NARS field app, data analysis tools and more scheduled at the EPA, NWQMC and USGS booths.
- Participate or support the **Fluid 5k Run** on Thursday morning. Donations support scholarships for volunteer monitors at the next National Monitoring Conference.
- Explore **Denver** with the free 16th Street trolley providing easy access to restaurants, micro-breweries and a range of other activities.

We sincerely hope you find tools and approaches that will enhance your own monitoring program and you make connections that will build your network of colleagues into the future. On behalf of all the Council members and friends of the Council who made this conference happen, we extend our gratitude to YOU for your contributions to advance data driven decision making in support of water quality protection and restoration. We thank you for being part of this conference and invite you to contribute your time and creativity to the Council. Learn more about our vision, goals, products, and people and let's work together for clean water.

Susan Holdsworth
Co-Chair, U.S. Environmental Protection Agency

Gary Rowe
Co-Chair, U.S. Geological Survey

11th NATIONAL MONITORING CONFERENCE



Working Together for Clean Water

March 25-29, 2019 Denver, Colorado



Welcome volunteer monitors, friends and colleagues!

We are pleased to welcome you to the 11th National Monitoring Conference. We hope you will meet new colleagues, reconnect with old friends, share your perspectives and knowledge, learn about the latest developments in the field, explore areas of interest, and (of course) have fun.

When we last gathered at the 2016 conference, the National Water Quality Monitoring Council had just passed a charter to establish a Volunteer Monitoring Work Group. Today, three years later the work group is actively exploring avenues for collaboration, outreach, and connecting data. The goal of the work group is to engage key stakeholders in volunteer monitoring-related discussions; provide a conduit for our community to share resources, technology, and lessons learned; and facilitate the integration of volunteer monitoring activities with ongoing water-quality monitoring conducted by local, state, and federal agencies. Keeping our community connected remains an essential goal and we are excited to connect with you throughout the conference. We hope you will take full advantage of the Conference's offerings that have a volunteer monitoring focus. Your colleagues are speaking in many sessions and are presenting posters that will be on display throughout the conference. These include:

| Session | Day/Time | Session Type | Session Title |
|---------|----------|------------------|---|
| C8 | T 10:30 | panel discussion | Integrating Volunteer Collected Data: An Agency Perspective |
| D8 | T 3:30 | workshop | Macroinvertebrates.org |
| F6 | W 10:30 | session talks | Innovate Collaborative Approaches Equal Success |
| G6 | W 2:00 | session talks | Building Blocks for Chesapeake Bay Monitoring Cooperative |
| I6 | Th 8:30 | session talks | Exploring Outcomes of Collaborative Monitoring |
| I8 | Th 8:30 | workshop | Developing a Monitoring Program That Delivers Results |
| J6 | Th 10:30 | session talks | Unique Strategies for Collaboration |

In addition, please check out the following:

- **Volunteer Monitoring Exhibitor Booth:** Located in the South Convention Lobby next to the EPA table. Thank you, Environmental Protection Agency, for sponsoring our booth! This will be "volunteer monitoring central" for the conference. Drop off materials to share, suggest topics for our meeting, sign up for our Wednesday dinner, learn about resources, or chat with your colleagues.
- **Wednesday Volunteer Monitoring Meeting and Dinner:** Wednesday at 5:45 pm after the concurrent sessions, we will gather to discuss community needs, resources, and share lessons learned. After the meeting, come for a fun dinner at a nearby restaurant.
- **Volunteer Monitoring "Fluid 5K" Run:** On Thursday at 7:00 am, join this race as a runner, walker, sponsor or volunteer. Funds raised will be applied toward the Eleanor Ely Memorial Volunteer Monitoring travel scholarships for the next conference in 2022; if you won't be running, consider sponsoring one of your friends or colleagues! (pre-registration required)

Last, we extend our very special thanks to the Last, we extend our very special thanks to the Campbell Scientific, Inc., Eureka Water Probes, Aquatic Informatics Inc., LaMotte Company, and UW-Madison NADP, who donated registrations that helped members of the volunteer monitoring community attend this conference.

Once again, welcome!

The Volunteer Monitoring Committee



National Water Quality Monitoring Council

Working together for clean water

Working Together For Clean Water: 2017-2019 Council Highlights

Each day, water-quality issues become more complex and the need to address them more urgent. The demand for clean, pure water continues to grow. At the same time, budgets to monitor, assess, protect and restore our waters are tighter, forcing scientists and managers to attempt to do more with less. The National Water Quality Monitoring Council (Council) exists to bring together the diverse

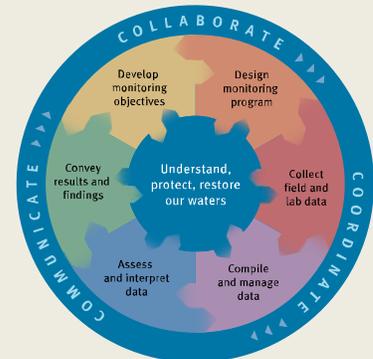
expertise needed to develop collaborative, comparable, and cost-effective approaches to monitor and assess our Nation's water quality (<http://acwi.gov/monitoring/>). These approaches are fundamental to the successful management and sustainability of our water resources.



assessment and statistical tools; sensors and real-time monitoring; and various tools for sharing and communicating developments and innovations in the monitoring community. Many Council products and services are now available to help meet water needs across the Nation.

The Council and its partners have made significant advances in setting priorities, including data management and information dissemination; compatible web services; State and regional councils; volunteer monitoring;

Created in 1997, the National Water Quality Monitoring Council (Council) is a national forum for coordination of comparable and scientifically defensible methods and strategies to improve water quality monitoring, assessment and reporting. The Council brings together scientists, managers, and citizens to ensure that 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. The Council is chartered as a subgroup of the Advisory Committee on Water Information (ACWI) under the Federal Advisory Committee Act.



The Monitoring Framework

Council Workgroups

Methods and Data Comparability Board (Methods Board) – Provides a forum for evaluating and promoting methods that facilitate comparability among water-quality monitoring and analytical methods. (**Contact:** Dan Sullivan, djsulliv@usgs.gov, (608) 821-3869)

The **Aquatic Sensor Workgroup** is a subcommittee of the Methods Board that has focused on quality control and management of water-quality sensor data. (**Contact:** Dan Sullivan, djsulliv@usgs.gov, (608) 821-3869)

Water Information Strategies Workgroup – Defines and promotes strategies for monitoring designs; data management, access, and exchange; data integration and analysis; and information reporting to address water needs. (**Contacts:** Mary Skopec, mary.skopec@dnr.iowa.gov, (319) 335-1579, Aaron Borisenko, borisenko.aaron@deq.state.or.us, (503-693-5723))

Collaboration and Outreach Workgroup – Works to build partnerships that foster collaboration and communication within the water-quality monitoring community. (**Contacts:** Candice Hopkins, chopkins@usgs.gov, (208) 387-1331, and Danielle Donkersloot, ddonkersloot@gmail.com)

National Network of Reference Watersheds – Defines and promotes strategies for improved coordination and collaboration for sharing and accessing reference watershed information and water-quality data for freshwater streams (**Contact:** Mike McHale, mmchale@usgs.gov)

Volunteer Monitoring (VM) Working Group – Engages key members of the Council in volunteer monitoring-related discussions to better encourage integration of volunteer monitoring activities with ongoing water-quality monitoring conducted by local, state, and federal agencies. (**Contacts:** Danielle Donkersloot, ddonkersloot@gmail.com and Julie Vastine, vastine@dickinson.edu, (717) 245-

The National Network of Reference Watersheds



The National Network of Reference Watersheds (NNRW) is a web-based resource with a collaborative, multipurpose design that delivers physical and chemical data for

minimally disturbed watersheds. The NNRW is made up of about 2,500 watersheds from across the United States. The network quantifies the level of disturbance for each watershed based on hydrologic and land-use disturbance metrics. To date the NNRW has focused on stream watersheds, but in 2019 the network will begin to incorporate lake watersheds. The NNRW allows users to search for watersheds based on land use characteristics, disturbance levels, and water quality data availability. The NNRW delivers water quality data for network watersheds through Council's Water Quality Portal. The NNRW also associates each watershed with the closest National Atmospheric Deposition Program station so users can easily access atmospheric deposition data associated with each watershed. Membership in the network is voluntary and open to interested individuals and institutions. More information and access to the NNRW at:

<https://my.usgs.gov/nnrw/main/home> (**Contact:** Mike McHale, mmchale@usgs.gov, (518) 285-5675).

Volunteer Monitoring and Citizen Science

The Council's VM Work Group was established in 2016 with the goal to foster community and connect people to new and existing resources. The 2016 Tampa NMC conference served as a wonderful opportunity to connect with monitoring coordinators from across the country to assess the pulse of the community and identify key projects to focus on. Since the 2016 conference, the VM work group has focused on communication and outreach. Check out the Council's newsletter for articles from the VM community doing engaging work. The work group also hosted eight webinars in 2017 and 2018 for the VM community on topics ranging from "Building Credibility" to "Bacteria Monitoring." Additionally, work group members participated in Water Quality Portal discussions to help explore strategies for increasing data submissions from the volunteer monitoring community. For more information check out: <https://acwi.gov/monitoring/vm/> (**Contacts:** Danielle Donkersloot, ddonkersloot@gmail.com and Julie Vastine, vastine@dickinson.edu, (717) 245-1135).



National Environmental Methods Index

The National Environmental Methods Index (NEMI; <https://www.nemi.gov/>) is an online resource of laboratory methods and field protocols. Introduced in 2002, NEMI includes methods for chemical, biological, and physical monitoring. NEMI methods are linked to sample results in the Water Quality Portal, allowing water managers quick access to method metadata needed to assure comparability of water-quality data. Current efforts to expand biological method data in NEMI include adding critical metadata fields. (Contact: Dan Sullivan, djsulliv@usgs.gov, (608) 821-3869 or Jim Kreft, jkreft@usgs.gov, (608) 821-3919).



Methods and Data Comparability Board

A **biosessment comparability subcommittee** was launched in 2018. Current efforts are focused on critical metadata fields



for biological data in the Water Quality Portal and the underlying Water Quality Exchange (WQX) schema, with plans for a breakout session at the 2019 NMC in Denver.

The **Aquatic Sensor Workgroup** contributed to the 2017 USGS continuous monitoring workshop, helped to build stronger collaboration on the collection, interpretation, and application of continuous monitoring data; shared technical approaches for the collection and management of continuous data that improves consistency and efficiency across the USGS; and explored techniques and tools for the interpretation of continuous monitoring data, which increases the value to cooperators and the public (see full report



at <https://doi.org/10.3133/ofr20181059>). Additional efforts by the workgroup included discussions of how to deal with uncertainty in sensor-derived data. (Contact: Dan Sullivan, djsulliv@usgs.gov, (608) 821-3869).

Water Information Strategies Workgroup

The Water Information Strategies (WIS) Workgroup prioritized three activities in 2017-18 and created three subcommittees to focus attention on developing products from these groups. The subcommittees included Improving Data Management, Evaluating NWQMC Progress, and Water Quality Standards.

Improving Data Management

The Data Management subcommittee was formed in response to the continued growth and utility of the Water Quality Portal. The WIS workgroup recognized the need to assist data owners in getting their information uploaded to the portal. One barrier for groups new to the Portal is understanding what information needs to be included with their data. In response to this issue, the Data Management subcommittee developed a document on the Best Practices for Metadata. The best practices guide will help new users navigate the how to gather the appropriate metadata to ensure that uploaded data are of known quality. This guide will be located on the Council website (Contact: Jane Caffrey, jcaffrey@uwf.edu, 850-857-6089).

The Water Information Strategies Workgroup is also coordinating with the Water Quality Portal team to provide review and input on future enhancements to the Water Quality Portal. Members of the WIS Workgroup represent diverse perspectives (state, local, community or volunteer monitoring groups) that help guide the Portal to meet the needs of the



user community. Similarly, WIS is collaborating with the USGS efforts to achieve: consistency in data collection, consistency in data reporting and discoverability and consistency in data

reporting quality. (Contact WQP: Jim Kreft, jkreft@usgs.gov, 608-821-3919 and Laura Shumway, Shumway.Laura@epa.gov; USGS Data Team: Lori Sprague lsprague@usgs.gov, 303-236-6921).

Evaluating Progress for the NWQMC

The 1998 Terms of Reference for the National Water Quality Monitoring Council states that progress towards achieving Council goals should be evaluated periodically, including evaluating Council accomplishments, plans, information products and collaborative efforts with participating organizations. While evaluation of various subprograms has occurred on a regular basis (e.g. Water Quality Portal), it was clear that a more systematic evaluation of the Council was necessary. The first step in this process was developing a Progress Matrix of Council Functions together with Council Activities and Products. The goal of the matrix is to determine how the NWQMC supported and promoted water-quality monitoring, and how Council work has improved water monitoring coordination, collaboration and communication. The

matrix can also be used to identify functions the Council has not addressed or addressed inadequately. (Contact: Leslie McGeorge, leslie.mcgeorge@dep.nj.gov and Mike Higgins, mike_j_higgins@fws.gov, 970-266-2924)

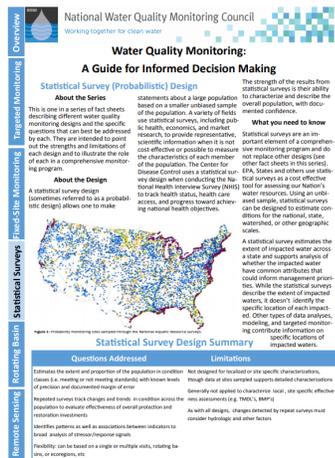
Water Quality Standards

The connection between water quality monitoring and water quality standards is important, but often confusing for groups or individuals that are not tasked with developing or interpreting water quality standards. The goal of this subcommittee is to explain the connection between monitoring and standards through the use of fact sheets, FAQs, and story maps. Topics that will be addressed by this committee include monitoring for standards development and monitoring to determine achievement of standards. (Contact: Chris Greene, christopher.greene@state.mn.us and Monty Porter, Monty.Porter@owrb.ok.gov).

Water Quality Monitoring: A Guide to Informed Decision Making

The Water Information Strategies (WIS) group continues to develop fact sheets designed to help managers, non-technical audiences, policy makers, and the public understand the differences in various monitoring programs. Available Fact Sheets Include:

- [Overview: A Guide for Informed Decision Making](#)
- [Targeted Water Quality Monitoring](#)
- [Fixed Site Monitoring](#)
- [Statistical Surveys](#)
- [Remote Sensing](#)
- [Rotating Basin](#)
- [Integrating Water Monitoring Data: Water Quality Indices, Report Cards and Multi-metric Web Portals](#)



The Council Continues to Reach Out to the Water Monitoring Community by:

- Sponsoring this biennial **National Monitoring Conference** to help water stakeholders exchange information and technology related to water monitoring, assessment, research, protection, restoration, and management, as well as to develop new skills and professional networks.

- Publishing the bi-annual online issues of **National Water Monitoring News**, highlighting recent activities of the national, State, regional, and tribal councils, watershed partnerships, and volunteer monitoring groups; projects, publications, tools, findings or announcements of interest to the water monitoring community (<http://acwi.gov/monitoring/newsletter/>).
- Hosting **webinars** representing a wide range of topics, speakers, and audiences such as:
 - Harmful Algal Blooms (HABs) Detection in the Gulf of Mexico
 - Volunteer Monitoring: Lake Monitoring
 - The Role of Environmental Monitoring and Data Management in Supporting Science
 - State Uses of Volunteer Monitoring Data
 - Coastal Acidification: moving from a global problem to a coastal water-quality issue
 - Standardized Electrofishing Sampling or “Where do I set the dials?”
 - Multivariate Statistical Analysis in Water Quality

Webinars are recorded, transcribed, and posted to our **YouTube channel** (youtube.com/nwqmc) for convenient viewing. Sign up for our webinar listserv to stay informed of our upcoming webinars (<http://acwi.gov/monitoring/webinars>).

- Announcing products and information relevant to the monitoring community through our [LinkedIn Group](#) and **Twitter Account** (@NWQMC).



The Council is dedicated to supporting and sustaining partnerships within the water monitoring community, including State, regional and tribal councils, as well as watershed groups and alliances, through these and many other outreach activities. (**Contacts:** Candice Hopkins, chopkins@usgs.gov, (208) 387-1331, and Danielle Donkersloot, ddonkersloot@gmail.com)

Additional information on Council activities can be found at the Council website, <http://acwi.gov/monitoring/>.



WQP to Date

- 365 million results
- 15k users a month
- 165k more users this year

Water Quality Portal

Premier source for water quality data
all-in-one format!

Tracking Data Retrievals by Organization

Did you know we are tracking each time your data results are being served?
Soon we will deliver how often your data is being downloaded!



Data Usability

Over 100 publications have used the WQP as a citation! Check it out!
https://www.waterqualitydata.us/apps_using_portal/



Developing a QA/QC Service!

We are creating QA/QC services which will include but not limited to: flagging data with erroneous lat/longs, data out of range, data without QAPPs for data submissions and retrievals from the portal!



Do you have a WQP story to share?

Stop by the EPA booth to share your WQP use story!

Stories will be compiled to create a WQP testimonial video to be shown at the final plenary & on the WQP website!



Start using the data!

Scan code or go to
<https://www.waterqualitydata.us/portal/>

WQP Sessions and Events

Sessions:

- Monday 1:30-5:00—WQX/WQP Training
- Wednesday 8:30-10 — Steps to Increase Interagency Coordination on Water-Quality Monitoring and Data Sharing

EPA Booth demos:

- Tuesday 10:00 - How's My Waterway 2.0 & Water Quality Portal
- Wednesday 3:30—Publishing Sensor Data

Networking Session:

- Sharing data for Biological Assessments

Elizabeth Jester Fellows Award



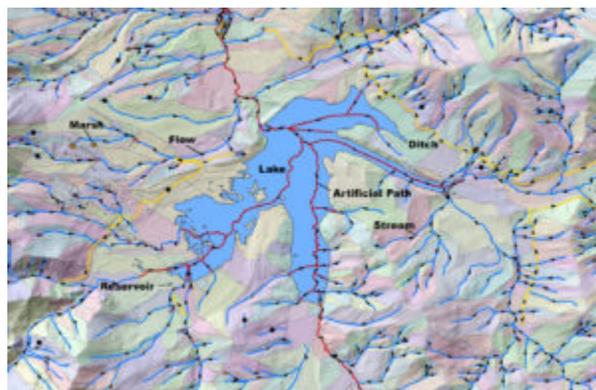
Elizabeth Jester Fellows was the Director of the EPA's Assessment and Watershed Protection Division until her death in November 2000. She dedicated her career to natural resources management, environmental protection, and public service. Elizabeth was the EPA co-chair of the Intergovernmental Task Force on Monitoring (ITFM) and envisioned the creation of its successor, the National Water Quality Monitoring Council. She was a strong and effective advocate for developing a nationwide framework for coordinating, collecting, assessing, and communicating water quality monitoring information and results. Elizabeth was the personification of the goals and ideals of the monitoring Council, and her legacy has been an inspiration to those who have followed her and continue the Council's work. In her memory, the Council has established the Elizabeth Jester Fellows Award to recognize individuals for outstanding achievement, exemplary service, and distinguished leadership in water quality monitoring and environmental protection.

Tommy Dewald, US EPA, Office of Water (retired) 2019 Elizabeth J. Fellows Award Recipient



During his 41-year career with the U.S. Environmental Protection Agency (EPA), Tommy Dewald was a tireless advocate for using geospatial data and technologies to guide water data collection and inventory, enable better scientific analyses, and facilitate public access to information about the water resources of the Nation. In the early 1990s, Tommy was instrumental in the integration of the EPA's Reach File digital stream network with the rich feature content of the U.S. Geological Survey's (USGS) 1:100,000-scale Digital Line Graph hydrography layer to produce the initial National Hydrography Dataset (NHD). This collaborative accomplishment was considered a foundational component of the EPA's water quality monitoring and assessment program that was overseen by Elizabeth Fellows. In recognition of their innovative work leading the NHD project, Tommy Dewald and Keven Roth (USGS), were honored in 2011 with the USGS Henry Gannett Award for "especially distinguished contributions to the topographic mapping of the Nation." The widespread success of the NHD ultimately led to the development of NHDPlus, which combined the NHD stream network with elevation data to enable the estimation of national stream flow and volume in support of water quality modeling.

Tommy has been a consistent champion and leader of the community that established and continues to advance the vision of a single surfacewater framework for the Nation, in support of the basic tenets of the National Spatial Data Infrastructure. For decades, Tommy advocated for resources and policy, within EPA and across the government, that have enabled the development and application of the NHD, NHDPlus, and related geospatial datasets and tools. He played a leadership role in the community-based governance bodies for both the NHD and the Watershed Boundary Dataset (WBD). His reasoned advice and support has made creation of USGS's next generation national hydrography product - the NHDPlus High Resolution (NHDPlus HR) - possible.



The NHDPlus hydrologic framework enables the modeling of water flow across the landscape and through the stream network. This enhanced framework has underpinned nearly all national water quality monitoring, assessment, and modeling efforts in recent years. Applications, such as the Water Quality Portal, ATTAINS (Assessment, TMDL Tracking And ImplementatiON System), WATERS (Watershed Assessment, Tracking and Environmental Results), SPARROW (SPATIally Referenced Regressions On Watershed attributes) models, and the National Water Model, rely upon this framework to enable network search and discovery of water quality analyses, tracking of progress toward meeting water quality improvement goals, and modeling of water quality/quantity conditions and forecast scenarios. Without the development of these core national hydrologic framework datasets that Tommy actively pursued and promoted, those efforts would have had diminished detail and applicability, while most likely based upon more-costly independent, non-standardized geospatial datasets.

Tommy was a spokesperson for all stakeholders, ensuring that they were included in the design and development process, and that their concerns were addressed. It is without doubt that the NHD and NHDPlus would not be the shared, federated, common framework it is today without Tommy Dewald's leadership. Last, but not least, Tommy has been a mentor to many geospatial partners and staff. His guidance, support, and knowledge has shaped many individuals in the geospatial community and given rise to even more advancements in the field.

Barry Alan Long Award



Barry Long was a hydrologist and water quality specialist with the National Park Service, Bureau of Land Management, and the U.S. Forest Service. In June 2000, Barry was diagnosed with acute myeloid leukemia. His colleagues and supporters were moved by the tremendous perseverance, spirit, and courage he displayed during his long struggle with the disease. Barry continued his career as a tactful advocate for the protection of water resources and through his work on the Council, which included organizing the 2010 National Monitoring Conference in Denver, Colorado. In his memory, the Council established the Barry A. Long award to honor an individual who has demonstrated exceptional perseverance, positive spirit, and significant contributions to water resource protection.

Diane Switzer

2019 Barry Alan Long Award Recipient



Diane Switzer is receiving the Barry A. Long Award for her outstanding contributions to water monitoring programs regionally and nationally, strong advocacy of state and tribal programs, support for volunteer monitors, and significant technical and programmatic contributions to EPA and the environment during her long and illustrious career!

During her thirty-two-year career at EPA, Diane has been a strong regional and national advocate for the Clean Water Act monitoring and assessment programs. After getting a BS in Biology from the Virginia Commonwealth University and a MBA from Texas A&M, Diane started work at EPA in 1987 as a NPDES water inspector at the Region 1 Laboratory, where she spent her entire career. Due to her excellent work and accomplishments, Diane was promoted to become the Regional Monitoring Coordinator (RMC) in 1994, and shortly afterwards to be the Team Leader for the Region's water and biological monitoring programs. She has extensive experience with both field and lab work, however, her real love has always been fieldwork and she has never passed up an opportunity to get out of the office and on the water!

Diane has been a national leader in developing foundational components of the monitoring and assessment program, including development and implementation of 305(b) guidance and reporting improvements, Elements of a State Water Monitoring Program guidance to improve state programs, national water databases STORET/WQX, the Biological Condition Gradient, and the National Aquatic Resource Surveys. According to the Office of Water, "Her willingness to share her knowledge and expertise helped develop other staff in HQs and in other Regions, leading to a more cohesive and collaborative national program. Her efforts have been integral for improving and expanding water quality monitoring and assessment for states in New England, as well as across the country."

Most notably, Diane has been a passionate advocate for the states and tribes and is held in high regard by her peers in state and tribal government throughout the Region. She has consistently demonstrated an ability to understand state and tribal programs and to support the individual needs and priorities of those programs. Her strong advocacy of EPA's partners' perspectives has strengthened the relationships between states and tribes and EPA, to the benefit of all. In part as a result of her activities, Region 1 has a well-connected network of state monitoring programs that are well known nationally for innovation and excellence. She has worked hard to successfully create multiple communication networks between the states, the Region and Office of Water. Region 1 has a great relationship with its states' water monitoring programs, a testament to Diane's commitment to "Cooperative Federalism" before we had that term for it.

Diane has always been a strong supporter of volunteer monitoring, and in 2005, she established the first EPA Volunteer Monitoring Equipment Loan Program. She has loaned out more than \$300,000 worth of monitoring equipment to more than 60 New England volunteer groups and the states, enabling a great expansion of monitored waters in the Region. This program served as a national model and several other Regions adopted this approach.

She never stops looking for opportunities for improvement and innovation. Most recently, Diane worked with New England states to establish the Regional Monitoring Network, a network of stream reference sites where temperature and flow are measured using EPA-loaned equipment to detect climate change impacts. This successful effort has since expanded to other Regions and also to lakes.

Diane is an excellent role model and mentor to her staff. Diane was instrumental in the successful ISO 17025 accreditation of EPA field sampling procedures during FY17, a first for the EPA lab. The Team now has a solid field and lab program with standard operating procedures and routine testing to ensure the quality of data being collected meets requirements. In addition to being Team Leader, she also participates in field and lab activities, always volunteering to conducting Assistance Visits (audits) for the National Aquatic Surveys.

Vision Award



Vision Award

The National Water Quality Monitoring Council's Vision Award recognizes a monitoring council or group that has demonstrated extraordinary vision and cooperation in the field of water quality monitoring on a local or regional level to enhance the management and protection of aquatic resources.

Southern California Coastal Water Research Project (SCCWRP) 2019 Vision Award Recipient

The Southern California Coastal Water Research Project (SCCWRP) has been leading one of the nation's longest running and most effective regional marine monitoring programs, the Southern California Bight Regional Monitoring Program (the Bight Program). This integrated, collaborative regional monitoring program has been actively informing environmental management decisions since 1994.



The Bight Program brings together over 100 organizations – federal, state and local government, industry, universities, and non-governmental agencies – to answer important questions about the health of the ocean adjacent to one of the most populated coastlines in the US. Results from the Bight Program have formed the basis for regulatory assessment tools such as sediment quality objectives, developed the backbone of public health notification networks, and transitioned new technology to routine monitoring applications.

The Bight Program is unique since little money exchanges hands – virtually all of the effort is provided in-kind from the numerous and diverse array of participating agencies. SCCWRP's role is to provide the vision, coordination, and facilitation necessary to ensure the in-kind effort effectively and efficiently addresses the specific questions managers ask.

The Bight Program addresses pressing issues for this region of 28 million inhabitants, and the intense urbanization that comes along with it. Sediment quality, beach water quality, ocean acidification, seafood contamination, harmful algal blooms, trash and plastic are all seemingly insurmountable problems that the Bight Program addresses. With SCCWRP's help, the Bight Program provides the insights, tools, and path forward for taking the next steps towards improving our environment.



Southern California Bight Regional Monitoring Program; Coordinating Agency: Southern California Coastal Water Research Project; Program Director: Kenneth Schiff



Acknowledgments



The National Water Quality Monitoring Council would like to acknowledge the commitment and hard work of all who helped make this conference run smoothly: the abstract reviewers, session moderators, workshop leaders and panel organizers, field trip leaders, oral and poster presenter, and legion of volunteers. The Council would like to offer its deepest gratitude to those who served on the 2019 Conference Planning Committee and its Subcommittees. Listed below are the many individual who helped organize this conference.

Conference Planning Committee Chairs

Marie DeLorenzo, NOAA
Lareina Guenzel, USEPA
Tim Oden, USGS
Jeff Schloss, University of New Hampshire/NALMS

Conference Planning Committee

Alyssa Anderson, NALMS
Bill Battaglin, USGS
Christopher Bellucci, Connecticut Department of Energy and Environmental Protection
Aaron Borisenko, Oregon Department of Environmental Quality
Dave Chestnut, South Carolina Department of Health and Environmental Control
Marie DeLorenzo, NOAA
Danielle Donkersloot, Volunteer Monitoring Representative, NWQMC
Philip Forsberg, NALMS
Lareina Guenzel, USEPA
Susan Holdsworth, USEPA
Candice Hopkins, USGS
Barb Horn, Colorado Parks and Wildlife
Tim Oden, USGS
Kristen Parry, Tetra Tech
Sara Peel, NALMS
Monty Porter, Oklahoma Water Resources Board
Gary Rowe, USGS
Jeff Schloss, University of New Hampshire/NALMS
Mary Skopec, Iowa Lakeside Laboratory
Dan Sullivan, USGS
Julie Vastine, Alliance for Aquatic Resource Monitoring

Awards Committee

Christopher Bellucci, Connecticut Department of Energy and Environmental Protection
Marie DeLorenzo, NOAA
Jim Dorsch, Metro Wastewater Reclamation District
Mike Eberle, USFS

Extended Sessions Committee

Aaron Borisenko, Oregon Department of Environmental Quality
Steve Greb, Wisconsin Department of Natural Resources
Chris Greene, Minnesota Department of Health
Gary Rowe, USGS
Jeff Schloss, University of New Hampshire/NALMS
Mary Skopec, Iowa Lakeside Laboratory

Local Planning Committee

Bill Battaglin, USGS
Devon Buckels, Greenway Foundation
Jane Clary, Wright Water
Jim Dorsch, Metro Wastewater Reclamation District
Alan Ellsworth, USNPS
Nikki Fitzgerald, Colorado School of Mines
Mike Higgins, USFWS
Barb Horn, Colorado Parks and Wildlife
Kris Jensen, USEPA
Karl Mauch, Colorado Department of Agriculture
Jon Novick, City of Denver
Tim Oden, USGS
Shera Reems, USEPA
Erik Wardle, Colorado State University
Greg Wetherbee, USGS

[Networking Committee](#)

Aaron Borisenko, Oregon Department of Environmental Quality

Danielle Donkersloot, Volunteer Monitoring Representative, NWQMC

Barb Horn, Colorado Parks and Wildlife

Tim Oden, USGS

Mary Skopec, Iowa Lakeside Laboratory

[Plenary Committee](#)

Tim Asplund, Wisconsin Department of Natural Resources

Jane Caffrey, University of West Florida

Marie DeLorenzo, NOAA

Dan Sullivan, USGS

[Program Committee](#)

Tim Asplund, Wisconsin Department of Natural Resources

Aaron Borisenko, Oregon Department of Environmental Quality

Dave Chestnut, South Carolina Department of Health and Environmental Control

Cyd Curtis, USEPA

Danielle Donkersloot, Volunteer Monitoring Representative, NWQMC

Mike Eberle, USFS

Danielle Grunzke, USEPA

Lareina Guenzel, USEPA

Mike Higgins, USFWS

Barb Horn, Colorado Parks and Wildlife

Doug McLaughlin, Kieser & Associates

Tim Oden, USGS

Kristen Parry, Tetra Tech

Monty Porter, Oklahoma Water Resources Board

Ken Schiff, Southern California Coastal Water Research Project

Jeff Schloss, University of New Hampshire/NALMS

Nancy Schuldt, Fond du Lac Band of Lake Superior Chippewa

Mary Skopec, Iowa Lakeside Laboratory

Dan Sullivan, USGS

Jeff Thomas, Electric Power Research Institute

[Sponsor and Exhibitor Committee](#)

Alyssa Anderson, NALMS

Danielle Donkersloot, Volunteer Monitoring Representative, NWQMC

Philip Forsberg, NALMS

Candice Hopkins, USGS

Mike McHale, USGS

Gary Rowe, USGS

Jeff Schloss, University of New Hampshire/NALMS

Dan Sullivan, USGS

[Volunteer Monitoring Committee](#)

Barb Horn, Colorado Parks and Wildlife

Danielle Donkersloot,

[Volunteer Monitoring Representative, NWQMC](#)

Ed Sherwood, Tampa Bay Estuary Program

Elizabeth Herron, URI Watershed Watch Program

Julie Vastine, Alliance for Aquatic Resource Monitoring

Marie DeLorenzo, NOAA

Sara Peel, NALMS

Conference Information



Registration

Conference registration is located on the ground floor of the Sheraton's Tower Building.

Hours:

| | |
|----------------------------|--------------------|
| Monday, March 25 | 12:00 pm – 6:00 pm |
| Tuesday, March 26 | 7:00 am – 5:00 pm |
| Wednesday, March 27 | 7:00 am – 5:00 pm |
| Thursday, March 28 | 7:00 am – 3:30 pm |

Meal Functions

All meals listed below are provided to all full conference registrants on Tuesday, Wednesday and Thursday. Daily registrants receive all meals on the day that they attend the conference.

Coffee and Pastries

| | | |
|----------------------------|-------------------|-------------------|
| Wednesday, March 27 | 8:00 am – 8:30 am | Majestic Ballroom |
| Thursday, March 28 | 8:00 am – 8:30 am | Majestic Ballroom |

Morning Break

| | | |
|----------------------------|---------------------|-------------------|
| Tuesday, March 26 | 10:00 am – 10:30 am | Majestic Ballroom |
| Wednesday, March 27 | 10:00 am – 10:30 am | Majestic Ballroom |
| Thursday, March 28 | 10:00 am – 10:30 am | Majestic Ballroom |

Box Lunch | Seating in Ballroom, but go check out posters/exhibition/breakouts

| | |
|----------------------------|--------------------|
| Tuesday, March 26 | 12:00 pm – 1:30 pm |
| Wednesday, March 27 | 12:00 am – 1:00 pm |

Afternoon Break

| | | |
|----------------------------|-------------------|----------------------|
| Tuesday, March 26 | 3:00 pm – 3:30 pm | Majestic Ballroom |
| Wednesday, March 27 | 3:30 pm – 4:00 pm | Majestic Ballroom |
| Thursday, March 28 | 3:30 pm – 4:00 pm | Grand Ballroom Foyer |

Exhibitor Reception

| | | |
|--------------------------|-------------------|-------------------|
| Tuesday, March 26 | 5:00 pm – 7:00 pm | Majestic Ballroom |
|--------------------------|-------------------|-------------------|

Plenary and Awards Luncheon

| | | |
|---------------------------|--------------------|----------------|
| Thursday, March 28 | 12:00 pm – 2:00 pm | Grand Ballroom |
|---------------------------|--------------------|----------------|

11th NATIONAL MONITORING CONFERENCE



Working Together for Clean Water

March 25-29, 2019

Denver, Colorado



Networking Session

Tuesday, March 26, 1:30 pm – 3:00 pm

Meet Your Peers – Who is Working on What You Care About?

Registration desk has a handout displaying the specific meeting location for each topic breakout.

Ever wish you had more time to ask peers about a challenge? Or perhaps vet a new approach, strategy or technology but you are not giving a presentation? Great ideas often come from conversations with new people about a shared interest. The purpose of this unique, facilitated networking session is to share perspectives with a subset of peers working on the same topic. Meet your peers start a discussion and continue it throughout the week and beyond.

How do I know what topic to attend?

When you registered, you selected a first and second priority topic based on conference themes presented in a menu. Your selection is printed on your name badge. When possible, we have honored your first choice. *Please attend the topic session printed on your name badge as we have made room arrangements based on it.*

Where will my topic be meeting during this Networking Block?

Registration desk has a handout displaying the specific meeting location for each topic breakout.

Find your topic and associated room number. Once you enter the room please find your peers as several topics will be meeting in the same room. Yell your topic title so others can find you. *Look to create groups of 6–10 members.* Due to limited time, two groups of 6 or 8 are better than a group of 12 or 16, so please split until size is 6–10 as quickly as possible to maximize discussion time. Multiple SMALL groups can meet on the same topic.

Once we are a group of 6–10 then what?

Identify a leader or several willing to be timekeepers and willing to facilitate several rounds of discussion. Review ground rules and begin one of two rounds of exchange (see below). These are meant to get discussions going and the group can decide collectively (not a takeover by one or two individuals) to deviate from this format.

Ground Rules

1. **BREVITY.** Don't tell the whole story. Pick the valuable items relevant to others in the group. Be selective.
2. **HERE HERE.** If someone has said what you think, experienced or believe, even if it is in different words, say "here here" instead of repeating so more variety can be shared.
3. **3 OR Pass.** Three minutes or Pass. Sharing is optional you do not have to share you can listen. If you do share, please honor your 3 minutes or agreed time and do not hold the entire group hostage. See number 1. If you have more to share, agree to go offline with person or set another time to continue topic discussion.
4. **ACCOUNTABILITY.** Take responsibility for your experience, if everyone is the time keeper, everyone honors the time. Decide to share names and who will do that within the group.

Two suggested rounds of exchange:

You have a tad less than 90 minutes. For guidance, if each person speaks for three minutes per round, 10 people, each round is 30 minutes. There is time for three rounds.

The first round will be introductions, where each participant shares their name, state, organization and primary roles or duties as they pertain to the topic under discussion.

The second and possible third round will include a share from the following choices, in context with the topic, share a specific strategy/vision, challenge, or request to the group.

How do we continue to network?

If your group wants to stay in touch, agree on who in the group, will collect names and send contact information to the group after the conference (we provide a form for this). You can just exchange business cards among relevant individuals as well.

Fluid 5K Run



The Fluid 5K Run

Thursday, March 28, 2019 | 7 am

Come one, come all! Participate in the Fluid Five, a 5K fun run/walk that not only gets you outside exploring the downtown Denver area, but which benefits the Eleanor Ely Memorial Scholarship to help volunteer monitoring coordinators (or others in need) attend future National Monitoring Conferences. The event will take place on Thursday morning, March 28 at 7:00 am. The cost to participate is \$30, which guarantees you a race t-shirt. You can also select the “non-racer” option to get a t-shirt, but not participate in the Fluid Five event, or can simply make a donation to the scholarship fund.



National Water Quality Monitoring Council

Working together for clean water



The Council is coordinating various demos on data portals, mobile apps, software and models, new apps, and more!

The National Water Quality Monitoring Council (Council) is coordinating various demos at the EPA booth and the USGS booth. The purpose of the demos is to showcase products and activities related to Council workgroups and goals. The demonstrations will include data portals, new software and models, new mobile apps, and other technical topics. Be sure to check the demo schedules at these booths to be sure you are aware of all the demos that will be scheduled, and some of the technical experts who will be on hand to chat. A complete schedule for demos will be available at the conference. In the meantime, some demos are already scheduled (times are subject to change). In some cases, you can arrange a different time for a one-on-one demo ... check with staff at the booths.

How's My Waterway 2.0

Tuesday March 26, 10:00 am – 10:30 am | EPA Booth

EPA will demonstrate their new revision of How's My Waterway. How's My Waterway provides information about the conditions of local streams, lakes and other waters in the U.S.

Contact: Dwane Young (Young.dwane@Epa.gov)

Water Quality Portal

Tuesday March 26, 10:00 am – 10:30 am | EPA Booth

Explore the WQP with EPA. In this hands-on demo, EPA will demonstrate how to use and download data from this publicly available water quality data resource.

Contact: Laura Shumway
(Shumway.laura@Epa.gov)

Mapping NADP Monitoring Data

Tuesday March 26, 12:30 pm – 1:30 pm | USGS Booth

Demo will include a series of color-coded maps that illustrate how concentrations and loads of atmospheric nitrate, sulfate, and pH (hydrogen ion) have changed over time 1985–2016 across the US. The maps are based on NADP monitoring data. The changes have resulted from implementation of Clean Air Act provisions over time.

Contact: Doug Burns (daburns@usgs.gov)

Pick Your Data Adventure: Tips and Tricks for Downloading and Automating Data Reports Using R

Tuesday March 26, 1:30 pm – 3:00 pm | EPA Booth

Explore connecting to and downloading data from USGS, DayMet, or Aquarius databases in R and see an example workflow for creating automated data html or word reports from Rmarkdown.

Contact: Leah Ettema (Ettema.Leah@epa.gov)

Lessons Learned from Nearly 30 Years of Nonpoint Source Effectiveness Monitoring

Tuesday March 26, 3:00 – 3:30 pm | EPA Booth

In 1991, EPA began the National Nonpoint Source Monitoring Program, which served local and statewide programs in program design and adaptive management by supporting nonpoint source monitoring science and technical materials and providing a venue for technical transfer. Join us for a short presentation on the valuable resources and lessons learned from nearly 3 decades of this program.

Contact: Cyd Curtis (Curtis.cynthia@Epa.gov) and Meg Wiitala (Wiitala.megan@Epa.gov)

National Aquatic Resource Survey (NARS) QAQC Application

Wednesday March 27, 1:00 pm – 2:00 pm | EPA Booth

Explore the beta version of a NARS data QAQC app. This new tool will provide exploration, QAQC and analysis of the raw NARS data. The app will ease the burden of data manipulation and file merging, and allows the user to quickly generate tables, graphs of summary statistics, and identify statistical outliers. We want your feedback on this early version of the app!

Contact: Alexandra Bijak
(bijak.alexandra@epa.gov)

Publishing Sensor Data

Wednesday March 27, 3:30 pm – 4:00 pm | EPA Booth

EPA will show their sensor demonstration project, Interoperable Watershed Network (IWN) application and discuss sharing sensor data.

Contact: Dwane Young (Young.dwane@Epa.gov)

11th NATIONAL MONITORING CONFERENCE



Working Together for Clean Water

March 25-29, 2019

Denver, Colorado



Networking Opportunities

We want you to share your insights, knowledge, questions, and creativity with us and with each other. Take advantage of these networking opportunities:

Wednesday Evening Informal Networking Opportunities

The NWQMC recognizes it can be challenging to meet others at a large conference, grow your peer network and have time for quality discussions. We created two informal networking opportunities to help you meet others and share with others in a meaningful context.

You can meet in the designated spot at 5:30 pm on Wednesday and decide to take a walk, go to happy hour and on to dinner. These gatherings are informal and organic. You decide when you have enough folks to move to a place to eat or drink and when you are done. Refer to the local dining guide for options beverage and dining options.

Young or New Water Quality Professionals

If you have been in your career for ten years or less, you are building your peer network. Join others and compare career tracks, discuss professional or water quality ideas, issues or challenges that dominate your life.

360 Inquiry Mentoring

We spend all day learning technical aspects of our work. This is a chance to share what makes our careers memorable, fun or successful? We are all teachers and students. We all have some advice we were given, a lesson we learned or a question we may have. This is a chance to find someone perhaps in your same sector (agency, educator, consultant, service provider, etc.) and mentor each other. Or perhaps you can find someone of the same gender, geographic region or another interest as common ground. Perhaps you have a vision of the difference you want to make in your career, and you can exchange where you both are on that path.

Come to the gathering place and call out a category, hold up a sign or just ask others who have come. Find your common ground and connect. Keep it simple, have some fun. Who knows, the next movement or million-dollar idea may be birthed right here this evening.

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Haiku or Limerick It!

Join us in a fun, expressive and creative outlet for our busy technical minds. Create a Haiku or Limerick about the conference, water quality, your field or something related. Get a form from the registration desk and turn your poem back to registration. A few will be chosen and read at the closing banquet and others will be used on the NWQMC website and other publications. Don't know what a Haiku or Limerick is?

Haiku is a three-line poem. First line has 5 syllables, second line 7 syllables and third line is back to 5 syllables. You can illuminate a problem or solution in a Haiku.

Chicken or the Egg?
No Egg, No Chicken Dummies
It's a no brainer!

This is my Onesie
It has a Haiku on it
My parents are nerds

Limerick is a seven-line poem. The 1st, 2nd and 5th lines all rhyme and are usually 7–9 syllables or so. The 3rd and 4th lines rhyme and are shorter in syllables.

Can't believe it's true, must be a ruse.
It seems kids these days actually choose.
It's a very strange fad,
to dress up just like Dad.
Bell-bottom pants and big clunky shoes." (Dwarvenkind)

There once was a young man from Kew
Who found a dead mouse in his stew.
Said the waiter, "Don't shout
Or wave it about,
Or the rest will be wanting one too!"

Conference Exhibitors



Abraxis, Inc.

[www.abraxiskits.com]
124 Railroad Drive
Warminster PA 18974
215-357-3911
info@abraiskits.com

Aqualytical, LLC

[<https://aqualytical.com>]
11760 Commonwealth Drive
Louisville KY 40299

Aquatic Informatics Inc.

[<https://aquaticinformatics.com>]
1465 Slater Rd
PO Box 5007
Ferndale WA 98248-5007
877-870-2782
info@aquaticinformatics.com

Beta Analytic, Inc.

[<https://www.radiocarbon.com>]
4985 SW 74th Court
Miami FL 33155
305-667-5167
lab@radiocarbon.com

BioSafe Systems

[www.biosafesystems.com]
22 Meadow St.
East Hartford CT 06108
336-402-4449
twarmuth@biosafesystems.com

Campbell Scientific, Inc.

[<https://www.campbellsci.com>]
815 W 1800 N
Logan UT 84321-1784

EarthTec

[<https://earthtecwatertreatment.com>]
113 SE 22nd Street, Suite 1
Bentonville AR 72712
800-257-9283
info@earthtecwatertreatment.com

EcoAnalysts, Inc.

[www.ecoanalysts.com]
1420 S. Blaine St., Suite 14
Moscow ID 83843
208-882-2588

EnviroScience, Inc.

[www.enviroscienceinc.com]
5070 Stow Road
Stow OH 44224
330-688-0111

Eureka Water Probes

[<https://www.waterprobes.com>]
2113 Wells Branch Parkway,
Suite 4400
Austin TX 78728
512-302-4333
info@waterprobes.com

Fluid Imaging Technologies

[www.fluidimaging.com]
200 Enterprise Dr.
Scarborough ME 04074
207-289-3200

Gold Systems

[<https://www.goldsystems.com>]
2121 S. McClelland St. #204
Salt Lake City UT 84106
801-485-7445
sales@goldsystems.com

GreenWater Lab/CyanoLab

[www.greenwaterlab.com]
205 Zeagler Drive, Suite 302
Palatka FL 32177
386-328-0882
markaubel@greenwaterlab.com

IDEXX Laboratories, Inc.

[www.idexx.com/water]
One IDEXX Dr.
Westbrook ME 04092
800-321-0207
water@idexx.com

Innovative Wireless Technologies (IWT)

[iwtenvironmental.com]
1100 Main Street
Lynchburg VA 24504
434-316-5230

In-Situ [in-situ.com]

221 E Lincoln Ave.
Fort Collins CO 80524
800-446-7488

Jonah Ventures

[jonahventures.com]
1600 Range St. #201
Boulder CO 80301
785-317-9318
info@jonahventures.com

KISTERS North America

[www.kisters.net]
1520 Eureka Road, Suite 102
Roseville CA 95661
916-723-1441
kna@kisters.net

LaMotte Company

[www.lamotte.com]
802 Washington Ave.
Chestertown MD 21620
800-344-3100

**National Atmospheric
Deposition Program (NADP)**

[nadp.slh.wisc.edu]
WSLH UW–Madison
465 Henry Mall
Madison WI 53706
608- 263-9162
Michael.Olson@slh.wisc.edu

**National Water Monitoring
Council**

[https://acwi.gov/monitoring]

**NOAA National Centers for
Coastal Ocean Science**

[https://coastalscience.noaa.gov]
1305 East West Highway, Rm 8110
Silver Spring MD 20910
240-533-0300
nccos.webcontent@noaa.gov

**North American Lake
Management Society**

[https://www.nalms.org]
PO Box 5443
Madison WI 53705
608-233-2836
info@nalms.org

Northern Water

[www.northernwater.org]
220 Water Ave
Berthoud CO 80513
800-369-7246

Onset – HOBO Data Loggers

[www.onsetcomp.com]
470 MacArthur Blvd.
Bourne MA 02532
sales@onsetcomp.com

Phytoxigene

[https://www.phytoxigene.com]
526 South Main Street, Suite 222
Akron OH 44331
858-335-2993
info@phytoxigene.com

Seametrics

[https://www.seametrics.com/]
19026 72nd Ave S
Kent WA 98032
253-872-0284
techsupport@seametrics.com

Sequoia Scientific, Inc.

[www.sequoiasci.com]
2700 Richards Road, Suite 107
Bellevue WA 98005
425-577-0472
info@sequoiasci.com

Turner Designs

[www.turnerdesigns.com]
1995 N 1st Street
San Jose CA 95112-4220
408-749-0994 / 877-316-8049
sales@turnerdesigns.com

**US Environmental Protection
Agency [www.epa.gov]**

1200 Pennsylvania Ave NW
Washington DC 20460

US Geological Survey

[https://www.usgs.gov/mission-
areas/water-resources]
413 National Center
Reston VA 20192

YSI, A Xylem Brand

[www.ysi.com]
1725 Brannum Lane
Yellow Springs OH 45387
937-767-7241
info@ysi.com

2019 National Monitoring Conference-at-a-Glance

\$ = Carries fee

R = Requires pre-registration

MONDAY, March 25

| | | |
|----------------------------------|---|----------------|
| | <i>Field trips meet at the Plaza Lobby Entrance – opposite building from registration</i> | |
| 8:00 – 12:00 | Tour of farmer BMPs to improve WQ plus drones | |
| 8:00 – 12:00 | Denver Zoo Water Conservation Tour – Cancelled | |
| 8:30 – 1:00 | Fourmile Canyon Fire tour – Cancelled | |
| 9:00 – 11:00 | Tour of Denver Water Recycling Plant – Cancelled | |
| 9:00 – 12:00 | Tour of Denver's new green infrastructure projects | |
| 9:00 – 3:00 | Tour of mine and acid mine drainage treatment plant – Cancelled | |
| 1:00 – 5:00 | Tour of Ice Core Laboratory and National WQ Laboratory – Cancelled | |
| 1:00 – 4:00 | Tour of Chatfield Farms Riparian Restoration – Cancelled | |
| 2:00 – 6:00 | Behind the Scenes of Water Treatment Engineering at its Best – Aurora Water's Binney Water Purification Facility – Cancelled | |
| 1:00 – 4:00 | Next Generation Field Methods | |
| A Sessions 1:30 – 3:00 | A1 | A2 |
| | <i>Denver Room</i> | <i>Tower D</i> |
| | WORKSHOP: Water Quality Portal (WQP); Water Quality Exchange (WQX) Training | USGS PFAS |
| 3:00 – 3:30 | Break | |
| B Sessions 3:30 - 5:00 | B1 | B2 |
| | <i>Denver Room</i> | <i>Tower D</i> |
| | WORKSHOP: Water Quality Portal (WQP); Water Quality Exchange (WQX) Training | USGS PFAS |

TUESDAY, March 26

| | | | | | | | | | |
|----------------------------------|--|---|----------------------|--|------------------------------------|--|--|--|---|
| 8:30-10:00 | Plenary (<i>Grand Ballroom</i>) | | | | | | | | |
| 10:00 – 10:30 | Break (<i>Exhibits in Majestic Ballroom</i>) | | | | | | | | |
| C Sessions 10:30-12:00 | C1 | C2 | C3 | C4 | C5 | C6 | C7 | C8 | C9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Columbine</i> | <i>Denver</i> |
| | Local and National Monitoring Networks in Support of Hydro-Terrestrial Modeling Across Spatial and Temporal Scales | Surveys for Contaminants of Emerging Concerns | HABs and Cyanotoxins | Making Chemical Concentrations Biologically Relevant | Data Soup: Recipes & Secret Spices | Applied Innovations I: Water Quality Monitoring | Biological Assessment, Data Quality, and Comparability | Panel Discussion: Integrating Volunteer Collected Data: an agency perspective on how to support volunteers and assess volunteer collected data | Workshop: Designing and instrumenting a high-frequency groundwater monitoring station |
| 12:00 - 1:30 | Box Lunch (<i>Grand Ballroom</i>) Exhibits Open in Majestic Ballroom *New Water Quality Professionals (<i>Tower C</i>) *EPA Regional Monitoring Coordinators (<i>Tower B</i>) | | | | | | | | |
| 1:30 – 3:00 | FIELD TRIP: NADP Air Monitoring Site | | | | | | | | |
| 1:30 – 3:00 | Networking Sessions/Meet Your Peers: See handout and nametag for location | | | | | | | | |
| 3:00 – 3:30 | Break – Exhibits in Majestic Ballroom | | | | | | | | |
| D Sessions 3:30 – 5:00 | D1 | D2 | D3 | D4 | D5 | D6 | D7 | D8 | D9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Columbine</i> | <i>Denver</i> | <i>Terrace</i> |
| | Machine Learning Applications for Predicting Groundwater Quality, Part I | Investigating the Impacts of Green Infrastructure in Urban Watersheds | Nutrient Response | Rain, Reporting, Regulations: Stormwater Collaboration | Modernizing the Data Flow | Applied Innovations II: Hydroecological Monitoring | Ecological and Community Health | Workshop: Macroinvertebrates.org: An open educational tool and training resource for aquatic macroinvertebrate identification | Workshop: Enhancing water quality monitoring using satellite data products |
| 5:00 – 7:00 | Exhibitor Reception | | | | | | | | |

WEDNESDAY, March 27

| | | | | | | | | | |
|------------------------------------|--|--|---|---|---|--|--|--|---|
| 8:00 – 8:30 | Coffee and Pastry (<i>Majestic Ballroom</i>) | | | | | | | | |
| E Sessions 8:30 – 10:00 | E1 | E2 | E3 | E4 | E5 | E6 | E7 | E8 | E9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Denver</i> | <i>Columbine</i> |
| | Machine Learning Applications for Predicting Groundwater Quality: Part II | Assessment Tools | Nutrient Flow Paths and Tracking | Monitoring TMDL and BMP Implementation Actions | Modeling Approaches to Reduce Uncertainty | Saddle Up! Harnessing the Power of Citizen Science | Passive Sampling of Trace Contaminants | Workshop: Screening for biological relevance of environmental chemistry data using the toxEval software package, Part I | Panel Discussion: Steps to Increase Interagency Coordination on Water-Quality Monitoring and Data Sharing |
| 10:00 – 10:30 | Break | | | | | | | | |
| F Sessions 10:30 – 12:00 | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Columbine</i> | <i>Denver</i> | <i>Spruce</i> |
| | Groundwater Quality Monitoring Across North America | Perspectives on Wetlands and Water Quality | Monitoring for Cyanobacteria Blooms and Toxins (HABs) | Monitoring and Assessing Change in Urban Waters | The Next "Wave" in Water-Quality Monitoring | Innovative Collaborative Approaches Equal Success | Biological Data and Indicators: Development and Applications | Workshop: Screening for biological relevance of environmental chemistry data using the toxEval software package, Part II | Workshop: Your Data Means Nothing if No One Knows About it: Analyzing, Synthesizing, and Communicating Your Monitoring Data |
| 12:00 – 1:00 | Box Lunch (<i>Grand Ballroom</i>) Exhibits Open in Majestic *EPA Nonpoint Source Monitoring: Open Discussion (<i>Tower C</i>) *USGS Lunch Breakout (<i>Tower B</i>) | | | | | | | | |
| 1:00 – 2:00 | Exhibit & Poster Viewing (<i>Majestic Ballroom</i>) | | | | | | | | |

WEDNESDAY, March 27 (continued)

| | G1 | G2 | G3 | G4 | G5 | G6 | G7 | G8 | G9 |
|----------------------------------|---|---|---|--|---|---|--------------------------------|--|--|
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Columbine</i> | <i>Denver</i> |
| G Sessions 2:00 – 3:30 | Innovative Approaches to State and National Assessments | Sediment Contaminants in Streams and Wetlands | Creative Developments in HAB Monitoring | Microplastics and Trash Monitoring | Monitoring at Different Spatial Scales | Building Blocks for Chesapeake Bay Monitoring Cooperative | Turning Data into Assets | Workshop: Exploring water data in R, the EGRET package and an overview of WRTDS, Part I | Workshop: Protocols for collecting, QCing and analyzing continuous vertical profile temperature data from fixed arrays in lakes, Part I |
| 3:30 – 4:00 | Break (<i>Exhibition in Majestic Ballroom</i>) | | | | | | | | |
| | H1 | H2 | H3 | H4 | H5 | H6 | H7 | H8 | H9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Columbine</i> | <i>Dever</i> |
| H Sessions 4:00 – 5:30 | Monitoring Changes in Groundwater Quality at Various Timescales | Evaluating Estuary Health | Management Perspectives for HABs | Microplastics in Wet Deposition and Aquatic Environments | Water-quality Constituent Delivery and Reactivity from Summit to Sea: Impacts of Altered Land Use and Aquatic System Connectivity | Lessons Learned Through Partnerships | Lake Monitoring and Management | Workshop: Exploring water data in R, the EGRET package and an overview of WRTDS, Part II | Workshop: Protocols for collecting, QCing and analyzing continuous vertical profile temperature data from fixed arrays in lakes, Part II |
| 5:45 | Volunteer Monitoring Meeting and Dinner USGS Meeting (<i>Windows Room</i>) | | | | | | | | |

THURSDAY, March 28

| | | | | | | | | | |
|------------------------------------|--|--|----------------------------------|--|--|--|--|---|--|
| 7:00 | Volunteer Monitoring “Fluid 5K” Fun Run (\$, R) | | | | | | | | |
| 8:00 – 8:30 | Coffee and Pastry (<i>Majestic Ballroom</i>) | | | | | | | | |
| I Sessions 8:30 – 10:00 | I1 | I2 | I3 | I4 | I5 | I6 | I7 | I8 | I9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Columbine</i> | <i>Spruce</i> | <i>Denver</i> |
| | Long-Term Trends in Stream Water Quality | Coastal Dynamics | Monitoring on Agricultural Lands | Contaminant Monitoring | Innovations in Stream Monitoring Methodology | Exploring Outcomes of Collaborative Monitoring | Advancements in Data Collection and Management | Workshop: Developing a monitoring program that delivers results | Panel Discussion: Forging effective use of diatoms in assessment, Part I |
| 10:00 – 10:30 | Break (<i>Exhibition in Majestic Ballroom</i>) | | | | | | | | |
| J Sessions 10:30 – 12:00 | J1 | J2 | J3 | J4 | J5 | J6 | J7 | J8 | J9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Columbine</i> | <i>Denver</i> |
| | PFAS & Groundwater | Tracing Contaminants in the Hydrologic Cycle | Data Into Policy | How is our water quality changing? National and state-scale approaches to analyzing and reporting trends | Long-Term Monitoring Through Regional Partnerships | Unique Strategies for Collaboration | Look! Data Visualization | Panel Discussion: Exploring Causal Hypotheses: What's driving environmental trends and conditions? | Panel Discussion: Forging effective use of diatoms in assessment, Part II |
| 12:00 – 2:00 | Awards Luncheon (<i>Grand Ballroom</i>) | | | | | | | | |
| K Sessions 2:00 – 3:30 | K1 | K2 | K3 | K4 | K5 | K6 | K7 | K8 | K9 |
| | <i>Windows</i> | <i>Ballroom 1</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Columbine</i> | <i>Denver</i> |
| | PFAS Monitoring in Water and Tissue/Pesticide Occurrence | Sediment Transport | Predictions for Decision Support | Monitoring and Assessing for Fecal Contamination | Evaluating Change | Ingredients for Effective Monitoring | Extreme Events | Panel Discussion: Applying the Biological Condition Gradient to Support Water Quality Management, Part I *NO BREAK | Workshop: Introduction to Open-Source Environmental IoT Monitoring with Arduino Framework Data Loggers |
| 3:30 – 4:00 | Break (<i>Grand Ballroom Foyer</i>) | | | | | | | | |

THURSDAY, March 28 (continued)

| | L1 | L2 | L3 | L4 | L5 | L6 | L7 | L8 | L9 |
|----------------------------------|--|-------------------|--|-------------------|--|---|--|---|--|
| | <i>Windows</i> | <i>See L9</i> | <i>Ballroom 2</i> | <i>Tower D</i> | <i>Silver</i> | <i>Vail</i> | <i>Terrace</i> | <i>Columbine</i> | <i>Ballroom 1</i> |
| L Sessions 4:00 – 5:30 | Hydrologic Studies featuring Isotope and Environmental Tracers | Session cancelled | Monitoring Stormwater: Best Management Practices | Evaluating Trends | Linking Multiple Stressors to Stream Ecological Health | Innovative Monitoring to Track State Nutrient Reductions in the Mississippi River Basin | Shale Gas Development and Ground Water Quality | Panel Discussion: Applying the Biological Condition Gradient to Support Water Quality Management, Part II | Panel Discussion: Using the Water Quality Portal for Regional and National Water-Quality Studies |

FRIDAY, March 29

| | | | | | | | | | |
|------------------------------------|--|--|--|--|--|--|--|--|--|
| M Sessions 8:30 – 10:00 | M1 | | | | | | | | |
| | <i>Denver</i> | | | | | | | | |
| | Workshop: Programming IoT Monitoring Stations Built on the Arduino Framework with the EnviroDIY ModularSensor Library, Part I | | | | | | | | |
| 10:00 – 10:30 | Break | | | | | | | | |
| | N1 | | | | | | | | |
| | <i>Denver</i> | | | | | | | | |
| N Sessions 10:30 – 12:00 | Workshop: Programming IoT Monitoring Stations Built on the Arduino Framework with the EnviroDIY ModularSensor Library, Part II | | | | | | | | |
| 9:00 – 1:00 | FIELD TRIP: Tour and hike at Red Rocks Amphitheatre (<i>Field trips meet at the Plaza Lobby Entrance – opposite building from registration</i>) | | | | | | | | |

11th NATIONAL MONITORING CONFERENCE



Working Together for Clean Water

March 25-29, 2019

Denver, Colorado



Plenary Agendas

Opening Plenary Session, Tuesday, March 26, 2019

- 8:30 Welcome to the 11th National Monitoring Conference
Susan Holdsworth, EPA and Gary Rowe, USGS
- 8:35 Welcome to Denver
Devon Buckels, Greenway Foundation
- 8:45 EPA Perspectives on Monitoring for Clean Water Act Implementation
John Goodin, Director, EPA Office of Wetlands, Oceans and Watersheds
- 8:55 Address from DOI
Kiel Weaver, DOI, Deputy Assistant Secretary for Water and Science
- 9:15 Turning water quality data into information
Robert Hirsch, Research Hydrologist Emeritus (USGS)
- 10:00 Charge to Conference Participants
Gary Rowe, USGS and Susan Holdsworth, EPA

Awards/Plenary Luncheon, Thursday, March 29, 2019

- 12:00 Lunch
- 12:30 Video: Water Quality Portal Testimonials
- 12:40 Presentation of Council Awards
Chris Bellucci, CT Dept. of Energy and Environmental Protection
- 1:05 Introduction for the Internet of Water
Sandra Connors, Deputy Director, EPA Office of Wetlands, Oceans and Watersheds
- 1:15 Building the Internet of Water (IoW): Enabling Sustainable Water Resource Management with Open Water Data.
Peter Colohan, Executive Director of the IoW, Duke University
- 1:50 Closing Remarks
Gary Rowe, USGS and/or Susan Holdsworth, EPA

11th NATIONAL MONITORING CONFERENCE



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Plenary Speakers

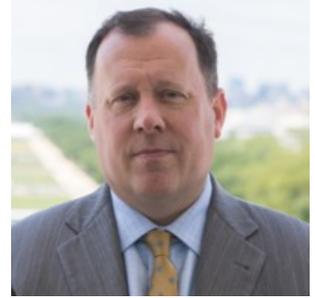
Devon Buckels, The Water Connection Director, Greenway Foundation: Devon Buckels is a civic-minded Denver native. Her decades of work in the public, private and nonprofit sectors has focused on creating healthy and sustainable communities. She has a master's degree in Urban and Regional Planning from the University of Colorado at Denver, and a Certification in Sustainability Leadership and Implementation from the Daniels College of Business. Devon is excited to serve as TGF's lead policy and water resources staff as Director of The Water Connection, supporting innovation in thought and practice for resilient Colorado watersheds.



John Goodin has served as the Acting Director of EPA's Office of Wetlands, Oceans, and Watersheds since January of 2017, where he leads multiple programs related to the protection and restoration of the nation's waters. Chief among them are Clean Water Act efforts in collaboration with states to monitor and assess water quality, develop restoration plans and nonpoint source pollution reduction plans, promulgate rulemakings and guidance related to the Act's jurisdiction, administer permitting responsibilities related to inland and ocean discharges of dredged and fill material, and advance state and local efforts under our National Estuary Program and Urban Waters program. Prior to his OWOW position, John was Director of EPA's Wetlands Division where he was responsible for leading the development and implementation of national wetlands policy, including advancing rulemakings and regulatory actions with the Army Corps of Engineers, as well as the strategic and financial support of state programs and aquatic resource science and monitoring. Since joining EPA in 1990, John has also led the Agency's Watershed Branch, where he conceived and implemented a new vision for the Clean Water Act's program on identifying and restoring impaired waters with the collaboration of state partners. He also previously led the Wetlands and Aquatic Resources Regulatory Branch and served as Acting Deputy Director of the Oceans and Coastal Protection Division. John holds a Master's degree in Zoology from the University of Western Australia and a Bachelor's degree in Biology from the University of Richmond.



Kiel Weaver is Principal Deputy Assistant Secretary for Water and Science at the U.S. Department of the Interior. Water and Science oversees the Bureau of Reclamation and the U.S. Geological Survey. Kiel works on numerous water resources issues, including federal policy impacting California water deliveries. Kiel is a seasoned professional with 23 years of federal service. Prior to joining Interior, he was the energy and environment policy advisor to former Speaker of the U.S. House, Paul Ryan. In this capacity, he advised the Speaker on water, energy, forestry and fish and wildlife issues and was the most senior House Republican staffer charged with interacting with his Senate counterparts and the executive branch. Previously, Kiel served as the long-time Republican staff director for what is now the House Water, Oceans and Wildlife Subcommittee, which has jurisdiction over aspects of federal water policy, among other things. He also worked in the private sector on behalf of public power clients and served as a senior policy aide in House and Senate member offices representing Montana and Minnesota. In his “spare” time, Kiel coaches his 13-year-old son’s lacrosse team, remarking that it’s easier to negotiate on controversial water items than coach 20 eighth grade boys.



Robert M. Hirsch is a Research Hydrologist Emeritus with the U.S. Geological Survey (USGS) located at the USGS headquarters in Reston, Virginia. He earned a B.A. in Geology from Earlham College, an M.S. in Geology from the University of Washington, and a Ph.D. from the Johns Hopkins University Department of Geography and Environmental Engineering. He began his USGS career in 1976 and has conducted research on water supply, water quality, pollutant transport, and flood frequency analysis. He is co-author of the textbook “Statistical Methods in Water Resources.” The second edition of this book will be published by the USGS in 2019. From 1994 through 2008, he served as the Chief Hydrologist of the USGS. In this capacity, Dr. Hirsch was responsible for all USGS water science programs. These programs encompass research and monitoring of the nation’s ground water and surface water resources including issues of water quantity and quality. In 2008 he returned to a research position and since that time he has focused his efforts on describing long-term changes in streamflow and river water quality. This includes exploring century-scale trends in flooding nationwide. It also includes the development and applications of new methods for characterizing trends in river water quality in many regions of the US. He has published applications of these methods to issues including nutrients and salinity in the watersheds of Chesapeake Bay, Lake Erie, Lake Champlain, and the Mississippi River. His research has provided important insights on causes of the observed trends and has also resulted in the development of software (the EGRET R-Package “Exploration and Graphics for RivEr Trends”) to help scientists analyze long-term water quality and quantity records. He retired from the USGS in 2018 but continues to collaborate with colleagues inside and outside the USGS as a scientist emeritus.



Sandra Connors currently serves as the Deputy Office Director in the Office of Wetlands, Oceans, and Watersheds (OWOW), where she leads multiple programs related to the protection and restoration of the nation’s waters. Within OWOW, Sandra helps lead Clean Water Act efforts in collaboration with states to monitor and assess water quality, develop restoration plans, promulgate rulemakings and guidance related to the Act’s jurisdiction, administer permitting responsibilities related to inland and ocean discharges of dredge and fill material, and advance state and local efforts under several partnership programs. Sandra previously served as Director for the Office of Strategic Environmental Management (OSEM), responsible for leading both EPA’s sustainability efforts and EPA’s process improvement efforts through the use of Lean and other evaluation tools. Before coming to OSEM, Sandra served as the Deputy Director of OSEWR’s Office of Resource Conservation (ORCR) where she helped manage EPA programs governing hazardous and non-hazardous wastes. Sandra also has experience with environmental enforcement in Superfund and other federal multimedia programs from her time as the Deputy Director in the Office of Site Remediation Enforcement as well as the Federal Facilities Enforcement Office. Prior to joining EPA, Sandra worked at the Environmental Law Institute. She holds a J.D. from the George Washington University, and a B.S. in Forestry from Virginia Tech.



Peter Colohan is the Executive Director of the Internet of Water (IoW), a project based at Duke University’s Nicholas Institute for Environmental Policy Solutions. Peter came to Duke after nearly a decade of Federal service with the National Oceanic and Atmospheric Administration (NOAA). At NOAA, Peter was a key advocate for the development of the National Water Model and the creation of the NOAA Water Initiative. During this time, Peter was also an enthusiastic participant in the 2017 Aspen Dialogue Series on Water Data, co-led by the Nicholas Institute, which led to the creation of the Internet of Water. From 2010–2014, Peter served as the Assistant Director for Environmental Information within the White House Office of Science and Technology Policy under President Barack Obama, on assignment from NOAA, where he worked closely with all Federal agencies responsible for climate, water and environmental science and technology. Prior to his federal service, Peter advised NOAA as a consultant on the development of the Group on Earth Observations (GEO), an intergovernmental body dedicated to the global exchange of environmental data and information. He served as that body’s Executive Officer from 2003 to 2005. He holds degrees from American University’s School of International Service and the College of William and Mary in Virginia.



Susan Holdsworth serves as the EPA co-chair of the National Water Quality Monitoring Council. She joined the Environmental Protection Agency in 1998. Early project responsibilities included working with states and across EPA to improve consistency in monitoring, assessment and listing methodologies for CWA Sections 303(d) and 305(b). In 2003 she led the Wadeable Streams Assessment in collaboration with states, EPA regions and ORD. In 2008 she was promoted to manage the Monitoring and Analysis Branch in EPA's Office of Wetlands, Oceans and Watersheds. Here she's had the opportunity to work with amazing talent inside and outside of EPA to promote data sharing, capacity building, and bringing a range of monitoring designs to meet the range of decision needs. Susan has a Bachelor of Science and a Master's in Environmental and Natural Resource Policy, both from the George Washington University.



Gary Rowe holds a B.S. in Geology from U.C. Davis and a Ph.D. in Geochemistry from Penn State University. He began his career with the U.S. Geological Survey in 1991 in the USGS Ohio Water Science Center where he led the National Water Quality Assessment (NAWQA) Program study of the Great and Little Miami River Basins. In 2003, Dr. Rowe was named a NAWQA Regional Program Officer where he oversaw NAWQA water-quality studies in the central United States. He led the NAWQA Cycle 3 Planning effort and is the USGS co-chair of the National Water-Quality Monitoring Council under the Advisory Council for Water Information. In 2017 he was named Program Coordinator of the USGS National Water Quality Program whose major components include NAWQA, the National Atmospheric Deposition Program, the USGS-National Park Service Water Quality Partnership and water-quality projects funded with NWQP cooperative matching funds and local, state, and tribal partners. Dr. Rowe has almost 28 years of experience conducting and overseeing water-quality studies at local to national scales.



Field Trips



*Details will be added as they become available.
Agenda subject to change.*

Visit our [Frequently Asked Questions page](#) for instructions on how to add a field trip to your existing registration.

Denver Zoo Water Conservation Tour

Monday, March 25 | 8:00 am – 12:00 pm | \$75

*Participants will need to be able to walk around the laboratories.
Visit Denver Zoo and get a water conservation tour.*

Tour of Farmer Best Management Practices to Improve Water Quality Plus Drones!

Monday, March 25 | 8:00 am – 12:00 pm | \$35

Participants will need to be able to do a little hiking to get to the site. Weather dependent.

Tour of Farm site/s on Little Thompson River with farmer designed grass filter strips (and other BMPs if available), for control of selenium, *E. coli*, nutrients and sediment. Tour will include edge-of-field water monitoring equipment, soil sensors and remote telemetry, a discussion of farmer goals and preliminary outcomes. A demonstration and discussion of the use of drones in agriculture and ag water quality will also be included.

Wildfire and Water Supplies: Tour of Fourmile Canyon Burned Area

Monday, March 25 | 8:30 am – 1:30 pm | \$45

Participants will need to be able to do some hiking. Weather dependent. Please bring a lunch.

Tour of Fourmile Canyon burned area (west of Boulder) to discuss effects of wildfire on water supplies.

Tour of Denver Water Recycling Plant

Monday, March 25 | 9:00 am – 11:30 am | \$40

Weather dependent.

Denver Water's Recycling Plant treats and delivers billions of gallons of water every year for industrial and outdoor irrigation uses. Once build-out is complete, the recycled water system will free up enough drinking water to serve almost 43,000 households.

Tour of Denver's New Green Infrastructure Projects

Monday, March 25 | 9:00 am – 12:00 pm | No cost, but pre-registration is required.

Participants will need to be able to walk for several miles. Weather dependent. Lunch on own.

Visit several of Denver's new green infrastructure projects in the downtown area plus stop(s) at brewery. The tour will visit to Denver's River North Neighborhood to see stormwater planters on Brighton Blvd., end of storm pipe treatment systems (including a green outlet and a UV system), a green alley, and rain gardens. If time permits, we will also visit a water quality BMP at 21st and Broadway which incorporates multiple types of green infrastructure. Field trip guides will discuss BMP design and construction, maintenance and performance monitoring.

Tour of Mine and Acid Mine Drainage Treatment Plant

Monday, March 25 | 9:00 am – 3:00 pm | \$40

Some time outdoors, so weather could be an issue. Lunch on own.

Visit treatment plant at ARGO mine. This tour would include a brief summary of mining in Colorado and history of the Central City/Clear Creek Superfund Site. The group would enter the Argo Tunnel to see the flow-through bulkhead installed about 90' in followed by a thorough tour of the WTP, which uses a High Density Sludge lime-precipitation process, clarification and filtration. This would also include operation of the filter press for dewatering of the metal hydroxide precipitates, and a discussion on disposal versus reuse. See www.rmwqaa.org/page-1003399/5040345 for a description of the tour. Could include lunch at Tommyknockers brewery.

Next Generation Field Methods

Monday, March 25 | 1:00 pm – 4:00 pm | No cost, but pre-registration is required.

Short walk to site. Weather dependent.

Three "stations" on this USGS guided tour. (1) Field demonstration of methods for next generation radar gage monitoring of streamflow, stream velocity, and gage height; (2) demonstrations of flow weighted and dip sample collection methods and on-site sample processing techniques; and (3) demonstration of biological sampling methods.

Tour of Ice Core Laboratory and National Water Quality Laboratory

Monday, March 25 | 1:00 pm – 5:00 pm | \$45

This tour would include a trip to the Denver Federal Center with stops and tours of the National Science Foundation Ice Core Facility and the USGS National Water Quality Laboratory.

Tour of Chatfield Farms Riparian Restoration

Monday, March 25 | 1:30 pm – 4:00 pm | \$45

Participants will need to be able to do a little hiking to get to the site. Weather dependent.

Learn about riparian restoration at Denver Botanic Gardens Chatfield Farms. Tour project being done along the section of Deer Creek that flows through Chatfield Farms. The work has included improving wildlife habitat, weed management, planting native species, and monitoring the biodiversity of the site.

Behind the Scenes of Water Treatment Engineering at Its Best – Aurora Water's Binney Water Purification Facility

Monday, March 25 | 2:00 pm – 6:00 pm | \$35

Attendees will get a unique behind the scenes look into what the City of Aurora has pioneered into an industry-leading technology for water quality. The Binney Water Purification Facility, which was completed in 2010 as part of Aurora Water's now infamous Prairie Waters system, uses state-of-the-art technology to treat highly impaired water received from the South Platte River downstream of Denver-metro as well as mountain snow melt water stored in Aurora Reservoir. The facility treats and blends both sources so that combined, they are indistinguishable from Aurora's other supplies. Attendees will watch a short video and tour the facility grounds to see first-hand technologies such as precipitative softening, advanced oxidation utilizing ultraviolet photolysis and hydrogen peroxide, biological filtration and granular activated carbon adsorption. Come see a project that has been leading the way in innovation for indirect potable reuse for nearly 10 years!

Tour of Denver's National Atmospheric Deposition Program (NADP) Air Monitoring Site

Tuesday, March 26 | 1:30 pm – 3:00 pm | No cost, but pre-registration is required.

Participants will need to climb a ~8-foot ladder to get to the top of the builder where the sampling equipment is. Only 4 at a time on roof.

Visit Denver NADP air monitoring platform. See NADP equipment, sample change out, data download, and hear description of USGS urban deposition project.

Tour and Hike at Red Rocks Amphitheatre

Friday, March 29 | 9:00 am – 1:00 pm | \$40

Participants will need to be able to walk for several miles and climb stairs. Weather could be an issue.

Visit Red Rocks, hike the trading post loop trail (1.5 miles), visit the Colorado Music Hall of Fame (at the Park), stop at brewery in Golden or eat lunch at the Ship Rock Grill.

Extended Sessions



Details will be added as they become available.

Agenda subject to change.

Updated 12 March 2019

Extended sessions include workshops, panel discussions and short courses and are offered in addition to a full slate of concurrent sessions at any given time.

Visit our [Frequently Asked Questions page](#) for instructions on how to add an extended session to your existing registration.

Monday, March 25

A1/B1 Workshop: Water Quality Portal; Water Quality Exchange Training

1:30 pm – 3:00 pm / 3:30 pm – 5:00 pm | Pre-registration Required

Participants will need to bring a laptop.

The Water Quality Portal (WQP) is the largest repository for water quality data delivering over 350 million water quality results from over 400 data partners. WQX provides the means for partners to be able to publish their data to the WQP. This training will be a 6-hour session encompassing how to utilize the full search capability of the WQP, including EPA's Data Discovery Tool, and how to publish and share data to the WQP using WQX Web. Participants in the full day training will learn how to use WQX to publish data, some of the WQX requirements, and how to resolve common errors. Participants will also learn how to use the WQP to discover and use data for water quality analyses.

Presenters

Laura Shumway, US Environmental Protection Agency

Jim Kreft, US Geological Survey

Kevin Christian, US Environmental Protection Agency

Dwane Young, US Environmental Protection Agency

Tuesday, March 26

C8 Panel Discussion: Integrating Volunteer Collected Data: An Agency Perspective on How to Support Volunteers and Assess Volunteer Collected Data

10:30 am – 12:00 pm

Since 1998 the Virginia Department of Environmental Quality has worked with citizen water quality monitors and other organizations. Through the years, the agency developed procedures to maximize the use of water quality data submitted by these external partners to include in the biennial 305(b)/303(d) Integrated Reports. Today nearly one third of stations included in the report originated from citizen and other monitoring organizations. Much of this data is of the same quality and used the same way as Virginia DEQ collected results. This panel will include information on how Virginia's program was built and perspectives that may be useful to other monitoring programs interested in incorporating data from external partners.

Presenters

Danielle Donkersloot, Volunteer Monitoring Representative

Aaron Borisenko, Oregon Department of Environmental Quality

Barb Horn, Colorado Parks and Wildlife

Sarah Gossett, Galveston Bay Foundation

C9 Workshop: Designing and Instrumenting a High-Frequency Groundwater Monitoring Station

10:30 am – 12:00 pm | Pre-registration Required

High-frequency, long-term monitoring of water quality has revolutionized the study of surface waters in recent years. However, application of these techniques to groundwater has been limited by the ability to remotely pump and analyze groundwater. This workshop will describe the design and instrumentation of an autonomous groundwater-quality monitoring system which can sample multiple wells to identify trends in groundwater chemistry and evaluate the timescales of change in groundwater quality.

The system collects and transmits high-frequency data from supply and monitoring wells in real-time. Analytical constituents include water temperature, specific conductance, pH, dissolved oxygen, and nitrate. The system consists of a water quality sonde and optical nitrate sensor, manifold, submersible three-phase pump, variable frequency drive, data collection platform, solar panels and rechargeable battery bank. The manifold directs water from multiple wells to a single set of sensors, thereby reducing setup and operation costs associated with multi-sensor networks. Sampling multiple wells at high frequency for several years provided a means of monitoring the vertical distribution and transport of contaminants in the aquifers through time. The system has been effectively deployed at 8 multi-well locations across the USA.

This workshop will demonstrate how to design and instrument a high-frequency groundwater quality monitoring station. Specific workshop sections include: high frequency groundwater monitoring site selection focusing on the various types of wells (supply, domestic, irrigation, monitoring); selecting perforation intervals; and instrumentation options including passive vs. active sampling.

There will be discussions covering: instrumentation, including the main components of the high frequency groundwater monitoring system (Saraceno *et al.* 2018); programming; communication; and power management. Calibration visits and why they are important for reliable data will be discussed. Standard protocols for high frequency groundwater monitoring equipment (Mathany USGS T&M Report, 2018) will also be outlined.

Data and signal processing methods will be presented, including: using Aquarius; de-spiking and noise reduction algorithms; and operational measurement uncertainty. Finally, applying trend analysis statistics to evaluate the data, including seasonal Kendall and Mann Kendall statistics and their associated R scripts, will be discussed.

Presenters

Justin Kulongoski, US Geological Survey

Tim Mathany, US Geological Survey

Kenneth Belitz, US Geological Survey

D8 Workshop: Macroinvertebrates.org: An Open Educational Tool and Training Resource for Aquatic Macroinvertebrate Identification

3:30 pm – 5:00 pm | Pre-registration Required

Macroinvertebrates.org is the product of a National Science Foundation funded web-based project titled 'Learning to See, Seeing to Learn.' The purpose of the online site is to provide high-quality tools and resources for training citizen scientists to identify aquatic macroinvertebrates with confidence and accuracy for water quality monitoring projects. This open educational resource is a powerful supplement to more-traditional identification keys typically used by volunteers. The tool features zoomable, high-resolution photography of the 150 most commonly found freshwater taxa in the Eastern United States with annotated diagnostic characters for 50 selected taxa at the order, family, and genus levels. These explorable images can be dynamically manipulated with supporting multimedia to see and learn these important characters in context. Detailed descriptions of the diagnostic characters, life history, food preferences, ecological information, pollution tolerance values, and terminology supports are also provided to aid identification for each taxon. Through this hands-on, minds-on workshop, participants will experience the many enhanced digital tools for identifying aquatic benthic macroinvertebrates to Order and some Family levels. Presenters will also provide an engaging presentation on the background and history of this project and the importance of understanding the needs to support and improve volunteer-level identification. Further time will be provided to explore the website with guided activities (a virtual 'bug hunt' and identification of preserved specimens) as well as time for the user to explore on their own. Additional sharing of effective resources to use with

macroinvertebrate identification (keys, apps) to compliment the website and tips for training volunteers on aquatic macroinvertebrate will be presented. Participant feedback and commentary provided during the workshop will be used to improve the site in future design iterations.

Presenter

Tara Muenz, Stroud Water Research Center

D9 Workshop: Enhancing Water Quality Monitoring Using Satellite Data Products

3:30 pm – 5:00 pm | Pre-registration Required

With the recent advancements in satellite technology, the open-data policy, and the availability of analysis ready data, it is now possible to incorporate satellite data products into decision-making frameworks and complement existing field-based water quality monitoring activities. To that end, satellite data providers and space agencies (like NASA), the aquatic remote sensing community, and the community of practice such as Geo AquaWatch plan to extend their reach to stakeholders, managements, and private sector across the nation to facilitate integrating satellite-derived water quality products (*e.g.*, turbidity) into water resource management. This workshop is another attempt to bridge this gap and will showcase ongoing efforts toward augmenting monitoring practices with spatially explicit water quality products made available at high-frequency rates. During this workshop, the water quality managers, water authorities, GIS practitioners, and other stakeholders will become familiar with the potentials and limitations of satellite-based water quality monitoring, engage with scientists and data providers and obtain insights on how to play a role in existing activities in their jurisdiction. This workshop provides a forum to reinforce the dialogue among remote sensing scientists and stakeholders toward streamlining end-users' access to satellite products for informed and timely decision-making.

The objectives of this session are to provide concrete examples of how satellite data can be used to augment in situ or modeled water quality monitoring efforts and to provide an open forum to discuss with participants how satellite data can be integrated into their existing monitoring efforts, in the context of domain characteristics such as how frequently water quality data are needed, over what area and at what scale, at what latency, and how the data are used.

Presenters

Christine Lee, Jet Propulsion Laboratory, NASA

Mohammed Al-Hamdan

Matt Miller, US Geological Survey

Dustin West

Brendan Palmieri

Wednesday, March 27

E8 / F8 Workshop: Screening for Biological Relevance of Environmental Chemistry Data Using the toxEval Software Package, Parts I & II

8:30 am – 10:00 am / 10:30 am – 12:00 pm | Pre-registration Required

Requirements for direct participation in the workshop.

1.
 1. *Participants are encouraged to bring their own laptop to follow along and explore the data analysis options.*
 2. *While this is an R software package, familiarity with the R environment is not necessary to use toxEval. There is, however, additional functionality that can be accessed by users with a background in R.*
 3. *Participants are encouraged to bring their own computer with the following software installed:*
 1. *R*
 2. *R-Studio*
 3. *The toxEval R-package.*
 4. *Directions for installation of all of these as well as the documentation for the toxEval package are included here: <https://github.com/USGS-R/toxEval>. Installing the toxEval package will automatically install the toxEval documentation as well.*

This workshop is intended to provide an efficient method to evaluate potential adverse biological impacts using analysis of environmental chemistry data. With thousands of potential chemicals in our natural environment, and advancements in instrumentation and analytical capabilities often providing detection levels in the nanogram per liter and picogram per levels, determination of the biological relevance of chemical occurrence and magnitude is a challenging task. The US Geological Survey and the US Environmental Protection Agency have collaborated to develop the software package toxEval to simplify this type of evaluation by efficiently examining chemistry data in multiple ways. These techniques allow for analysis of small to large data sets including capabilities to visualize and examine results for multiple chemicals per sample with multiple samples per site collected at numerous sites across a broad geographic area.

In this workshop, environmental chemistry data is compared with benchmark bioeffect concentrations (concentrations at which adverse biological effects may exist) to screen for potential adverse effects and prioritize the potential hazard by chemicals and sites. This approach is intended to provide information for assisting scientists and watershed managers to better understand where the greatest likelihood of adverse biological effects exist, and what types of adverse effects to search for in resident organisms.

ToxCast is used as the default benchmark concentration database due to its broad coverage of more than 9000 chemicals and more than 300 bioeffect assays. Since there are often specific, previously compiled benchmark databases (*e.g.*, the EPA aquatic life benchmarks) that are well established, an

option is available to override the default bioeffect database in favor of a custom database for screening.

The workshop will include the following components:

1. An introduction to bioeffect evaluation concepts included in toxEval,
2. Formatting chemistry and site data for input into toxEval,
3. Conducting an analysis using ToxCast as the bioeffect database (this is the default in toxEval)
4. Conducting an analysis using a custom toxicity database
5. Analysis using the graphical user interface (through the R Shiny environment)
6. Additional flexibility in analysis using the underlying R code

Participants will be able to bring their own data set for analysis or use a data set provided by the instructors. While this is an R software package, familiarity with the R environment is not necessary to use toxEval. Participants are encouraged to bring their own computer with R, R-Studio, and toxEval installed. Directions for installation as well as toxEval documentation are included here: <https://github.com/USGS-R/toxEval>

Presenters

Steven R. Corsi, US Geological Survey

Laura A. DeCicco, US Geological Survey

William Battaglin, US Geological Survey

E9 Panel Discussion: Steps to Increase Interagency Coordination on Water-Quality Monitoring and Data Sharing

8:30 am – 10:00 am

Faced with the responsibility of wisely using limited funding for environmental monitoring, it is becoming increasingly important to leverage existing monitoring and data reporting across organizations to address interjurisdiction issues and support secondary data users who add to our collective understanding of water quality in US streams, rivers, and estuaries. Numerous past efforts have recognized the need for increased coordination. While these efforts have resulted in important advancements such as the formation of the National Water Quality Monitoring Council (NWQMC), the National Environmental Methods Index, and the Water Quality Portal, the vision for broad coordinated national monitoring and data reporting has not yet been fully realized. To build on these previous efforts, three new interagency workgroups have recently been established within the NWQMC to further explore ways to increase coordination of monitoring and reporting by taking into consideration past lessons learned about barriers and recommendations for success. Specifically, these workgroups are working to identify small changes that organizations can make without extensive modification to their current approaches and without securing large new sources of funding. In this way, organizations could continue to address their own priorities while realizing additional benefits from being part of a larger coordinated effort. The objectives of this panel session are to 1) present interim outcomes from

these workgroups, on the topics of consistency in data collection, consistency in data reporting quality, and consistency in data discoverability and 2) seek input on next steps.

Presenters

Lori Sprague, US Geological Survey

Bryan Rabon, South Carolina Department of Health and Environmental Control

Jane Caffrey, University of West Florida

Laura Shumway, US Environmental Protection Agency

Roger Stewart, Virginia Department of Environmental Quality

F9 Workshop: Your Data Means Nothing If No One Knows About It: Analyzing, Synthesizing, and Communicating Your Monitoring Data

10:30 am – 12:00 pm | Pre-registration Required

Water quality monitoring data are collected for a myriad of purposes. Whether it is for determining changes in water quality, evaluating climate change effects, protecting human health, establishing baseline conditions, measuring results of restoration activities, or modeling future conditions, synthesizing and communicating results is an essential part of using the data. Too often, monitoring datasets are not used to their full potential for managing, restoring, and protecting water resources. This cross-cutting session touches on a variety of conference themes and is intended for anyone working in the water quality monitoring world, including federal, state, tribal, and local water professionals, nonprofits, academia, volunteer citizen scientists, non-traditional monitors, managers, and researchers. This extended session will provide a brief overview of data analysis and synthesis techniques, and touch on science communication best practices. The majority of the session will include hands-on activities, where participants will use their own data to conduct analysis and synthesis. The results of the data discovery portion will be used to create data visualizations for the participant's intended audience. Science communication strategies will be discussed, and multiple products will be reviewed to help the participant choose the communication products to best help them share their results and reach their intended audiences. Participants will walk away with new tools, techniques, and visualizations customized to their monitoring data and program goals.

Presenters

Caroline Donovan, University of Maryland Center for Environmental Science

Sky Swanson, University of Maryland Center for Environmental Science

G8 / H8 Workshop: Exploring Water Data in R, the EGRET Package and an Overview of WRTDS, Parts I & II

2:00 pm – 3:30 pm / 4:00 pm – 5:30 pm | Pre-registration Required

Exploring water quality and streamflow data is critical for understanding the world around us. The USGS has developed the EGRET R package to facilitate obtaining and interpreting surface-water quality data. This short course, presented by the authors of EGRET, will describe how these tools can be used. The EGRET package is designed to retrieve relevant water quality and streamflow data from USGS NWIS and

EPA Storet and then structures the data in standard formats for analysis. EGRET uses the Weighted Regressions on Time, Discharge, and Season (WRTDS) method to evaluate trends in concentration and flux. It is focused on producing graphical outputs that can help enhance the understanding of the nature and possible drivers of the observed trends. These methods are highly flexible, allowing for the examination of non-monotonic trends and also allowing for considerations of trends that may be different across different seasons or flow conditions. They also allow for the proper analysis of “less than” data in the overall record. This workshop is designed to give participants a good understanding of the WRTDS method and the overall structure of EGRET and the types of analyses and products it can produce.

Presenters

Robert Hirsch, US Geological Survey

Laura A. DeCicco, US Geological Survey

G9 / H9 Workshop: Protocols for Collecting, QCing and Analyzing Continuous Vertical Profile Temperature Data From Fixed Arrays in Lakes, Parts I & II

2:00 pm – 3:30 pm / 4:00 pm – 5:30 pm | Pre-registration Required

The EPA is working with its regional offices, states, tribes and other entities in the Northeast and Midwest to develop Regional Monitoring Networks (RMNs) for freshwater inland lakes. The data will be used to document current conditions and detect changing baselines through the collection of long-term data. One of the top priorities is collecting vertical profile data, which will provide important information about stratification (mixing) patterns. Where feasible, moored arrays of continuous sensors that record temperature and dissolved oxygen data year-round at 60-minute intervals will be deployed at RMN lakes. Vertical profile data are high priority because warming temperatures and earlier ice-out could contribute to an increase in the strength and duration of summer stratification, which would have wide-reaching, cascading effects on lake ecosystems.

During the first part of the workshop, we will go through the RMN protocols for collecting continuous vertical profile temperature data using low budget fixed arrays. The session will include a discussion about what factors to consider when selecting equipment. We will also hear lessons learned from lake RMN partners who recently started deploying continuous sensors. During the second half of the session, we will train participants on how to use a free R tool for QCing and summarizing continuous vertical profile temperature data.

Presenters

Jen Stamp, Tetra Tech, Inc.

Erik Leppo, Tetra Tech, Inc.

Britta Bierwagen, US Environmental Protection Agency

Katie Hein, Wisconsin Department of Natural Resources

Shane Bowe, Red Lake Band of Chippewa Indians

Kayla Bowe, Red Lake Band of Chippewa Indians

Lisa Borre, Cary Institute of Ecosystem Studies

Thursday, March 28

I8 Workshop: Developing a Monitoring Program That Delivers Results

8:30 am – 10:00 am | Pre-registration Required

Developing a water quality monitoring program is an effective means of reaching diverse audiences, providing education and raising awareness of local water resource issues that can lead to results – in understanding, protecting and restoring local waters. Prior to developing a monitoring program, it is essential to think through the scientific process and the steps necessary to create a program where the data collected match your monitoring objectives. The study design process facilitates the essential decisions that need to be made. This 90-minute, interactive session will explore the fundamental building blocks for building a strong monitoring program.

This study design workshop is an overview to orient new monitoring coordinators or agencies looking to implement monitoring programs as well as key resources and considerations needed to develop scientifically robust, sustainable programs. Session objectives will include:

1. Getting started: Overview of tools from coordinating the first meeting to resources/trainings needed to successfully build the capacity of volunteers to collect and analyze water quality data.
2. Six stage monitoring cycle: The 1,000 view on the entire monitoring process.
3. Study design: A ten-step model to answer the who, what, where, how, and quality assurance/quality control measures needed to establish your program.
4. Quality Assurance: Defining your programs data quality needs for your defined data uses and data users.
5. Program evaluation: Defining parameters for success at the beginning of your project and developing a framework for iterative and formative evaluation of your project.
6. Outreach, fundraising and additional resources: Insight to go-to fact sheets, web sites for additional resources.

Presenters

Barb Horn, Colorado Parks and Wildlife

Danielle Donkersloot, Volunteer Monitoring Representative

I9 / J9 Panel Discussion: Forging Effective Use of Diatoms in Assessment, Parts I & II

8:30 am – 10:00 am / 10:30 am – 12:00 pm

Although diatoms have been integral to river and lake assessment for many decades, powerful resources to improve diatom data are now accessible to a broader audience. In this workshop, we will explore these new tools and their application to both small-scale and large-scale surveys to maintain data continuity over time. Diatoms of North America (diatoms.org) is a peer-reviewed web flora that guides identification to over 900 (and growing) species pages. Managers will learn how this project

supports taxonomic consistency and how to use the site to make sense of their species data. Several regional voucher floras (northeast lakes, northeast rivers, southeast rivers, Pacific Northwest urban rivers, and California rivers) have been developed and are publicly available. We will discuss “what is a voucher flora”? and how we can use them to produce transparent, verifiable records of species data. Recently, through the USGS NAWQA program, QA/AC protocols have been refined to eliminate analyst bias. We will explore the steps necessary to design survey analyses so that analyst bias, if present, can be corrected. Finally, a diatom taxonomic certification program is being developed, and is planned to be administered through the Society for Freshwater Science (SFS). The taxonomic certification program will incorporate a series of training and testing modules so that diatom analysts have the ability to obtain up to four levels of certification for their expertise. The program will further manager’s abilities to select contracting laboratories and recognize the level of professional accomplishment by certified taxonomists.

Presenters

Sarah Spaulding, US Geological Survey

Daren Carlisle, US Geological Survey

Meredith Tyree, University of Colorado

Eric D. Stein, Southern California Coastal Water Research Project

Mark Edlund, St. Croix Water Research Station

Janice Alers-Garcia, US Environmental Protection Agency

Sylvia Lee, US Environmental Protection Agency

Amina Pollard, US Environmental Protection Agency

Richard Mitchell, US Environmental Protection Agency

Marina Potapova, Academy of Natural Sciences, Drexel University

Ian Bishop, University of Rhode Island

Mihaela Enache, New Jersey Department of Environmental Protection

J8 Panel Discussion: Exploring Causal Hypotheses: What’s Driving Environmental Trends and Conditions?

10:30 am – 12:00 pm

Identifying major drivers of change and variability in environmental systems is fraught with difficulty. These difficulties arise from the observational nature of the environmental data, confounding influences on the outcomes of interest, and high natural variability of the data. Furthermore, most causal statements are speculative or simply refer to previous publications. This session brings together water-quality and ecology experts on causal analysis to discuss the challenges and opportunities of approaching causal explanations for environmental trends and conditions from a systems perspective. Each panelist will briefly present work that explores causal hypotheses for spatial and temporal variability in water quality or riverine ecology, with a focus on Structural Equation Modeling (SEM) as a unified approach for addressing the study questions. Panelists will discuss the opportunities and challenges of studying causal hypotheses in environmental studies that cover a variety of geographic

settings and scales. Audience members may also ask questions of the panelists and may contribute to the discussion by sharing their experiences and challenges of identifying major drivers of change and variability. While all panelists use SEM in their work, this session will not focus on the technical details of SEM. Instead, panelists will discuss their efforts to explore and confirm conceptual models of environmental change and variability more generally, with some insight on using SEM in an environmental context.

Presenters

Jenny Murphy, US Geological Survey
James Grace, US Geological Survey
Kathryn Irvine, US Geological Survey
Travis Schmidt, US Geological Survey
Karen Ryberg, US Geological Survey
Gretchen Oelsner, US Geological Survey

K8 / L8 Panel Discussion: Applying the Biological Condition Gradient to Support Water Quality Management, Parts I & II

2:00 pm – 3:30 pm / 4:00 pm – 5:30 pm

The Biological Condition Gradient (BCG) is a conceptual, scientific framework for interpreting biological response to increasing effects of stressors on aquatic ecosystems. The framework was developed based on common patterns of biological response to anthropogenic stressors observed empirically by aquatic biologists and ecologists from different geographic regions of the United States. It describes how measurable characteristics of aquatic ecosystems change in response to increasing levels of stress, from a natural condition (undisturbed or minimally disturbed by human activities) to severely altered conditions (highly disturbed). In this session, we consider the ways in which states and local governments are applying BCGs to support their water quality management programs. We also consider the added value of the BCG as a complement to other technical tools and models including indices of biological, watershed and catchment integrity. Panel members will discuss an innovative technical development or application that resulted from BCG development and application.

Presenters

Susan Jackson, US Environmental Protection Agency
Lisa Huff, Alabama Department of Environmental Management
William Bouchard, Minnesota Pollution Control Agency
Martha Sutula
Jen Stamp, Tetra Tech, Inc.
Kate Macneale, King County Water and Land Resources
Prassede Vella, Massachusetts Bays National Estuary Program
Emily Shumchenia, E&C Enviroscope

K9 Workshop: Introduction to Open-Source Environmental IoT Monitoring with Arduino Framework Data Loggers

2:00 pm – 3:30 pm | Pre-registration Required

This session introduces the use of open-source Arduino-framework data loggers for environmental Internet of Things (IoT) monitoring, providing history and case studies. A companion half-day, hands-on workshop is scheduled for Friday, March 29 and titled: “Programming IoT Monitoring Stations Built on the Arduino Framework with the EnviroDIY ModularSensor Library.”

We are seeing a revolution in low-cost wireless sensing devices that share real-time data via the internet. This Internet of Things (IoT) revolution has great potential to transform water quality monitoring. Many IoT devices are built on open-source hardware and software, such as the Arduino framework that is attracting growing attention by do-it-yourself (DIY) environmental monitoring geeks. DIYers generally find rapid success at reading data from simple sensors to an Arduino board. However, it is much more challenging to program an Arduino to perform all required functions of a solar-powered station that collects data from several research-grade environmental sensors, saves to an SD card, transmits to a public server with web services, and puts the sensors to sleep to conserve energy between logging intervals.

For Part 1, we will describe the history and evolution of successful open-source environmental data loggers, and the required hardware and software features for solar-powered, wireless environmental monitoring stations.

For Part 2, we will provide case studies of how we developed and deployed water quality monitoring stations using the EnviroDIY Mayfly data logger and the EnviroDIY ModularSensors software library (<https://github.com/EnviroDIY>).

Presenters

Anthony Aufdenkampe, LimnoTech

Beth Fisher, University of Minnesota

L9 Panel Discussion: Using the Water Quality Portal for Regional and National Water-Quality Studies

4:00 pm – 5:30 pm

The availability of multi-agency water-quality data in online databases can help counterbalance diminishing resources for stream monitoring, enable access to decades of baseline data, and can lead to important regional and national insights that would not otherwise be possible. The Water Quality Portal (WQP) is currently the largest source of water-quality data for the Nation and users can access data from STORET, NWIS and STEWARDS. Since the WQP went online in 2012 there have been over 100 studies that reference the WQP. These studies generally fall into one of three categories: 1) use of the WQP to develop specialized regional water-quality databases to use for water-quality studies; 2) regional or national water-quality studies; and 3) use of data from the WQP to validate water-quality or remote-sensing models. This session will focus on how the WQP is used in these different types of

regional and national water-quality studies with a focus on the science outcomes to highlight the kind of questions that can be addressed using data from the WQP. This session brings together scientists from federal, state, and regional agencies to discuss specific projects that use data from the WQP to address water-quality issues. Each panelist will briefly present the results of their studies. Panelists will also discuss the opportunities and challenges of working with the WQP and take questions from the audience.

Presenters

Gretchen Oelsner, US Geological Survey

James Kreft, US Geological Survey

Claire Buchanan, Interstate Commission on the Potomac River Basin

Hilary Dugan, University of Wisconsin

John Iames, US Environmental Protection Agency

Melissa Riskin, US Geological Survey

Dan Wang, California Department of Pesticide Regulation

Jason Williams, Idaho Department of Environmental Quality

Friday, March 29

M1 / N1 Workshop: Programming IoT Monitoring Stations Built on the Arduino Framework with the EnviroDIY ModularSensor Library, Parts I & II

8:30 am – 10:00 am / 10:30 am – 12:00 pm | Pre-registration Required

Workshop attendees must bring a laptop. Attendees interested in purchasing the Arduino hardware at the end of the workshop, can pay with a check or cash.

The hardware purchase costs will be:

- *EnviroDIY Mayfly Data Logger Board, Arduino Compatible, + watch battery + SD card: \$68*
- *micro USB cable, \$3*
- *DS18B20 Waterproof Temperature Sensor, plus resistor & grove connector, \$8*

Hardware will be provided to attendees at no cost for use during the workshop. Payment is only required if attendees want to take them home.

This session is a hands-on programming workshop. For an introduction to the use of open-source Arduino-framework data loggers for environmental Internet of Things (IoT) monitoring, including history and case studies. A companion session “Introduction to Open-Source Environmental IoT Monitoring with Arduino Framework Data Loggers” is scheduled for Thursday, March 28 at 2:00–3:30 (K9).

We are seeing a revolution in low-cost wireless sensing devices that share real-time data via the internet. This Internet of Things (IoT) revolution has great potential to transform water quality monitoring. Many IoT devices are built on open-source hardware and software, such as the Arduino framework that is attracting growing attention by do-it-yourself (DIY) environmental monitoring geeks. DIYers generally find rapid success at reading data from simple sensors to an Arduino board. However, it is much more challenging to program an Arduino to perform all required functions of a solar-powered station that collects data from several research-grade environmental sensors, saves to an SD card, transmits to a public server with web services, and puts the sensors to sleep to conserve energy between logging intervals. The EnviroDIY community has made all of this much simpler by creating their Modular Sensor library.

Part 1 will introduce participants to using the EnviroDIY ModularSensors library and its high-level functions that work identically for a wide variety of Arduino boards, radios and environmental sensors, including those that use SDI-12 or Modbus communication protocols. Participants are required to bring a laptop with the following software installed prior to meeting: PlatformIO IDE (with Atom or VSCode; GitHub Desktop (connected to GitHub account); Git (installed separately from GitHub Desktop). Instructions for connecting to GitHub and installing PlatformIO are available in episodes 3 & 4 of the online tutorial at <https://envirodiy.github.io/LearnEnviroDIY>.

Part 2 will guide participants through a number of hands-on exercises to program a monitoring station. We will have the following station hardware available to participants for use during the workshop: an EnviroDIY Mayfly board, a USB communication cable for programming the board, and a DS-18B20 waterproof temperature sensor. Additional sensors will be available for programming demonstration and practice, and selected items will be available for purchase at the end of the workshop.

Presenters

Anthony Aufdenkampe, LimnoTech

Beth Fisher, University of Minnesota

Concurrent Session Presentations



MONDAY, MARCH 25

A1 WORKSHOP: Water Quality Portal (WQP); Water Quality Exchange (WQX) Training

1:30 – 3:00 | Room

See page XX for session description.

B1 WORKSHOP: Water Quality Portal (WQP); Water Quality Exchange (WQX) Training

3:30 – 5:00 | Room

See page XX for session description.

TUESDAY, MARCH 26

Plenary

8:30 – 10:00

C1 Local and National Monitoring Networks in Support of Hydro-Terrestrial Modeling Across Spatial and Temporal Scales

10:30 – 12:00 | Room: Windows

Moderator: Yishen Li, U.S. EPA

10:35 Linking Long-Term and Short-Term Data Streams to Investigate Crystal Production and Dune-Field Susceptibility to Climate Change at White Sands National Monument

Donald Rosenberry, USGS

10:55 Hydrologic and Water Quality Responses to Hydroclimatic Change Over Five Decades in the McMurdo Dry Valleys, Antarctica

Michael Gooseff, University of Colorado

11:15 Application of the Monthly Water Balance Model to Better Understanding Data Availability and Cryospheric Processes in Alaska

Katie Schneider, Colorado School of Mines, Earth, Energy, Environment

11:35 Optimal Hydrograph Separation to Estimate Base Flow in the Continental U.S.

Sydney Foks, USGS

C2 Surveys for Contaminants of Emerging Concerns

10:30 - 12:00 | Room: Ballroom 1

Moderator: Leanne Stahl, U.S. EPA

10:35 A Synoptic Survey of Select Wastewater-Tracer Compounds and the Pesticide Imidacloprid in Florida's Ambient Freshwaters

Jay Silvanima, Florida Department of Environmental Protection

10:55 Managing Emerging Urban-Use Pesticides with Enhanced Green Infrastructure at The Watershed Scale

Jordyn Wolfand, Stanford University

11:15 Expanding Our Understanding of Pharmaceutical Exposures in Aquatic Environments: Development of a New Pharmaceutical Method and Its Application to Wastewater and Surface Water Samples

Edward Furlong, USGS

11:35 Occurrence of Lead-210 and Polonium-210 in Public-Drinking-Water Supplies from Principal Aquifers of the United States and Relations with Commonly Monitored Water-Quality Parameters

Zoltan Szabo, USGS

C3 HABs and Cyanotoxins

10:30 – 12:00 | Room: Ballroom 2

Moderator: Julie Chambers, Oklahoma Water Resources Board

10:35 Why Cyanobacteria Dominate the World: Ecological Strategies

Barry Rosen, USGS

10:55 Rediscovering Cyanotoxins in South Carolina

Emily Bores, South Carolina Department of Health and Environmental Control

11:15 Monitoring of Harmful Algal Blooms in Lake Okeechobee, the Caloosahatchee River, and the St. Lucie River

Amanda Booth, USGS

11:35 Citizen Scientists Assist Cylindrospermopsin Monitoring in Missouri Reservoirs

Anthony Thorpe, The Lakes of Missouri Volunteer Program

C4 Making Chemical Concentrations Biologically Relevant

10:30 – 12:00 | Room: Tower D

Moderator: Dave Chestnut, South Carolina Department of Health & Environmental Control

10:35 Screening and Prioritization of Surface Waters Using High Throughput In Vitro Assays as Effects-Based Monitoring Tools

Brett Blackwell, USEPA

10:55 In Vitro Water Quality Screening Tools for Quantifying Human and Ecological-Related Endocrine Activity

Elizabeth Medlock Kakaley, USEPA

11:15 Contaminant Mixtures and Predicted Effects in Wadeable Streams of The Southeastern United States

Paul Bradley, USGS

11:35 Using Pathway-based Biological Effects Monitoring and the Adverse Outcome Pathway Framework to Link Chemical Exposure with Ecological Hazards

Brett Blackwell, USEPA

C5 Data Soup: Recipes & Secret Spices

10:30 – 12:00 | Room: Silver

Moderator: Jim Dorsch, Colorado Metro Wastewater Reclamation District

10:35 The Internet of Water: How Improved Water Data Infrastructure Can Answer Fundamental Questions,

Candice Hopkins, USGS

10:55 AWQMS: Data Extraction, Utilization, and Assessment

Chris Adams, Oklahoma Water Resources Board

11:15 Volunteer-Friendly Techniques for Integrating Diverse Data into an Open Access Database,

Helen Schlimm, Dickinson College

11:35 U.S. EPA's Interoperable Watershed Network – Lessons Learned and Next Steps for Publishing Continuous Monitoring Data

Dwane Young, USEPA

C6 Applied Innovations I: Water Quality Monitoring

10:30 – 12:00 | Room: Vail

Moderator: Jeff Thomas, EPRI

- 10:35 Using Stable Isotopes to Quantify Groundwater Infiltration and Imported Water in The San Diego County MS4 During Dry-Weather
Alex Messina, Amec Foster Wheeler
- 10:55 Harnessing a Real Time Sensor Network for Illicit and Accidental Discharge Detection: Case Study Using Charlotte-Mecklenburg’s Sensor Network and the R Programming Language
Caroline Burgett, Mecklenburg County Government, North Carolina
- 11:15 Experience Using the Winning Sensor from the Nutrient Sensor Challenge (Using the WIZ for Surface Water)
Alan Lindquist, USEPA
- 11:35 A Device that Greatly Reduces Fouling on Autonomous Multiparameter Datasondes
Joe Meiman, National Park Service

C7 Biological Assessment, Data Quality, and Comparability

10:30 – 12:00 | Room: Terrace

Moderator: Pete Ruhl, USGS

- 10:35 Challenges in Establishing the Comparability of Bioassessment Data from Different Sources,
Elizabeth Smith, Kansas Department of Health and Environment
- 10:55 Data Quality Documentation for Biological Assessments Using an Error Partitioning Framework
Sam Stribling, Tetra Tech, Inc.
- 11:15 Evaluation and Use of Combined Environmental Datasets for Broad-scale Analyses
Ben Jessup, Tetra Tech, Inc.
- 11:35 Facilitated Discussion

C8 Panel Discussion: Integrating Volunteer Collected Data: An Agency Perspective on How to Support Volunteers and Assess Volunteer Collected Data

8:30 – 10:00 | Room: Columbine

See page XX for session description.

C9 Workshop: Designing and Instrumenting A High-Frequency Groundwater Monitoring Station

8:30 – 10:00 | Room: Denver

See page XX for session description.

Lunch

12:00 – 1:30 *New Water Quality Professionals
 *EPA Regional Monitoring Coordinators

1:30 – 3:00 Field Trip: NADP Air Monitoring Site
 *Networking Sessions/Meet Your Peers

3:00 – 3:30 **Break**

D1 Machine Learning Applications for Predicting Groundwater Quality, Part I

3:30 – 5:00 | Room: Windows

Moderator: Denis LeBlanc, USGS

3:35 Machine Learning Applications for Predicting Groundwater Quality,
 Paul Stackelberg, USGS

3:55 Predicting Arsenic and Manganese in Drinking Water Wells in The Glacial Aquifer System,
 Northern USA
 Sarah Elliott, USGS

4:15 Predicting Ph, Redox, And Other Water- Quality Conditions in the Glacial Aquifer System
 Craig Brown, USGS

4:35 Machine Learning Methods for Prediction and Visualization of groundwater redox in 3-D, Central
 Valley, California
 Celia Rosecrans, USGS

D2 Investigating the Impacts of Green Infrastructure in Urban Watersheds

3:30 – 5:00 | Room: Ballroom 1

Moderator: Kristina Hopkins, USGS

3:35 International Stormwater BMP Database: Lessons Learned from Over 20 Years of Stormwater
 Monitoring,
 Jane Clary, Wright Water Engineers, Inc.

- 3:55 How Much Stormwater Control Is Needed to Detect Changes at The Watershed Scale? A Meta-Analysis
Colin Bell, Colorado School of Mines, Earth, Energy, Environment
- 4:15 Managing Infiltration of Stormwater in Urban Environments
Aditi Bhaskar, Colorado State University
- 4:35 Monitoring Differences in Street Tree Installation Practices for Stormwater Runoff Reduction
Shawn Fisher, USGS

D3 Nutrient Response

3:30 – 5:00 | Room: Ballroom 2

Moderator: Dave Chestnut, South Carolina Department of Health & Environmental Control

- 3:35 Literature-Based Synthesis of Nutrient Stressor-Response Relationships to Inform Assessment, Monitoring, and Criteria Development in Rivers and Streams
Sylvia Lee, USEPA
- 3:55 Advancing National Urban Wet-Deposition Monitoring; The Network for Urban Atmospheric Nitrogen Chemistry
Gregory Wetherbee, USGS
- 4:15 Legacy Phosphorus Has Lasting Impacts on Surface Water Quality
Sarah Stackpoole, USGS
- 4:35 Facilitated Discussion

D4 Rain, Reporting, Regulations: Stormwater Collaboration

3:30 – 5:00 | Room: Tower D

Moderator: Lori Pillsbury, Oregon Department of Environmental Quality

- 3:35 Urban Waters Program - A Platform for Actionable Science to Improve Cities and Their Waterways,
Shawn Fisher, USGS
- 3:55 Providing A Mile by Giving an Inch – Sharing Data Required by the Permit
Michael Long, Woolpert
- 4:15 Meeting the Stormwater Monitoring Challenges in Three Unique Arid Region Watersheds: Adaptive Approaches Developed in Response to Regulatory Program Requirements and Demands for the Riverside County Stormwater
Rebekah Guill, County of Riverside, California
- 4:35 The Collaborative Power of the Southern California Stormwater Monitoring Coalition
Michael Trapp, Michael Baker International

D5 Modernizing the Data Flow

3:30 – 5:00 | Room: Silver

Moderator: Candice Hopkins, USGS

3:35 Modernizing the National Water Information System Discrete Water Quality Data Solution,
Joseph Kalfsbeek, USGS

3:55 NWQMC Water Quality Portal Progress and Status
James Kreft, USGS

4:15 Developing Automated, Customizable Reporting Tools for the NERRS System Wide Monitoring Program
David Eslinger, NOAA

4:35 Soup to Nuts Case Study - The Wild Rice Water Quality Monitoring Project
Nancy Schuldt & Mark LeBaron, Fond du Lac Band of Lake Superior Chippewa

D6 Applied Innovations II: Hydroecological Monitoring

3:30 – 5:00 | Room: Vail

Moderator: Gary Rowe, USGS

3:35 Using Trail Camera Images to Evaluate Stream Flow-Habitat Connectivity
Chris Bellucci, Connecticut Department of Energy and Environmental Protection

3:55 Hydro-Alteration in Rivers and Streams - Can We Estimate it Using Field Measures of Channel Habitat from EPA's National Aquatic Resource Surveys?
Philip Kaufmann, USEPA

4:15 Stream Discharge Monitoring and Load Estimation for Small Scale Watersheds
Abbie Lasater, University of Arkansas

4:35 Tricks from a Creative Scientist: How Felt Fish, E. Coli Processing Mats, Friendly Field Forms, and Animated Micro-Video Lessons Can Engage Volunteers, Make Science Fun, and Decrease Data Errors
Meghan Smart, Arizona Department of Environmental Quality

D7 Ecological and Community Health

3:30 – 5:00 | Room: Columbine

Moderator: Sarah Lehmann, U.S. EPA

3:35 The Relationship Between Tree Mortality from a Pine Beetle Epidemic and Increased Dissolved Copper Levels in the Upper Big Thompson River, Colorado

Andrew Fayram, *Big Thompson Watershed Forum*

3:55 Wetlands and Fire: Reframing the Question

Linda Vance, *Montana Natural Heritage Program*

4:15 Classifying, Designating and Managing Headwaters Harboring Rudimentary Biological Assemblages

Robert Miltner, *Ohio Environmental Protection Agency*

4:35 Regional Assessments of Aquatic Intactness: Sensitivity of Inferences to Differences in Data Sources, Scoring, and Aggregation

Scott Miller, *Utah State University*

D8 Workshop: Macroinvertebrates.org: An Open Educational Tool and Training Resource for Aquatic Macroinvertebrate Identification

3:30 – 5:00 | Room: Denver

See page XX for session description.

D9 Workshop: Enhancing Water Quality Monitoring Using Satellite Data Products

3:30 – 5:00 | Room: Terrace

See page XX for session description.

Exhibitor Reception

5:00 – 7:00

Coffee & Pastries/Exhibits Open/Poster Viewing

8:00 – 8:30

E1 Machine Learning Applications for Predicting Groundwater Quality: Part II

8:30 – 10:00 | Windows

Moderator: Paul Stackleberg, USGS

- 8:35 The Use of Machine Learning Models to Predict Groundwater Quality in the Confined Claiborne Aquifers of the Mississippi Embayment
Katherine Knierim, USGS
- 8:55 Mapping Water Quality in the Northern Atlantic Coastal Plain Aquifer System Using Machine Learning Methods and Modeled Groundwater Age
Leslie DeSimone, USGS
- 9:15 A Comparison of Statistical Modeling Techniques to Predict Arsenic in Domestic Wells in the Conterminous United States
Melissa Lombard, USGS
- 9:35 Facilitated Discussion

E2 Assessment Tools

8:30 – 10:00 | Room: Ballroom 1

Moderator: Sarah Lehmann, U.S. EPA

- 8:35 Development of Natural Conditions Classification and Aquatic Life Use Assessment Protocols for Swamp Systems in Virginia
Andrew Garey, Virginia Department of Environmental Quality
- 8:55 Assessing Reclamation and Land Use Plan Effectiveness: Building A Multi-Scale Monitoring Program for Alaska Public Lands
Colin Brady, U.S. Department of the Interior, Bureau of Land Management
- 9:15 10,000 Lakes -> 4 Indices: Minnesota Fish-Based IBI Tools for Lake
Jacquelyn Bacigalupi, Minnesota Department of Natural Resources
- 9:35 Implementation of Minnesota's Fish-Based Lake Indices of Biotic Integrity within a Watershed Assessment Framework
Derek Bahr, Minnesota Department of Natural Resources

E3 Nutrient Flow Paths and Tracking

8:30 – 10:00 Room: Ballroom 2

Moderator: Lareina Guenzel, U.S. EPA

- 8:35 Groundwater Inflow into Upper Klamath Lake, OR, and its Potential Role in Algal Bloom Dynamics
Hedeff Essaid, USGS
- 8:55 Spatial and Temporal Variability in Water Quality in Three Urbanized Bayous of the Pensacola Bay System, Escambia County, Florida, USA
Grace Sommerville, University of West Florida

9:15 Tracking Nitrate Contamination and Septic Effluent in an Urbanizing Dryland Agricultural Watershed,
Jason Williams, Idaho Department of Environmental Quality

9:35 Facilitated Discussion

E4 Monitoring TMDL and BMP Implementation Actions

8:30 – 10:00 | Room: Tower D

Moderator: Cyd Curtis, U.S. EPA

8:35 Evaluating Compliance with TMDL Waste Loads for Highway Environments by using Characterization and BMP Performance Monitoring Data
Bhaskar Joshi, California Department of Transportation

8:55 Tackling Water Quality in The Arkansas Basin
Michael Weber, Lower Arkansas Valley Water Conservation District

9:15 USDA Forest Service National BMP Program: Implementation and Monitoring Results
Joan Carlson, U.S. Forest Service

9:35 USDA Forest Service's National Best Management Practices Program: Past, Present and Future
Michael Eberle, U.S. Forest Service

E5 Modeling Approaches to Reduce Uncertainty

8:30 – 10:00 | Room: Silver

Moderator: Jason Heath, ORSANCO

8:35 Exploring Drivers of Regional Water-Quality Change Using Differential Spatially Referenced Regression – Nitrogen in the Chesapeake Bay Watershed
Jeffrey Chanut, USGS

8:55 An Evaluation of Methods for Computing Annual Water-Quality Loads
Casey Lee, USGS

9:15 Using Uncertainty Reduction Analysis to Inform Water Quality Modeling, Monitoring, and Restoration
Daniel Sobota, Oregon Department of Environmental Quality

9:35 Estimation of Nonlinear Trends Based on High-Frequency Water-Quality Monitoring Data,
Guoxiang Yang, USGS

E6 Saddle Up! Harnessing the Power of Citizen Science

8:30 – 10:00 | Room: Vail

Moderator: Danielle Donkersloot, Council Volunteer Monitoring Representative

- 8:35 Water Data Collaborative: Harnessing the Power of Citizen Science
Arleen Odonnell, Eastern Research Group
- 8:55 Beginning with the End in Mind-tools from the Water Data Collaborative
Samantha Briggs, Izaak Walton League of America
- 9:15 Unifying Volunteer Water Quality Information with Modern Software
John Dawes, Chesapeake Commons
- 9:35 Analysis of Volunteer-Collected Water Data to Inform Water Quality Monitoring Activities
Emily Wiggans, Chesapeake Conservancy

E7 Passive Sampling of Trace Contaminants

8:30 – 10:00 | Room: Terrace

Moderator: Michael Rosen, USGS

- 8:35 Semipermeable Membrane Devices for Monitoring Polycyclic Aromatic Hydrocarbon Concentrations in Southern Lake Powell, Glen Canyon National Recreation Area, Arizona and Utah, 2016–17
Alissa Coes, USGS
- 8:55 In Situ Groundwater Sampling for Long-Term Monitoring of Cations, Trace Elements, and Isotopes
Rebecca Frus, USGS
- 9:15 Using Chemcatcher® Passive Samplers for Agricultural and Urban Use Pesticides in Surface Waters in Northern California
Michelle Hladik, USGS
- 9:35 Glyphosate and Aminomethylphosphonic Acid (AMPA) In Streams and Rivers in the U.S., 2015-2017
Laura Medalie, USGS

E8 Workshop: Screening for Biological Relevance Of Environmental Chemistry Data Using The toxEval Software Package, Part I

8:30 – 10:00 | Room: Denver

See page XX for session description.

E9 Panel Discussion: Steps to Increase Interagency Coordination on Water-Quality Monitoring and Data Sharing:

8:30 – 10:00 | Room: Columbine

See page XX for session description.

F1 Groundwater Quality Monitoring Across North America

10:30 – 12:00 | Room: Windows

Moderator: Richard Webb, USGS

10:35 Groundwater Time Series Data Indicate Seasonal and Anthropogenic Influences on Arsenic Concentrations at Three Water-supply Wells in New Hampshire

James Degan, USGS

10:55 Understanding Water Quality in a Dynamic Karst Aquifer—An Integrated Approach Using Continuous Monitors and Discrete Samples

Steve Opsahl, USGS

11:15 Evaluating Changes in Groundwater Quality Through Decadal Sampling and Use of Groundwater Age Dating

Bruce Lindsey, USGS

11:35 Facilitated Discussion

F2 Perspectives on Wetlands and Water Quality

10:30 – 12:00 | Room: Ballroom 1

Moderator: Gregg Serenbetz, U.S. EPA

10:35 Watershed-Scale Wetland Functions Affect Downstream Systems

Charles Lane, USEPA

10:55 Lake, Wetland, and Stream Biotic and Abiotic Properties Have Similar Drivers and Spatial Structure at the National Scale

Katelyn King, Michigan State University

11:15 Let's Stop "Mucking Around": Understanding Wetland Soil Physicochemistry in Relation to Water Quality, Ecosystem Integrity, and Risk Assessment for Wisconsin's Wetlands and Other Waters

Aaron Marti, Wisconsin Department of Natural Resources

11:35 Facilitated Discussion

F3 Monitoring for Cyanobacteria Blooms and Toxins (HABs)

10:30 – 12:00 | Room: Ballroom 2

Moderator: Leslie McGeorge, New Jersey Department of Environmental Protection

10:35 Potential for Cyanotoxin Occurrence in the Nation's Large Rivers

Jennifer Graham, USGS

10:55 Occurrence of Microcystin In Ozark Streams Across A Nutrient Gradient in Northwest Arkansas,

Bradley Austin, University of Arkansas

11:15 Are Cyanotoxins Emerging Risks In Oregon's Drinking Water?

Michael Mulvey, Oregon Department of Environmental Quality

11:35 Monitoring Cyanobacteria in Mixed Algal Populations in an Effort to Predict the Onset of Cyanohabs

Tom Brumett, Turner Designs

F4 Monitoring and Assessing Change in Urban Waters

10:30 – 12:00 | Room: Tower D

Moderator: Chris Bellucci, Connecticut Department of Energy and Environmental Protection

10:35 Monitoring and Assessing Change in Urban Waters

John Jastram, USGS

10:55 An Exploration of Streamflow and Water Chemistry Patterns in Urban Waters

Aaron Porter, USGS

11:15 Identifying and Evaluating Water Chemistry Trends in Urban Waters

James Webber, USGS

11:35 Detecting and Assessing Ecological Responses in Urban Waters

Shannon Curtis, Fairfax County Department of Public Works and Environmental Services

F5 The Next "Wave" in Water-Quality Monitoring

10:30 – 12:00 | Room: Silver

Moderator: George Ritz, USGS

10:35 Integrated Synoptic Surveys Using an Autonomous Underwater Vehicle (AUV) in Reservoirs and Bays by the United States Geological Survey

Lee Bodkin, USGS

10:55 Self-Directed Surveys of Reservoir Water Quality to Support Algal Assessments

Celeste Journey, USGS

11:15 Filling the Gaps: How Autonomous Vehicles Enhance Fixed Station Water Quality Monitoring
Joseph Smith, US Naval Academy

11:35 If Autonomous Underwater Vehicles (AUVs) Are The Next Wave In Water Quality Monitoring, Are Autonomous Surface Vehicles (ASVs) The Wave On The Horizon?
Richmond Paschall, US Naval Academy

F6 Innovative Collaborative Approaches Equal Success

10:30 – 12:00 | Room: Vail

Moderator: Helen Schlimm, Dickinson College

10:35 4-H AL Water Watch: Increasing Environmental Literacy and Watershed Stewardship through Youth-Focused Citizen Science
Sydney Smith, Auburn University

10:55 Mining Impacted Streams Task Force
Skip Feeney, Colorado Water Quality Control Division

11:15 North Dakota Statewide Sampling Network – A Federal-State Partnership for Effective Water-Quality Monitoring,
Joel Galloway, USGS

11:35 Facilitated Discussion

F7 Biological Data and Indicators: Development and Applications

10:30 – 12:00 | Room: Columbine

Moderator: Aaron Borisenko, Oregon Department of Environmental Quality

10:35 Influence of Benchmark Accuracy and Precision on Assessments of Aquatic Resource Condition,
Jennifer Courtwright, Utah State University

10:55 Using Macrophyte Bioassessment to Assess Lake Health in Wisconsin
Katie Hein, Wisconsin Department of Natural Resources

11:15 Development and Refinement of Benthic Indices to Assess Coastal Waters for U.S. EPA's National Coastal Condition Assessment
Marguerite Pelletier, USEPA

11:35 The Biological Condition Gradient - Monitoring Changes in Assemblage Structure in Response to Stressors
Lou Reynolds, USEPA

F8 Workshop: Screening for Biological Relevance of Environmental Chemistry Data Using The toxEval Software Package, Part II

10:30 – 12:00 | Room: Denver

See page XX for session description.

F9 Workshop: Your Data Means Nothing if No One Knows About it: Analyzing, Synthesizing, and Communicating Your Monitoring Data

10:30 – 12:00 | Room: Spruce

See page XX for session description.

Lunch

*Nonpoint Source Monitoring; Open discussion

12:00 – 1:00 *USGS Meeting

12:00 – 1:00 *Tribal Water Quality Monitoring?

1:00 – 2:00 **Poster Session**

G1 Innovative Approaches to State and National Assessments

2:00 - 3:30 | Room: Windows

Moderator: Jason Hill, Virginia Department of Environmental Quality

2:05 The Kentucky Assessment and TMDL Tracking System (KATTS): Modernizing Kentucky's Monitoring, Assessment, and Action Workflow
Katie McKone, Kentucky Division of Water

2:25 Comparing Stream Assessment Data Collected at Randomly-Selected Sites to Data Collected from the Same Stream at Nearby, Road-Accessible Sites
Michael Miller, Wisconsin Department of Natural Resources

2:45 WWF-Canada's Freshwater Program: From Watershed Reports to Atlantic Datastream,
Catherine Paquette, World Wildlife Fund

3:05 Watershed Condition Framework for Wild and Scenic Rivers
Jennifer Back, National Park Service

G2 Sediment Contaminants in Streams and Wetlands

2:00 - 3:30 | Room: Ballroom 1

Moderator: Gregg Serenbetz, U.S. EPA

- 2:05 Pesticides in Washington State Stream Sediments
Abigail Nickelson, Washington State Department of Agriculture
- 2:25 Regional Assessment of Sediment Quality in Puget Sound Lowland Streams
Rich Sheibley, USGS
- 2:45 Sediment Chemistry, Toxicity and Aquatic Communities Across an Urban Gradient of Wadeable Streams in the Southeastern United States
Patrick Moran, USGS
- 3:05 Facilitated Discussion

G3 Creative Developments in HAB Monitoring

2:00 - 3:30 | Room: Ballroom 2

Moderator: Danielle Grunzke, U.S. EPA

- 2:05 Detecting the Contributing Factors of Lotic Algal Blooms: A Cacapon River, WV Case Study,
Gordon Selckmann, Interstate Commission on the Potomac River Basin
- 2:25 Playing Whack-A-HAB: Chasing Algal Blooms Across Kansas
Trevor Flynn, Kansas Department of Health and Environment
- 2:45 Development of Strategies and Methods for Monitoring for Algal Blooms and Occurrence of Toxic Cyanobacteria Using Next Generation qPCR and Phylochip Microarrays
Laura Webb, USEPA
- 3:05 Use of Aircraft and UAV Remote Sensing to Screen for HABs in Fresh and Marine Waters of NJ,
Johannus Franken, New Jersey Department of Environmental Quality

G4 Microplastics and Trash Monitoring

2:00 - 3:30 | Room: Tower D

Moderator: Mike Eberle, US Forest Service

- 2:05 Microplastics in Lakes Mead and Mohave: Occurrence and Biological Uptake
Austin Baldwin, USGS
- 2:25 Trash Monitoring Methods in Aquatic Environments: Challenges in Standardization and Answering Management Questions
Shelly Moore, Southern California Coastal Water Research Project

2:45 NOAA's Marine Debris Monitoring and Assessment Project: What Do the Data Tell Us
Sherry Lippiatt, NOAA

3:05 Facilitated Discussion

G5 Monitoring at Different Spatial Scales

2:00 - 3:30 | Room: Silver

Moderator: Cyd Curtis, U.S. EPA

2:05 Benefits of Comprehensive Water-Quality and Hydrologic Monitoring for Upper Clear Creek Watershed Management, Timothy Steele, TDS Consulting

2:25 Limits on Biological Uplift of Stream Restoration from Proximity of Source Populations, Mark Southerland, AKRF

2:45 Project Tracking to Account for Effects of Restoration and Mitigation on Landscape Conditions, Tony Hale, [San Francisco Estuary Institute](#)

3:05 Landscape Drivers of Dynamic Change in Water Quality of US Rivers, Edward Stets, USGS

G6 Building Blocks for Chesapeake Bay Monitoring Cooperative

2:00 - 3:30 | Room: Vail

Moderator: Samantha Briggs, Izaak Walton League

2:05 Chesapeake Monitoring Cooperative: An Overview
Peter Tango, Chesapeake Bay Program

2:25 Building Blocks for Chesapeake Bay Monitoring Cooperative
Emily Bialowas, Izaak Walton League of America

2:45 Establishing Essential Building Blocks to Inform Data Integration & New Monitoring throughout the Chesapeake Bay
Helen Schlimm, Dickinson College

3:05 Chesapeake Monitoring Cooperative's Resources Are Available To Everyone!
Caroline Donovan, University of Maryland Center for Environmental Science

G7 Turning Data into Assets

2:00 - 3:30 | Room: Terrace

Moderator: Danielle Donkersloot, Council Volunteer Monitoring Representative

2:05 Forty Years of Water Quality Statistics: What's Changed. What Hasn't
Dennis Helsel, Practical Stats

- 2:25 Turning Data Sets into Assets, Everyone is Doing it Why Aren't You?
Barb Horn, Colorado Parks & Wildlife
- 2:45 Assessing water quality at US Fish and Wildlife Refuges in the Southeastern US
Michelle Moorman, U.S. Fish and Wildlife Service
- 3:05 Protecting Public Health with Open Recreational Water Quality Data: Challenges and Solutions,
Gabrielle Parent-Doliner, Swim Drink Fish Canada

G8 Workshop: Exploring Water Data in R, the EGRET Package and an Overview of WRTDS, Part I

2:00 - 3:30 | Room: Columbine

See page XX for session description.

G9 Workshop: Protocols for Collecting, QCing and Analyzing Continuous Vertical Profile Temperature Data from Fixed Arrays in Lakes, Part I

2:00 - 3:30 | Room: Denver

See page XX for session description.

3:30 – 4:00 **Break**

H1 Monitoring Changes in Groundwater Quality at Various Timescales

4:00 – 5:30 | Room: Windows

Moderator: Bruce Lindsey, USGS

- 4:05 Nebraska's NRDs: Monitoring Ground Water for the Long Haul
Richard Ehrman, Lower Platte South Natural Resources District
- 4:25 Groundwater Quality Monitoring in Eastern Nebraska: Adapting Long-term Monitoring to Inform Evolving Groundwater Management Strategies
Cory Kavan, USGS
- 4:45 Trends after 30 Years of Agrichemical Monitoring in Alluvial Groundwater of the South Platte River Basin in Colorado
Karl Mauch, Colorado Department of Agriculture
- 5:05 Trends in Groundwater Quality Determined from High-Frequency Water-Quality Data At 8 Networks Across the USA
Justin Kulongoski, USGS

H2 Evaluating Estuary Health

4:00 – 5:30 | Room: Ballroom 1

Moderator: Hugh Sullivan U.S. EPA

- 4:05 Using Diverse Indicators to Assess Environmental Health for Ecosystems and Communities,
Caroline Donovan, University of Maryland Center for Environmental Science
- 4:25 Multiple Indicators and Time Scales to Assess for Potential Marine Water Quality Impairments
from Nutrients in Puget Sound
Stephanie Jaeger, King County Department of Natural Resources and Parks
- 4:45 Developing a Coastal Health Index for the Northern Gulf of Mexico
Jenny Oakley, University of Houston, Clear Lake
- 5:05 Effects of Hurricane Harvey on the Water Quality of the Galveston Bay Estuary, Texas
George Guillen, University of Houston, Clear Lake

H3 Management Perspectives for HABs

4:00 – 5:30 | Room: Ballroom 2

Moderator: Tom Wall, U.S. EPA

- 4:05 EPA's One Health Approach to HABs
Lesley D'Anglada, USEPA
- 4:25 A Monitoring and Early Warning System for Cyanobacteria, Cyanotoxins, and Taste-and-Odor
Compounds in the Kansas River, Kansas
Guy Foster, USGS
- 4:45 A Water Utility's Perspective: Planning for Harmful Algal Bloom Events on the Kansas River,
Michelle Wirth, Water One, Johnson County, Kansas
- 5:05 Putting Volunteer Monitors in the Driver's Seat: Developing a Cyanobacteria Research Plan
Around Their Needs, Nancy Leland
Lim-Tex Water Quality Monitoring

H4 Microplastics in Wet Deposition and Aquatic Environments

4:00 – 5:30 | Room: Tower D

Moderator: Blaine Snyder, Tetra Tech, Inc.

- 4:05 Microplastics in urban streams of the Northeast Region—A pilot study to assess conditions
across USGS water-quality networks
Shawn Fisher, USGS

- 4:25 Occurrence of Microplastic on National Park Beaches
Stefanie Whitmire, USGS
- 4:45 Microplastics in the Mountains: A Pilot Study to Assess the Presence of Microplastics in Colorado Headwaters and Considerations for Future Research
Erin Cooper, Inland Ocean Coalition
- 5:05 It's Raining Plastic
Gregory Wetherbee, USGS

H5 Water-quality Constituent Delivery and Reactivity from Summit to Sea: Impacts of Altered Land Use and Aquatic System Connectivity

4:00 – 5:30 | Room: Silver

Moderator: Tim Asplund, Wisconsin Department of Natural Resources

- 4:05 Identifying Dominant River Corridor Functions to Prioritize Regional Water Quality Management Strategies
Judson Harvey, USGS
- 4:25 Towards Real-Time Water Quality Forecasts for Streams of the United States
Jacob Zwart, USGS
- 4:45 The Role of Very Small Ponds Compared to Large Reservoirs in Regional Nutrient Budgets
Noah Schmadel, USGS
- 5:05 An Overview of the Water Prediction Work Program (2WP) Science
Edward Stets, USGS

H6 Lessons Learned Through Partnerships

4:00 – 5:30 | Room: Vail

Moderator: Emily Bialowas, Izaak Walton League

- 4:05 Howdy Partner! Teaming Up to Protect Water Quality in Central Texas
Jacob Apodaca, Lower Colorado River Authority & Jenna Walker, Texas State University
- 4:25 Incorporating Volunteers into Regulatory Monitoring Programs
Natasha Dickrell, Pinellas County Public Works
- 4:45 Monitoring Mutualism: How Investing in Level III Volunteer Monitoring Benefits All Partners,
Julie Ela, Rivanna Conservation Alliance
- 5:05 Five Lessons to Share from 50 Years of Running Save Our Streams
Samantha Briggs, Izaak Walton League of America

H7 Lake Monitoring and Management

4:00 – 5:30 | Room: Terrace

Moderator: Jeff Schloss, University of New Hampshire

4:05 Statewide Data Analysis to Identify Lake Chlorophyll a Endpoints and Nutrient Thresholds to Protect Beneficial Uses

Monty Porter, *Oklahoma Water Resources Board*

4:25 Evaluating Iowa's Swimming Beach *E. coli* Bacteria Impairments

Jason Palmer, *Iowa Department of Natural Resources*

4:45 Implementation and Results of a Comprehensive Urban Shallow Lake Monitoring Plan to Understand Ecosystem Dynamics and Inform Holistic Lake Management

Sarah Wein, *Capitol Region Watershed District, Minnesota*

5:05 Water Quality Goals in Collision: The Uncertain Case of Zinc in the Coeur d'Alene (Idaho)

Mark Solomon, *University of Idaho*

H8 Workshop: Exploring Water Data in R, the EGRET Package and an Overview of WRTDS, Part II

4:00 – 5:30 | Room: Columbine

See page XX for session description.

H9 Workshop: Protocols for Collecting, QCing and Analyzing Continuous Vertical Profile Temperature Data from Fixed Arrays in Lakes, Part II

4:00 – 5:30 | Room: Denver

See page XX for session description.

5:45 **Volunteer Monitoring Meeting and Dinner**

THURSDAY, MARCH 28

7:00 **Volunteer Monitoring "Fluid 5K" Fun Run**

8:00 – 8:30 **Coffee & Pastries/Exhibits Open/Poster Viewing**

I1 Long-Term Trends in Stream Water Quality

8:30 – 10:00 | Room: Windows

Moderator: Mike McHale, USGS

8:35 Relationship between Water Quality Trends and Watershed Characteristics across the United States

Michelle Newcomer, Lawrence Berkeley Lab

8:55 Assessing Water-Quality Trends Under a Changing Hydrologic Cycle in an International Basin,

Rochelle Nustad, USGS

9:15 Long-Term Trends in Dissolved Solids Concentrations in the Upper Colorado River Basin, 1929 – 2017

Christine Rumsey, USGS

9:35 Salinity Sources and Selenium Sinks: Patterns from 30 Years of Monitoring in the Agricultural Region of the Arkansas River in Colorado

Carleton Bern, USGS

I2 Coastal Dynamics

8:30 – 10:00 | Room: Ballroom 1

Moderator: Brian Hasty, U.S. EPA

8:35 Investigating the Physical and Chemical Influences of Bacterial Trends in Possession Sound

Kara Anderson, Unaffiliated

8:55 Conflicting Indicators of Estuarine Health in a Southwest Florida Estuary Susceptible to Harmful Algal Blooms

Michael Wessel, Janicki Environmental

9:15 Challenges of Implementing Land Use Based Outfall Monitoring in a Complex Coastal Urban Setting

Kristin Ricigliano, New York City Department of Environmental Protection

9:35 National Coastal Condition Assessment Update

Hugh Sullivan, USEPA

I3 Monitoring on Agricultural Lands

8:30 – 10:00 | Room: Ballroom 2

Moderator: Ed Sherwood, Tampa Bay Estuary Program

- 8:35 Pesticide Trends and Better Attributional Support for Drivers of Trend
Karen Ryberg, USGS
- 8:55 How Clean is Clean Enough? Assessing Edge-of-Field Nutrient Runoff
Daren Harmel, U.S. Department of Agriculture, Agricultural Research Service
- 9:15 Relating Carbon and Nitrogen Transport from Constructed Farm Drainage
Anthony Seeman, Iowa Soybean Association
- 9:35 Facilitated Discussion

I4 Contaminant Monitoring

8:30 – 10:00 | Room: Tower D

Moderators: Tom Faber, U.S. EPA

- 8:35 Benthic Biodiversity and Benthic Pollutant Loads in Emergent Marshes of the New Jersey Meadowlands
Ying (Cheryl) Yao, Rutgers University
- 8:55 Monitoring Sediment Pollutants in Green Streets in the City of Portland, Oregon
Peter Bryant, City of Portland Bureau of Environmental Services
- 9:15 Comparison of lead Concentration Levels in Biological and Sediment Samples in Possession Sound
Tiana Tanis, Everett Community College
- 9:35 Pharmaceutical Concentrations in Great Lakes Tributaries: Chemical and Site Prioritization Based on the ToxCast High Throughput Screening Database
Steven Corsi, USGS

I5 Innovations in Stream Monitoring Methodology

8:30 – 10:00 | Room: Silver

Moderator: Elizabeth Smith, Kansas Department of Health and Environment

- 10:05 Monitoring a Glacial Melt Lake Deep in a Fumarole Ice Cave in the Summit Crater of Mount Rainier, Washington State, U.S.A.
Lee Florea, Indiana University
- 10:25 How Elk Selfies, Midnight Flowing Streams and 150,000 Time-lapse Images Enabled Arizona to Probabilistically Assess Intermittent Streams for the First Time
Jason Jones, Arizona Department of Environmental Quality

10:45 Challenges in Implementation of Bioassessment Monitoring for Municipal Programs in Arid Southern California - A Closer Look at the Environmental Conditions, Regulatory Thresholds, and Future Considerations

John Rudolph, Wood PLC

11:05 Analyzing Stream Macroinvertebrate Data in Combination with Continuous Thermal and Hydrologic Data

Jen Stamp, Tetra Tech, Inc.

16 Exploring Outcomes of Collaborative Monitoring

8:30 – 10:00 | Room: Vail

Moderator: Caroline Donovan, University of Maryland Center for Environmental Science

10:05 Collaborative Monitoring Efforts to Detect Changing Baselines

Britta Bierwagen, USEPA

10:25 Grand County Learning by Doing Cooperative Effort: A NEW Approach to Managing Aquatic Resources

Jessica Alexander, Denver Water

10:45 The day-to-day of monitoring with EnviroDIY sensor stations: a case study on Ridley Creek in Chester County, PA, David Bressler, Stroud Water Research Center and

Lauren McGrath, Willistown Conservation Trust

11:05 Seagrass Monitoring in the Pensacola Bay System: A Partnership between Citizens and the University of West Florida

Jane Caffrey, University of West Florida

17 Advancements in Data Collection and Management

8:30 – 10:00 | Room: Columbine

Moderator: Erik Leppo, Tetra Tech, Inc.

10:05 Tiers of Engagement – Creative Methods for Easy Stream Monitoring

Samantha Briggs, Izaak Walton League of America

10:25 Use of Mobile Technologies to Manage Multiple Discipline NPDES Requirements

Rachel McPherson, Port of Los Angeles

10:45 Macroinvertebrates.org: An Online Identification and Training Tool for Aquatic Macroinvertebrates

Tara Muenz, Stroud Water Research Center

11:05 Monitoring Program Evolution: Improving Efficiency, Accuracy, and Consistency

Joe Sellner, Capitol Region Watershed District, Minnesota

I8 Workshop: Developing a Monitoring Program That Delivers Results

8:30 – 10:00 | Room: Spruce

See page XX for session description.

I9 Panel Discussion: Forging Effective Use of Diatoms in Assessment, Part I

8:30 – 10:00 | Room: Denver

See page XX for session description.

10:00 – 10:30 **Break**

J1 PFAS & Groundwater

10:30 – 12:00 | Room: Windows

Moderator: Tim Oden, USGS

10:35 Development of the USGS Sampling Protocol for PFAS in Uncontaminated Groundwater— Initial Quality Control Sample Results from Two Pilot Study Areas

Gerolamo Casile, USGS

10:55 Occurrence of Per- And Polyfluoroalkyl Substances in Shallow Groundwater, Long Island, New York

Irene Fisher, USGS

11:15 Perfluoroalkyl Acid Precursors in Groundwater and Surface Water

Andrea Tokranov, USGS

12:35 A Public Health Response to Large-Scale PFAS Contamination in Minnesota

Chris Greene, Minnesota Department of Health

J2 Tracing Contaminants in the Hydrologic Cycle

10:30 – 12:00 | Room: Ballroom 1

Moderator: Stan Skrobialowski, USGS

10:35 Quantification of Non-Point Source Contaminants from Homeless Encampments in a Semi-Arid Urban Watershed

Jose Calderon, San Diego State University, Department of Civil, Construction, and Environmental Engineering

10:55 Bioaccumulation of PCBs Under Different River Hydrologic Regimes

William Hobbs, Washington State Department of Ecology

11:15 Monitoring Impacts of Wildfires on Regional Air and Water Quality by Using Tracer Molecules

Jeremy Jasmann, USGS

- 11:35 Advancing Continuous Streamflow and Water Quality Monitoring Networks in the Coastal Plain, Waccamaw River Watershed, South Carolina
Benjamin Thepaut, USGS

J3 Data Into Policy

10:30 – 12:00 | Room: Ballroom 2

Moderator: Susan Holdsworth, U.S. EPA

- 10:35 Making Monitoring Data Work for Wisconsin Waters
Tim Asplund, Wisconsin Department of Natural Resources
- 10:55 Turning Data into Information to Influence Water Management Policy: Examples from Connecticut
Chris Bellucci, Connecticut Department of Energy and Environmental Protection
- 11:15 Taking Probabilistic Monitoring Data to the Next Level: Evaluating Stressor Risk in Aquatic Life Use Total Maximum Daily Loads
Emma Jones, Virginia Department of Environmental Quality
- 11:35 Water Quality Monitoring of the Construction of Natural Gas Pipelines in Virginia
Jason Hill, Virginia Department of Environmental Quality

J4 How is our water quality changing? National and state-scale approaches to analyzing and reporting trends

10:30 – 12:00 | Room: Tower D

Moderator: Scott Miller, Bureau of Land Management

- 10:35 So, How's the Water? Analyzing Long Term Water Quality Trends in Indiana Streams
Paul McMurray, Indiana Department of Environmental Management
- 10:55 Minnesota's Approach to Detecting Changes in Water Quality
Eileen Campbell & John Sandberg, Minnesota Pollution Control Agency
- 11:15 Statistical Power for Trend Detection Under Alternative Panel Designs for Surveys over Time
Tony Olsen, USEPA
- 11:35 Facilitated Discussion

J5 Long-Term Monitoring Through Regional Partnerships

10:30 – 12:00 | Room: Silver

Moderator: Madeline Magee, Wisconsin Department of Natural Resources

- 10:35 Southern California Bight Regional Monitoring: 25 Years Overcoming Challenges
Kenneth Schiff, Southern California Coastal Water Research Project

- 10:55 Evolving with Our Estuary: Lessons Learned from 25 Years Studying San Francisco Bay
Donald Yee, San Francisco Estuary Institute & the Aquatic Science Center
- 11:15 Adaptive Water Quality Monitoring and Evolving Assessments Enhance Decision-Support for Watershed and Bay Recovery in the Chesapeake Bay Program Partnership
Peter Tango, Chesapeake Bay Program
- 11:35 Monitoring Long-Term Water Quality Recovery in the Tampa Bay Estuary Through Regional Partnerships
Edward Sherwood, Tampa Bay Estuary Program

J6 Unique Strategies for Collaboration

10:30 – 12:00 | Room: Vail

Moderator: David Bressler, Stroud Water Research Center

- 10:35 The Surfrider Foundation's Blue Water Task Force extends the coverage of beach monitoring programs to protect public health and safe ocean recreation
Mara Dias, Surfrider Foundation
- 10:55 The Coordinated Aquatic Monitoring Program: Evolving Collaborations in Manitoba
Jennifer Van de Vooren, Manitoba Hydro Electric Energy and Natural Gas
- 11:15 Networked Lake Science: Harnessing the Power of Collaboration and Partnerships to Advance Understanding of Lake Ecosystems
Lisa Borre, Cary Institute of Ecosystem Studies
- 11:35 Records of Engagement for Participatory Monitoring and Modeling of Water Quality
Pierre Glynn, USGS

J7 Look! Data Visualization

10:30 – 12:00 | Room: Terrace

Moderator: Sara Peel, Arion Consultants

- 10:35 Telling the Water Story: How's My Waterway 2.0
Dwane Young, USEPA
- 10:55 Interactive Mapping as a Tool for Collaborative Water Quality Data Management and Visual Presentation
Meg Harris, Whatcom Conservation District, Washington
- 11:15 Analyzing Water Quality Pesticide Monitoring Data with the Click of a Mouse
Colin Donald, Oregon Department of Environmental Quality

11:35 Using Photos and Stories as Innovative Communication Tools to Connect Scientists and the Public to Marine Water Quality in Puget Sound, Washington
Carol Falkenhayn Maloy, Washington State Department of Ecology

J8 WORKSHOP: Panel Discussion:

Exploring Causal Hypotheses: What's Driving Environmental Trends and Conditions?

10:30 – 12:00 | Room: Columbine

See page XX for session description.

J9 Panel Discussion: Forging Effective Use of Diatoms in Assessment, Part II

10:30 – 12:00 | Room: Denver

See page XX for session description.

12:00 – 2:00 **Awards Luncheon**

K1 PFAS Monitoring in Water and Tissue/Pesticide Occurrence

2:00 - 3:30 | Room: Windows

Moderator: Bill Bataglin, USGS

2:05 Comprehensive Chemical Monitoring – Maximizing Information from Target Chemical Focused Studies
Larry Barber, USGS

2:25 Mixtures of Fungicides and Insecticides Occur Frequently in Central California Coastal Streams with Urban and Agricultural Land Uses
Mark Sandstrom, USGS

2:45 Understanding VOC and PFAS Plume Paths in a Water-Table Aquifer Dominated by Groundwater/Lake Interactions, Cape Cod, Massachusetts
Denis LeBlanc, USGS

2:05 Impact of Watershed Characteristics on Pesticide Concentrations Observed in California's Surface Water
Dan Wang, California Department of Pesticide Regulation

K2 Sediment Transport

2:00 - 3:30 | Room: Ballroom 1

Moderator: Paul McMurray, Indiana Department of Environmental Management

2:05 Continuous Monitoring of Chlorophyll-a in the Sacramento River Deep Water Shipping Channel in the Sacramento-San Joaquin Delta, California
Brittany Griffiths, USGS

- 2:25 Decadal Changes in Riverine Sediment: A Comparison of Major Drivers of Change
Jennifer Murphy, USGS
- 2:45 Recent Trends in Nutrient and Sediment Loading to Coastal Areas of the Conterminous U.S. (2002-2012): Insights and Global Context
Gretchen Oelsner, USGS

3:05 Facilitated Discussion

K3 Predictions for Decision Support

2:00 - 3:30 | Room: Ballroom 2

Moderator: Gary Rowe, USGS

- 2:05 Versatility of Spatial Stream Network Modeling for Watershed Predictions of Conductivity
Michael McManus, USEPA
- 2:25 Implementation of an Automated Beach Water Quality Nowcast System at California Oceanic Beaches
Ryan Searcy, Heal the Bay
- 2:45 What Are the Chances? A look at Bayesian Network Modeling as a Predictive Decision Support Tool
Douglas McLaughlin, Kieser & Associates, Environmental Science & Engineering
- 3:05 Using Conceptual and Numerical Models to Predict Dissolved Solids in the Colorado River at Imperial Dam, Arizona, California, and Nevada
Alissa Coes, USGS

K4 Monitoring and Assessing for Fecal Contamination

2:00 - 3:30 | Room: Tower D

Moderator: Diane Switzer, U.S. EPA

- 2:05 Implementing A Fecal Coliform Monitoring Program: Lessons Learned from a 16-Year Monitoring Program
Kristin Ricigliano, New York City Department of Environmental Quality
- 2:25 Devil in the Details: Lessons in Appropriate Collection and Analysis of Bacteria Data for Adequate Protection of Public Health
Heather Krish & Darcy Ebentier, Wood PLC
- 2:45 Human Health in the Los Angeles River Recreational Zones: An Assessment of Fecal Indicator Bacteria
Annelisa Moe, Heal the Bay
- 3:05 Linking Epidemiology Studies to Monitoring for Beach Water Quality
Kenneth Schiff, Southern California Coastal Water Research Project

K5 Evaluating Change

2:00 - 3:30 | Room: Silver

Moderator: Bryan Rabon, South Carolina Department of Health & Environmental Control

- 2:05 Salinization Trends in Water-Supply Lakes and Streams in the Triangle Area of North Carolina
Mary Giorgino, USGS
- 2:25 Sediment Monitoring Using Continuous Turbidity and Satellite Imagery on Large Northern Lakes and Rivers, an Experience from Manitoba, Canada
Russell Schmidt, Manitoba, Hydro
- 2:45 Water Quality Monitoring of Abiotic and Biotic Factors in an Effluent-Dominated Segment of the South Platte River: Quantifying Overall Improvements in the Aquatic Environment
Jordan Parman, Metro Wastewater Reclamation District, Denver, Colorado
- 3:05 Facilitated Discussion

K6 Ingredients for Effective Monitoring

2:00 - 3:30 | Room: Vail

Moderator: Sydney Smith, Auburn University

- 2:05 Essential Building Blocks for Effective Monitoring Programs
Barb Horn, Colorado Parks & Wildlife
- 2:25 Long-term Citizen Science Water Monitoring Data: An Exploration of Accuracy Over Space and Time
Kelly Albus, University of North Texas
- 2:45 A Plan to Inventory the National Wild and Scenic River System - Values of an Agency-Nonprofit Partnership
Aisling Force, Adventure Scientists
- 3:05 Facilitated Discussion

K7 Extreme Events

2:00 - 3:30 | Room: Terrace

Moderator: Robert Mason, USGS

- 2:05 Flash Flood Water Sampling in Remote Areas: Application of MiniSippers for Automated, High-Resolution, Long Duration Water Quality Monitoring during Extreme Conditions in Grand Canyon National Park
Thomas Chapin, USGS

- 2:25 Wildfire and water quality event response by the U.S. Geological Survey: Case Study from the Colorado Front Range
Sheila Murphy, USGS
- 2:45 Flushing of Anthropogenic Contaminants During Storm Events in Urban Waterways in Southern California
Federick Pinongcos, San Diego State University
- 3:05 Diluted Bitumen (Oil Sands) Spills into Rivers—Lessons from the 2010 Enbridge Line 6B Pipeline Release into the Kalamazoo River
Kelly Warner, USGS

K8 Panel Discussion: Applying the Biological Condition Gradient to Support Water Quality Management, Part I

2:00 - 3:30 | Room: Columbine

See page XX for session description.

K9 Workshop: Introduction to Open-Source Environmental IoT Monitoring with Arduino Framework Data Loggers

2:00 - 3:30 | Room: Denver

See page XX for session description.

3:30 – 4:00 **Break**

L1 Hydrologic Studies featuring Isotope and Environmental Tracers

4:00 – 5:30 | Room: Windows

Moderator: Karl Haase, USGS

- 4:05 USGS Groundwater Dating Portfolio, Gerolamo Casile, USGS
- 4:25 Geochemical and Isotopic Determination of Deep Groundwater Contributions and Salinity to the Shallow Groundwater and Surface Water Systems, Mesilla Basin, New Mexico, Texas, and Mexico
Andrew Robertson, USGS
- 4:45 Status of Ongoing USGS Studies on the Buffalo River (Arkansas)
Billy Justus, USGS
- 5:05 Combining Water Stable Isotopes and Meteorological Data to Link Precipitation Modes with Recharge and Runoff
Martha Scholl, USGS

L2 Session Cancelled

L3 Monitoring Stormwater: Best Management Practices

4:00 – 5:30 | Room: Ballroom 2

Moderator: Aaron Borisenko, Oregon Department of Environmental Quality

4:05 Determining Which Iron Minerals in Iron-Enhanced Sand Filters Remove Phosphorous from Stormwater Runoff

Beth Fisher, *University of Minnesota*

4:25 Field Evaluation of Brining as a Stormwater Best Management Practice to Reduce Chloride Pollution from Road Salt

Danelle Haake, *Saint Louis University*

4:45 Measuring the Impacts of Green Stormwater Infrastructure on Stream Health

Kristina Hopkins, *USGS*

5:05 Facilitated Discussion

L4 Evaluating Trends

4:00 – 5:30 | Room: Tower D

Moderator: Michelle Maier, U.S. EPA

4:05 Water-Quality Trends in the Nation's Rivers and Streams: Relations to Levels of Concern

Megan Shoda, *USGS*

4:25 Investigation of the Influence of Naturally Elevated Groundwater Total Dissolved Solids Concentration on Freshwater Benthic Macroinvertebrate Communities in the Southern California Region

John Rudolph, *Wood PLC*

4:45 Water Quality Changes in the West Fork of the White River from Upstream to Downstream: What Could this Mean for Water Resource Managers?

Erin Scott, *University of Arkansas*

5:05 Bridging Maryland's Protection Gap: Monitoring to Identify Coldwater Streams and Define their Spatial Extent

Matthew Stover, *Maryland Department of the Environment*

L5 Linking Multiple Stressors to Stream Ecological Health

4:00 – 5:30 | Room: Silver

Moderator: Monty Porter, Oklahoma Water Resources Board

- 4:05 Factors Contributing to Poor Biological Condition in Streams of the Puget Sound Lowlands: Results from a Collaborative Regional Stream Status and Trends Monitoring Program
Keunya Song, Washington State Department of Ecology
- 4:25 Linking the Agricultural Landscape of the Midwest to Stream Health
Travis Schmidt, USGS
- 4:45 Contrasting Multi-Stressor Effects on Biological Communities Between Urban and Agricultural Streams,
Ian Waite, USGS
- 5:05 Comparator Site Selection and Screening-Level CAUSAL Assessments
Ken Schiff, Southern California Coastal Water Research Project

L6 Innovative Monitoring to Track State Nutrient Reductions in the Mississippi River Basin

4:00 – 5:30 | Room: Vail

Moderator: Yishen Li, U.S. EPA

- 4:05 Tracking Nutrient Reductions in Indiana and Arkansas – Lessons Learned for other HTF states,
Kate Gardiner, University of Illinois
- 4:25 The Great Rivers Ecological Observatory Network (GREON) for Monitoring Water Quality in the Upper Mississippi River Basin
Miles Corcoran, Lewis & Clark Community College
- 4:45 The Great Lakes to Gulf Observatory – Transforming Water Quality Data to Knowledge to Guide Conservation Practices and Policies
Edward Kratschmer, Lewis & Clark Community College
- 5:05 N-Gage: A New Method for Incentivizing Water Quality Improvement
Hans Kok, Conservation Technology Information Center, West Lafayette, Indiana

L7 Shale Gas Development and Ground Water Quality

4:00 – 5:30 | Room: Terrace

Moderator: Tim Oden, USGS

- 4:05 Groundwater Samples from 35 Domestic Wells Within the Shale-Gas Development in Northeastern Pennsylvania
Matthew Conlon, USGS

- 4:25 Methane and Benzene in Groundwater in Areas of Unconventional Oil and Gas Production in the U.S.
Peter McMahon, USGS
- 4:45 Using Citizen Scientists and Stream Methane to Monitor Oil and Gas Development in Pennsylvania
Josh Woda, Penn State University
- 5:05 Relations of Groundwater Chemistry to Oil Development in Different Hydrogeologic Settings – Preliminary Results from California Regional Groundwater Monitoring Near Oil Fields
Matthew Landon, USGS

L8 Panel Discussion: Applying the Biological Condition Gradient to Support Water Quality Management, Part II

4:00 – 5:30 | Room: Columbine

See page XX for session description.

L9 Panel Discussion: Using the Water Quality Portal for Regional and National Water-Quality Studies

4:00 – 5:30 | Room: Ballroom 1

See page XX for session description.

FRIDAY, MARCH 29

M1 Workshop: Programming IoT Monitoring Stations Built on the Arduino Framework with the EnviroDIY ModularSensor Library, Part I

8:30 – 10:00 | Room: Denver

See page XX for session description.

10:00 – 10:30 **Break**

N1 Workshop: Programming IoT Monitoring Stations Built on the Arduino Framework with the EnviroDIY ModularSensor Library, Part II

8:30 – 10:00 | Room: Denver

See page XX for session description.

9:00 – 1:00 **FIELD TRIP: Tour and hike at Red Rocks Amphitheatre**

11th NATIONAL MONITORING CONFERENCE



Working Together for Clean Water

March 25-29, 2019

Denver, Colorado



EPA Booth Demonstrations

Stop by EPA's booth to see all demonstrations that will be conducted throughout the conference!

Tuesday March 26

10:00-10:30 (break)

How's My Waterway 2.0:

EPA will demonstrate their new revision of How's My Waterway. How's My Waterway provides information about the conditions of local streams, lakes and other waters in the U.S.

Contact: Dwane Young (Young.dwane@Epa.gov)

Water Quality Portal

Explore the WQP with EPA. In this hands-on demo, EPA will demonstrate how to use and download data from this publicly available water quality data resource.

Contact: Laura Shumway (Shumway.laura@Epa.gov)

1:30-3:00 (Networking timeslot)

Pick Your Data Adventure: Tips and Tricks for Downloading and Automating Data Reports Using R

Explore connecting to and downloading data from USGS, DayMet, or Aquarius databases in R and see an example workflow for creating automated data html or word reports from Rmarkdown.

Contact: Leah Ettema (Ettema.Leah@epa.gov)

3:00-3:30 (break)

Lessons Learned from Nearly 30 Years of Nonpoint Source Effectiveness Monitoring

Lessons Learned from Nearly 30 Years of Nonpoint Source Effectiveness Monitoring"

In 1991, EPA began the National Nonpoint Source Monitoring Program, which served local and statewide

programs in program design and adaptive management by supporting nonpoint source monitoring science and technical materials, and providing a venue for technical transfer. Join us for a short presentation on the valuable resources and lessons learned from nearly 3 decades of this program.

Contact: Cyd Curtis (Curtis.cynthia@Epa.gov) and Meg Wiitala (Wiitala.megan@Epa.gov)

Wednesday March 27

1:00-2:00

National Aquatic Resource Survey (NARS) QA/QC Application

Explore the beta version of a NARS data QA/QC app. This new tool will provide exploration, QA/QC and analysis of the raw NARS data. The app will ease the burden of data manipulation and file merging, and allows the user to quickly generate tables, graphs of summary statistics, and identify statistical outliers. We want your feedback on this early version of the app!

Contact: Alexandra Bijak (bijak.alexandra@epa.gov)

3:30-4:00 (break)

Publishing Sensor Data – EPA will show their sensor demonstration project, Interoperable Watershed Network (IWN) application and discuss sharing sensor data.

Contact: Dwane Young (Young.dwane@Epa.gov)

Poster Presentations



Posters will be showcased during the 1:00–2:00 pm Poster Viewing time on Wednesday, March 27. Check the index card by each poster to see when the presenter will be available throughout the week to answer questions.

Water Quality Prediction: State of the Art and Future Directions

01 Using Hydrologic Indices to Continuously Estimate Sediment and Mercury Concentrations
Alexandra Etheridge, USGS

02 Estimating Watershed Mercury Contribution to Lake Fort Smith State Park, Arkansas, USA
William Harmon, USGS

03 Mesocosm Studies: Key to Causal Inferences and the Development of Predictive Models of Ecosystem Response
Travis Schmidt, USGS

04 Statistical Models for Load Estimation Using Real Time Water Quality Monitoring
Slater Smith, University of Arkansas

05 The Metabolism of Streams and Rivers in the U.S.
Edward Stets, USGS

06 Temporal Variations of Discharge and Water Quality Observed and Simulated from 1992 to 2015 at Five Research Watersheds in the Water, Energy, and Biogeochemical Budget program
Richard M.T. Webb, USGS

Emerging Risks in Water Quality

07 Partnerships in Preventing PAH Pollution Across National Watersheds: Lessons

Learned in Coordinating Legislation, Funding, and Best Practices Across States
Lillian Power, Department of Energy & Environment Washington, DC

08 Developing a Risk-based Monitoring Plan for Contaminants of Emerging Concern
Savannah Tjaden, University of California, Santa Barbara

Monitoring Water Across a Changing Hydrologic Cycle

09 Dissolved Organic Carbon Concentration and Composition of Coastal and Major Inland Rivers in the USGS National Water Quality Network
Sara Breitmeyer, USGS

10 The National Ecological Observatory Network: Monitoring Changes in Stream Morphology and Biological Habitat at the Continental Scale
Nicolas Harrison, Battelle Ecology

11 Long-term Monitoring of the Lake Houston Watershed — Evaluating the Water-Quality Response to Extreme Hydrologic Events in a Municipal Supply Reservoir
Zulimar Lucena, USGS

12 Long-term Coastal Water Quality Monitoring in Pacific Island National Park
David Raikow, National Park Service

13 The Importance of Monitoring and Researching Mercury in the Environment
Paul Schuster, USGS

14 Impacts of Fire on Mercury Transport and Microbial Processes in the Russian River Watershed, Sonoma County, CA
Jennifer Underwood, USGS

Tools to Mine, Share, and Visualize Water Quality Data

15 NHDPlus High Resolution
Karen Adkins, USGS

16 Web Maps for Assessing Groundwater Quality and Groundwater Quality Trends in California
George Bennett, USGS

17 CUAHSI Data Services: Tools and Cyberinfrastructure for Water Data Publication, Discovery, Research, and Collaboration
Liza Brazil, The Consortium of Universities for the Advancement of Hydrologic Science, Inc.

18 Markup Application for Hydrography Datasets
Tatyana Dimascio, USGS

19 Innovative Data Publishing to the Water Quality Portal (15-minute oral presentation)
Dave Wilcox, Gold Systems

20 Sharing NARS Data through WQX: Data Transformation, Migration, and a Vision for the Future
Shawn Henderson, USEPA

21 Quality Management and Upload Platform for Field Measurements Data
Revital Katznelson, Volunteer

22 Assessing Water Sensor Data Quality: Initial Commissioning to Ongoing Uncertainty Evaluation Tools at NEON
Guy Litt, Battelle Ecology

23 Chesapeake Bay Program: Improvements to the Chesapeake Environmental Data Repository and DataHub
Michael Mallonee, Chesapeake Bay Program

24 Framework for a National Hydrologic Analysis Website
Scott Prinos, USGS

25 Moving to Electronic Submissions and Reporting for Water Quality Assessment
Jesse Boorman-Padgett, USEPA

26 Automating Retrieval of Wastewater Discharge Monitoring Reports with R
Michael Schramm, Texas A&M, College of Agriculture & Life Sciences

27 Geospatial Visualizations of Pesticides Found in Florida's Ambient Fresh Waters and Variables Correlated with their Occurrence
James (Jay) Silvanima, Florida Department of Environmental Protection

28 Working Down the User Pyramid with NHDPlus
Michelle Thawley, USEPA

29 Connecting Data to the National Hydrography Dataset
Michael Tinker, USGS

30 Los Angeles River Watershed Report Card: Utilizing Regulatory Monitoring Data to Assess and Visualize Watershed Health
Amanda Wagner, Heal the Bay

Innovative Designs and Technology for Water Quality Monitoring and Assessment

31 Electronic Field Forms and Automated Data Entry - Improved Data Quality and Data Management Efficiency
Kristopher Barrios, New Mexico Government

32 Evaluating the Effect of Opening the Bonnet Carre Spillway on the Mississippi Gulf Coast Oyster Production and Current Vs. Historical Spatial Relationships
Jarett Bell, University of Mississippi

- 33 Novel Approaches to Storm Water Monitoring from the Scripps Institution of Oceanography to Receiving Waters in San Diego, CA
Kate Buckley, Wood PLC
- 34 Development of an Effective Shade Model for Water Quality Management in Oregon
Erin Costello, Oregon Department of Environmental Quality
- 35 Metals Concentrations in Pore Water Collected Using a Novel Boat-Operated Pore Water Sampling Device in a Swift, Deep Non-Wadable River to Assess Copper Toxicity to Epibenthic Organisms,
Stephen Cox, USGS
- 36 Data Loggers: Continuous Conductivity Quality Control
Leah Ettema, USEPA
- 37 Continuous Water Quality Monitoring in Lake Mead, NV
Todd Tietjen, Southern Nevada Water Authority
- 38 Legrangian Water Quality Data Collection Along the Upper Colorado River During Low Flow Conditions of 2018
Michael Gooseff, University of Colorado
- 39 In-situ Time Integrative Field Filtration Enhancing E-DNA Water Monitoring
Brent Hepner, Aqualytical
- 40 Using Continuous Data as Surrogates to Estimate Nutrient and Ion Loads
Dawn Hintz, Susquehanna River Basin Commission
- 41 Tools for Implementing an Adaptive Management Approach to Nutrients
Lynette Guevara, New Mexico Government
- 42 Specific Conductance: Accurate Temperature Compensation for Acid Water
R. Blaine McCleskey, USGS
- 43 From Algal Toxins to Environmental DNA: Use of Passive Samplers to Streamline Monitoring
Ellen Preece, Washington State University
- 44 Measurement of Nutrients in Saline and Hypersaline Matrices
Sarah Stetson, USGS
- Holistic Water Quality Monitoring: Exploring Chemical, Physical, and Biological Integrity**
- 45 Use of Occurrence and Exposure-Activity Ratios (EARs) to Identify Which Bioactive Chemicals in the Illinois Waterway Might Explain the Stalling of the Invasive Carp Population Front
William Battaglin, USGS
- 46 Time of Travel as a New Criterion for Groundwater Sampling: Demonstrations of the Purge Analyzer Tool (PAT)
Philip Harte, USGS
- 47 Multi-Stressor and Multi-State Approach to Creating Tolerance Values for Biological Condition Gradient Models
Jason Hill, Virginia Department of Environmental Quality
- 48 Sensitive Inorganic Monitoring Indicators for Tracing Groundwater Contamination from Shale Gas Development
Tianming Huang, Institute of Geology and Geophysics (IGG)
- 49 *Research on Coal-Tar Based Sealcoat Exemplifies the One Health Concept*
Barbara Mahler, USGS
- 50 Analyzing Multivariable Water Chemistry to Assess Water Quality of Reference Sites in Texas in Compliance with the National Rivers and Streams Assessment
Gabriel Nejad, Tarleton State University

- 51 Evaluating Potential Acute and Chronic Effects of Pesticide Mixtures in Streams from Five Regional Studies Across the United States (USA)
Lisa Nowell, USGS
- 52 Vertical Variations in Trophic State Parameters in Missouri Reservoirs
Daniel Obrecht, University of Missouri
- Effective Monitoring Collaborations and Partnerships**
- 53 Citizens, Oysters and Changing the Culture through POP (Pensacola Oyster Project)
Barbara Albrecht, Panhandle Watershed Alliance
- 54 Fraser Flats River Habitat Project
Jessica Alexander, Denver Water Department
- 55 Generating a Geochemical Model Using Collaborative Continuous Data Streams: A Tool to Help Understand the Effects of River Discharge on Estuaries
Owen Boram, Unaffiliated
- 56 Standardizing Citizen-led Creek Monitoring in the San Francisco Bay Area
Helen Fitanides, The Watershed Project
- 57 Citizen Monitoring Efforts Tracking the Effectiveness of the City of Chico Municipal Stormwater Program and Low Impact Development (LID) Projects Implemented In The Big Chico Creek Watershed
Timmarie Hamill, Volunteer
- 58 Biomonitoring for Reintroduced American Eel in the Susquehanna River Basin
Aaron Henning, Susquehanna River Basin Commission
- 59 Achieving Accurate & Precise Data in Community-Based, Water-Quality Monitoring: The Indigenous Observation Network
Nicole Herman-Mercer, USGS
- 60 Celebrating over 50 Years of Stream Water Quality Monitoring Through Effective Partnerships: The Provincial Water Quality Monitoring Network in Ontario
Georgina Kaltenecker, Provincial Water Quality Monitoring Network
- 61 Innovative, Collaborative Opportunities for Undergraduate Students Monitoring Marine Water Quality
Katherine Dye, Marina McLeod, and Ardi Kveven, Everett Community College
- 62 Using Project WET to Empower an Existing Network of Citizen Scientists
Candice Miller, Oklahoma Conservation Commission
- 63 A Unique Partnership for Establishing Water Quality Monitoring on the Connecticut River in Massachusetts near the Border with Vermont and New Hampshire
Jonathan Morrison, USGS
- 64 Investigating the Biogeochemical Influence of the Freshwater Plume in a Salt Wedge Estuary
Ingrid Phillips, Unaffiliated
- 65 At the Table: Bringing Resources Together to Measure the Effectiveness of Tillage Practices on Water Quality in Eastern Washington
Stacy Polkowske, State of Washington, Department of Ecology
- 66 A New Approach for Stormwater Outreach, Education, and Involvement: South Carolina Adopt-a-Stream
Kaleigh Sims, Clemson University
- 67 Community-Based Monitoring in New Jersey: A Mutualistic Relationship Between Volunteers and the State
Erin Stretz, The Watershed Institute

- 68 The Oldest Community Well Testing Program in the Country: A Successful Model for Public Health and Groundwater Surveillance
Mara Tippet, Raritan Headwaters
- 69 Heavy Metal Cycling in Possession Sound: A Study of the Role of Eelgrass and Water Column Trace Metals in Possession Sound and the Snohomish River Estuary
Hannah Weinrich, Unaffiliated
- 70 Central Plains Regional Monitoring Network (RMN) Partnership with Federal, State, Tribal and University Collaborators
Gary Welker, USEPA
- 71 Baywatchers Program: The Influence Monitoring Can Have on Decision-Making
Christine Gurdon, Buzzards Bay Coalition
- 72 Partnering for Clean Water on California's Central Coast: How Bioassessment Monitoring Informs Restoration and Conservation
Karissa Willits, Morro Bay National Estuary Program
- Measuring Effectiveness of Management Actions, Improvement, and Restoration Activities**
- 73 Sediment and Nutrient Loading from a Conventional and Conservation Tilled Paired Watershed Study in the Dryland Farming Region of the Inland Pacific Northwest
Ryan Boylan, Palouse Conservation District, Pullman, WA
- 74 Atmospheric Nitrogen Deposition to the Chesapeake Bay Watershed: Temporal Trends, Spatial Patterns, and Future Projections
Douglas Burns, USGS
- 75 Value of Economic Information for SPARROW Nutrient Modeling of BMP placement: A Case Study
Heather Fair-Wu, USGS
- 76 Monitoring Water-Quality Responses to Pipeline Construction Along Two Proposed Natural Gas Pipeline Routes in
Virgini John Jastram, USGS
- 77 Reducing Dissolved Phosphorus in Stream Water May Not Influence Estimation of Sediment Equilibrium Phosphorus Concentration
Eleanor Henson, University of Arkansas
- 78 Impacts of Land Use and Management Changes on Total Nitrogen Yields and Loads in the Chesapeake Bay Watershed
Matthew Miller, USGS
- 79 The Importance of Partnerships in Documenting Improvements in Water Quality in Agriculture
Teri Nehls, Arkansas – USDA
- 80 Edge of Field Runoff Analysis of Land Conservation Practices in Northeast Texas
Edward Rhodes, Texas A&M College, of Agriculture & Life Sciences
- 81 Beavers in an Urban Environment: Results from a Three-Year Study in the Tualatin River Basin, Oregon
Casie Smith, USGS
- 82 Water Quality Status and Trends in Chesapeake Bay and its Tidal Tributaries in 1985-2016: Temporal and Spatial Patterns Uncovered Through Criteria Attainment Assessments
Peter Tango, Chesapeake Bay Program
- 83 Nonpoint Source Monitoring – Lessons and Applications
Megan Wiitala, USEPA

Monitoring and Assessment to Protect Human and Ecosystem Health

- 84 Glyphosate is Pervasive in U.S. Streams and Rivers
Laura Medalie, USGS
- 85 Seasonal Methylmercury Export from the Hells Canyon Reservoir Complex, Idaho and Oregon, USA
Austin Baldwin, USGS
- 86 Beach Monitoring and Notification Program Faces Uncertain Future
Stacey Banks, USEPA
- 87 Temporal Variability of Nutrients and Agrichemicals in Waterways Across Illinois
Alycia Bean, University of Idaho
- 88 Assessing Spatial Differences in Uranium Concentrations in Groundwater Along the Horn Creek Drainage in Grand Canyon National Park, Arizona
Kimberly Beisner, USGS
- 89 Hormones and Pharmaceuticals in Groundwater Used for Public and Domestic Supply across the United States
Laura Bexfield, USGS
- 90 Mixed-Organic/Inorganic-Chemical Exposure in USA Point-of-Use Drinking Water
Paul Bradley, USGS
- 91 A Gift for Streams and Rivers - More Education and Inspiration for the Oklahoma Blue Thumb Volunteers
Cheryl Cheadle, Oklahoma Conservation Commission
- 92 Source Water Assessment Developments and What's New at The Water Research Foundation
Michael Dirks, The Water Research Foundation
- 93 Comparison of Sampling and Analytical Methods Used in Studies of Methane in Groundwater in Northeastern Pennsylvania
Joseph Duris, USGS
- 94 Integrating Potential Wetland Restoration Site Identification into Watershed Planning for Water Quality Improvement
Dan Dvoretz, Oklahoma Conservation Commission
- 95 The Dragonfly Mercury Project: Biosentinel Mercury Concentrations and Landscape Drivers Across US National Parks
Colleen Flanagan Pritz, National Park Service
- 96 Arsenic Levels of San Gabriel Ground and Surface Water
Bryan Giberson, Cal Poly Pomona
- 97 We are All Downstream: Contaminants of Emerging Concern During De Facto Water Reuse
Susan T. Glassmeyer, USEPA
- 98 A Public Health Response to Large-Scale PFAS Contamination in Minnesota
Christopher Greene, New Mexico Government
- 99 Watershed Assessment Modelling to Identify Sources of Nutrient, Sediment and Pathogen Pollution for Strategic Planning in a Coastal Watershed
Meg Harris, Whatcom Conservation District
- 100 Dissolved Oxygen Monitoring in Support of Determining Biological Response to Phosphorous Loading in Streams in Connecticut
Brittney Izbicki, USGS
- 101 Bioaccumulation of Selenium and Mercury in Fish Tissues of an Urban Watershed and Reservoir, Denver Colorado
Nathan Jahns, GEI Consultants, Inc.

- 102 Fish Tissue Monitoring Recommendations to Support the Implementation of the EPA's 2016 304(a) Recommended Freshwater Chronic Aquatic Life Selenium Criterion
Karen Kesler, USEPA
- 103 Potential Drivers of Salinity Trends in Rivers and Streams of the US: 1992–2012
Gretchen Oelsner, USGS
- 104 Lessons Learned: USGS Response to Epic Flooding in the Columbia and Mississippi River Basins
Stanley Skrobialowski, USGS
- 105 Evaluating Fish Tissue Contaminant Monitoring Alternatives: Fish Plug Samples Versus Homogenized Whole Fillets
Leanne Stahl, USEPA and Blaine Snyder, Tetra Tech, Inc.
- 106 Exploring the Utility of Monitoring Surface Water for Dissolved Methane in the Marcellus Shale Region of the Susquehanna River Basin, USA
Luanne Steffy, Susquehanna River Basin Commission
- 107 An Overview of Oregon Water Science Center Quality Assurance Procedures for Continuous Water Quality Temperature Monitoring
Marc Stewart, USGS
- 108 Monitoring Cyanobacteria Blooms in Upper Klamath Lake, OR: A Closer Look at Techniques and Methods
Olivia Stoken, USGS
- 109 Exploring Innovative Diatom Counting Methods for Use in Bioassessment to Improve Performance without Additional Cost
Meredith Tyree, University of Colorado
- 110 Harmful Algae Blooms as seen through the lens of Land Cover/Land Use in Urban and Rural Lakes
Laura Webb, USEPA
- 111 Implications of Phytoplankton Mobility on the Assessment of Chlorophyll A Criteria
Bruce Weckworth, Hampton Roads Sanitation District
- 112 Baseline Data Collection at Fire-Affected Wetlands
Camielle Westfall, State of Montana
- 113 Using Hydroacoustics to Estimate Suspended-Sediment and Total Metal Concentrations on the San Juan River near Bluff, UT
Chris Wilkowske, USGS

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