National Water Monitoring News

ACWI NWQMC

Highlights

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

USGS personnel collecting a water sample for Avian Influenza project at Bayley Lake, Little Pend Oreille National Wildlife Refuge, Stevens, County, Washington. *(Photo by Alan Cressler, USGS)*

National Water Quality Monitoring Council

Working together for clean water

Words from the Council Co-chairs

Welcome to the 11th edition of the National Water Quality Monitoring Council's Newsletter!

Preparations are well underway for the 10th National Monitoring Conference will be held May 2-6, 2016 in Tampa Bay, Florida (see page 16). The Conference Planning Committee (CPC) led by co-chairs Alice Mayio (EPA), Callie Oblinger (USGS), and Greg Piniak (NOAA), have been making a lot of progress and the next face-to-face Council meeting, scheduled for December 1-3 in Tuscaloosa, Alabama will be devoted to developing the final agenda for the Tampa conference. We thank members and friends of the Council who are helping with the planning effort as there is a lot of behind the scenes work that goes into making a conference of this size great so all the support is sincerely appreciated.

One area we are seeking your help with is providing nominations for three Council-sponsored awards that will be given out at Tampa. These are:

- The Elizabeth J. Fellows Award which honors individuals for outstanding achievement, exemplary service, and distinguished leadership in the field of water quality monitoring, and/or distinguished leadership at the local, state, interstate, tribal, and/or national levels in natural resource management and environmental protection
- The Vision Award which 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, and
- The Barry A. Long Award to honor an individual who has demonstrated exceptional perseverance, positive spirit, and significant contributions to water resource protection

Please visit the 10th National Monitoring Conference website to access nomination forms for each award and note that nominations need to be submitted on or before January 31, 2016.

In closing we hope you find the information presented of use in your water-quality monitoring work. Please check the 10th National Monitoring Conference website for updates, including conference registration and exhibitor's information. We also invite you to submit your water-quality news, announcements, successes, challenges, and findings to our newsletter editors for the Spring 2016 edition of the Newsletter.

Best Regards,

Gary Rowe, USGS Co-Chair
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Susan Holdsworth, EPA Co-Chair
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National Council Highlights

Council Member Updates

Retiring Council Members

Curtis Cude is retiring from his service on the NWQMC. Curtis started working in 1994 for the Oregon Department of Environmental Quality (DEQ) in the Laboratory's Water Quality Monitoring section. Curtis eventually held the role of Ambient Network Coordinator while at the lab. In 2002, Curtis moved to DEQ's Information Services section to lead development of the Pacific Northwest Water Quality Data Exchange and assisted the Environmental Data Standards Council in developing the Environmental Sampling, Analysis, and Results standard which was adapted by the U.S. Environmental Protection Agency (EPA) for their Water Quality Exchange. During this time (2005-2007), he served the NWQMC as the Region 10 representative and co-chaired the Water Information Strategies Group with Peter Tennant. Curtis led the development of data management and access recommendations for the development of the National Monitoring Network.

In 2008, Curtis joined the Oregon Public Health Division as manager of the Environmental Public Health Program. He developed a portfolio of Healthy Waters programs including Beach Monitoring, Harmful Algae Bloom Surveillance, Fish Consumption Advisories and Domestic Well Safety. He rejoined the NWQMC in late 2009 as a representative of municipal, drinking water, and public health interests, primarily to provide a public health perspective to the Council's work. During this stint, he participated on the Collaboration and Outreach group contributing material for the Council newsletter, presenting the "Healthy Waters 101: Water Quality Monitoring for Public Health" webinar, and co-chairing the program development subcommittee for the 2014 National Monitoring Conference in Cincinnati, Ohio.

Peter Tennant is retiring. Peter Tennant has been an active and vocal proponent of the value of water quality monitoring and environmental assessments since his early days with the Massachusetts Division of Water Pollution Control. From 1972 to 1976, he led his fellow "Water Wrats" in essentially inventing the science of water quality monitoring within the State, including developing their own sampling methods and mathematical models for rivers. In 1976, the "Wrats" were saddened with losing their poet, moral compass, and den leader when Peter moved to Cincinnati, Ohio, and started with ORSANCO, but his legacy molded their future. Since that time, Peter has continually supported the collection of high quality data needed to run ORSANCO's programs on behalf of its eight member states. Throughout his rise to the position of Executive Director of ORSANCO, he was instrumental in the evolution of large river monitoring methods, helping to form the globally respected programs that exist there today.

While Peter was hands-on in the completion of many significant achievements throughout his career, his true strengths lie in his ability to vet technical ideas through workgroups and committees for the betterment of the environment. In addition to the many ORSANCO committees he has served on, he held voluntary positions in national organizations to advocate the importance of good water quality and the need for first class monitoring programs. He served as both Chair and Co-Chair of the Water Information Strategies (WIS) Workgroup. Peter also served on the Steering Committee of the National Monitoring Network for U.S. Coastal Waters and Tributaries and was Co-Chair of the 4th National Monitoring Conference in 2004 in Chattanooga, Tennessee. He authored a fact-sheet in 2008 for the National Water Quality Monitoring Council and was a key contributor to many other Council products during his tenure. Peter led the effort to submit a proposal that led to Cincinnati's hosting the 9th National Monitoring Conference.

Welcome New Council Members!

Larry Willis is the new EPA Region 3 State representative to the Council. Larry leads a team of water quality monitoring scientists in the Roanoke, Virginia, office of the Virginia Department of Environmental Quality. Larry is a strong supporter of probabilistic monitoring; he was instrumental in the creation of Virginia's probabilistic monitoring program (ProbMon). Larry was intensively involved with the EPA National Aquatic Resource Surveys, including service on the National Lake Assessment Steering Committee and the National Rivers and Streams Assessment (NRSA) Steering Committee. As a representative of NRSA, he served as the Lead Trainer for PHAB at the Train-the-Trainer and regional training events. In 2008, Larry spent 4 months on interagency loan to EPA to help kick-off the first NRSA sampling. In recent years, Larry's focus has been on methods development and assessment of sedimentation. Larry and his team have developed calculators for Relative Bed Stability in Excel, SAS, and R. His work has shown that sedimentation is the most common stressor in Virginia's streams.

Chris Greene works in the Site Assessment and Consultation Unit at the Minnesota Department of Health and joins the Council to provide a public health perspective to the Council's work. Chris worked for an EPA contractor in Northern Virginia for 10 years where he conducted exposure and risk assessments for contaminated sites, developed tools and models for EPA's New Chemicals and Existing Chemicals programs, and worked on EPA's Exposure Factors Handbook. He took a position at the Minnesota Department of Health, where he soon became involved with a new program to develop health-based guidance on values for contaminants of emerging concern (CECs) in drinking water. In this program, he conducts exposure screenings of chemicals when they are nominated to the program by outside stakeholders. When a chemical is selected for full review (based on exposure potential and toxicity) he conducts a more in-depth exposure assessment and develops Relative Source Contribution factors to allocate health risks among multiple exposure sources. Because the CEC program relies on outside sources for most of its water quality data, Chris has worked to develop partnerships with other agencies, most notably USGS, to make CEC data easily accessible.

Jeff King, PhD, is the new NOAA representative to the Council. Jeff is Acting Director of the Hollings Marine Laboratory/Center for Human Health Research, in Charleston, SC, an interdisciplinary collaborative research laboratory with a mission to provide science and technology to sustain, protect, and restore coastal ecosystems, with emphasis on understanding the linkages between the condition of the coastal environment and human health and well-being.

Jeff's prior work, with the U.S. Army Corps of Engineers, included co-authoring the draft Environmental Impact Statement for Savannah Harbor Expansion Project, and working with regulatory staff to evaluate complex or controversial applications for Clean Water Act wetland/stream permits and wetland/stream mitigation banks. He also led efforts to characterize mercury in surface waters and outfalls associated with the Savannah River Site, including support of a TMDL for mercury in the Savannah River. Jeff has taught marine science courses, and has served as an adjunct professor at the Skidaway Institute of Oceanography and Savannah State University. He has degrees in biochemistry from Florida State University, clinical toxicology from Johns Hopkins University, and environmental engineering from the Georgia Institute of Technology. He is also a registered Professional Engineer in Georgia and South Carolina.

Federal Partnerships

NARS Update: EPA National Aquatic Resource Surveys

Working with partners in the States, Tribes, and other Federal agencies, the U.S. Environmental Protection Agency (EPA) leads a series of statistically-valid surveys of the Nation's waters known as the National Aquatic Resource Surveys (NARS). Each summer, field crews around the country sample water quality, biology, habitat, sediment, and other indicators using standardized methods and following strict quality assurance guidelines. This past summer, crews sampled nearly 1,500 coastal and Great Lakes nearshore sites for the National Coastal Condition Assessment 2015. In 2014, field crews completed two years of sampling rivers and streams for the second National Rivers and Streams Assessment. Sampling for the second National Lakes Assessment took place in 2012, and for the first National Wetlands Condition Assessment (NWCA) in 2011 (the second will be completed next summer).

Reports summarizing the findings of these field surveys are in various stages of completion, with the coastal and wetland reports expected to be released near the end of 2015. When the NWCA report is released, EPA will have published national-scale reports describing the ecological condition of *all* aquatic resources in the conterminous U.S. The intent is to revisit each resource type every five years. For more information on the National Aquatic Resource Surveys, visit www.epa.gov/aquaticsurveys.

Funding Opportunity: National Ground-Water Monitoring Network

The USGS is working with the Federal Advisory Committee on Water Information's Subcommittee on Ground Water (SOGW) to develop and administer a National Ground-Water Monitoring Network (NGWMN). The NGWMN will consist of selected wells and springs from existing Federal, State, tribal, and local long-term groundwater monitoring networks. The water level and water quality data collected at these sites is available through a data portal (cida.usgs.gov/ngwmn/) that can be used to address national and regional groundwater questions. The USGS received an appropriation in FY 2015 to fund NGWMN activities. Data providers and other partners received a portion of this funding to allow them to participate in the pilot phase and begin or complete the process of making their data available through the Network portal.

Up to $2 million, administered by the USGS, will be available in FY 2016 in the form of cooperative agreements with non-Federal partners. These agreements will be used to bring additional data providers into the Network and to provide continued support to current data providers. The NGWMN is envisioned as a long-term collaborative partnership among Federal and non-Federal data providers. The USGS is preparing an announcement describing the funding opportunity and plans to make the opportunity available on grants.gov. Council members and friends with groundwater responsibilities are encouraged to submit a proposal and to share this information with their colleagues who are responsible for water-level networks.

For more information, see the SOGW website at acwi.gov/sogw/, or contact Bill Cunningham (wcunning@usgs.gov) or Daryll Pope (dpope@usgs.gov).

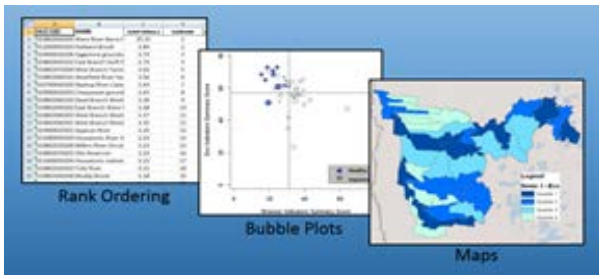
Call for Award Nominations!

We are currently accepting nominations for three NWQMC awards that will be presented at the Conference: the Elizabeth J. Fellows Award, the Vision Award, and the Barry A. Long Award. Nominations are due by January 31, 2016.

Visit our website at acwi.gov/monitoring/conference/2016/ for the latest conference updates, including registration information, and to submit award nominations.

The Watershed Index Online: A Tool for Comparative Watershed Assessment

Federal, State and local water quality programs are increasingly using comparative watershed assessment tools to inform their decisions on how to prioritize watersheds for restoration and protection activities in the context of their overall water quality goals. The Watershed Index Online (WSIO) is a free decision-support tool developed by the EPA to assist resource managers with this process through a library of watershed indicators.



The WSIO Tool allows the user to view their comparative watershed analysis results in tables, bubble plots, and maps.

Comparative watershed assessment involves the systematic evaluation of large numbers of watersheds, in order to identify and communicate similarities and differences among these watersheds. This type of assessment requires that data on various watershed attributes (such as land cover, hydrology, slope, soils, biology, water quality, etc.) be consistently translated into "indicators" of watershed condition and drivers of change (stressors) for the watersheds being compared. An added feature of the WSIO Tool is the ability to incorporate local datasets into the WSIO Tool with the provided indicators.

The goal of the WSIO is to increase the capacity for States and others to perform comparative watershed analysis by providing a watershed comparison tool and a library of hundreds of the most popular watershed indicators, already processed and compiled for roughly 83,000, 12-digit Hydrologic Unit Code (HUC12) watersheds throughout the contiguous United States. The WSIO Tool allows users to easily download uniformly measured watershed indicators for a defined project area, to generate comparative rankings for those watersheds and sub-watersheds based on ecological, stressor, and social context indicators selected by the user, and to save a variety of watershed comparative screenings for further analysis or export of tables, maps, and plots.

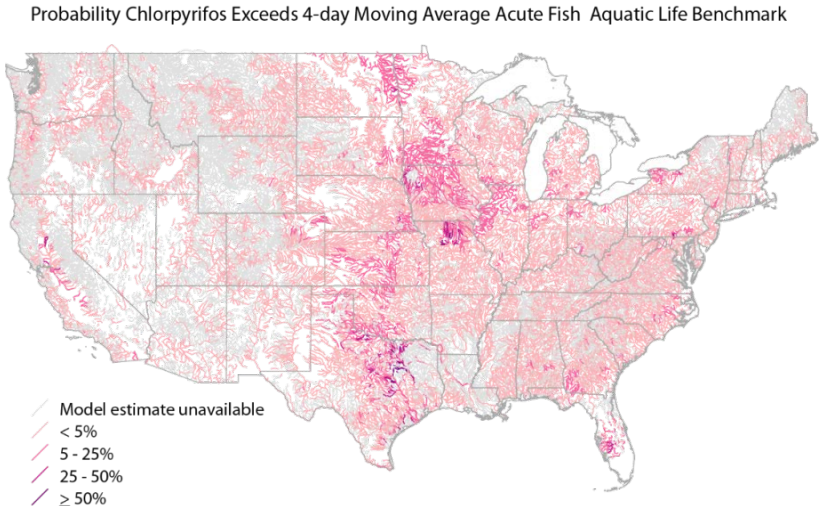
To download the WSIO Tool and access more information on the WSIO, visit gispub.eap.gov/wsio. Send questions to r4_wsio@epa.gov.

Predicting Pesticides in Streams and Rivers: Where is Water-Quality at Risk?

A new interactive mapping tool provides predicted concentrations for 108 pesticides in streams and rivers across the Nation and identifies which streams are most likely to exceed water-quality guidelines for human health or aquatic life.

Citizens and water managers can create maps showing where pesticides are likely to occur in local streams and rivers and evaluate the likelihood of concentrations exceeding water-quality guidelines. The predictions can also be used to design cost-effective monitoring programs.

Because pesticide monitoring is very expensive, we cannot afford to directly measure pesticides in all streams and rivers. This model can be used to estimate pesticide levels at unmonitored locations to provide a national assessment of pesticide occurrence.



The online mapper showing chlorpyifos (an insecticide used commonly on corn, citrus, and almond crops) levels with a likelihood of exceeding the acute fish aquatic life benchmark.

The online mapping tool is based on a USGS statistical model — referred to as Watershed Regression for Pesticides (or "WARP") — which provides key statistics for thousands of streams, including the probability that a pesticide may exceed a water-quality benchmark and the reliability of each prediction. The WARP model estimates concentrations using information on the physical and chemical properties of pesticides, agricultural pesticide use, soil characteristics, hydrology, and climate.

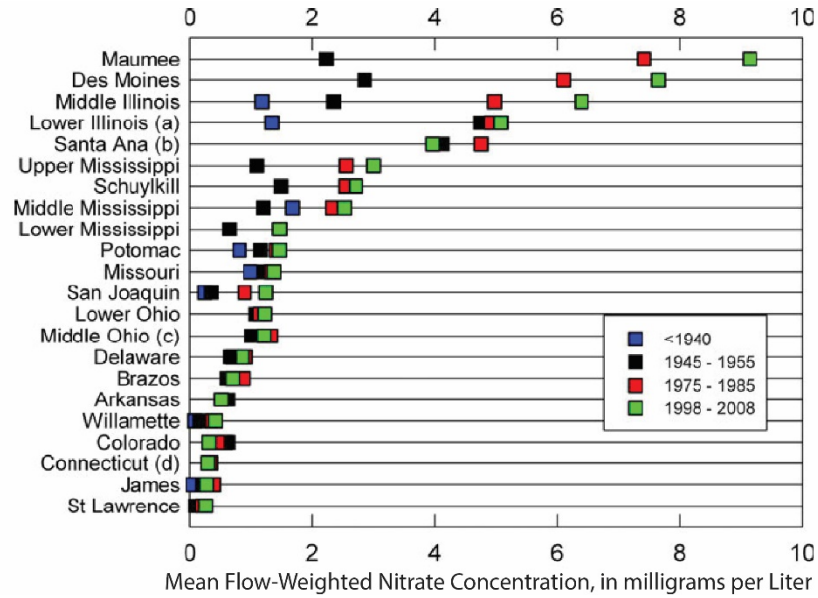
Interactive mapping of predicted pesticide levels for streams in the U.S. is available online. National maps and trend graphs of agricultural use of 459 pesticides from 1992 to 2012 for the conterminous U.S. are also available online. The model used by the mapping tool is based on data from USGS monitoring of pesticides in streams across the Nation since 1992 as part of the National Water-Quality Assessment (NAWQA) Program.

U.S. Rivers Show Few Signs of Improvement from Historic Nitrate Increases

A recent U.S. Geological Survey study provides a rare glimpse into how nitrate levels in 22 large rivers across the Nation have changed over the last 65 years. The study includes rivers flowing into the Great Lakes and coastal waters such as Long Island Sound, Delaware River estuary, Chesapeake Bay, San Francisco Bay, and the Gulf of Mexico.

From 1945 to the mid-1980s, nitrate levels in large U.S. rivers increased up to fivefold in intensively managed agricultural areas of the Midwest, and doubled in some areas along the East and West coasts.

In recent decades, nitrate changes have been smaller and levels have remained high in most of the rivers studied. During 1998-2008, the highest mean flow-weighted concentrations of nitrate occurred in the Midwest (>4mg/L) while the lowest concentrations (<2mg/L) occurred in the Western U.S., the St. Lawrence River, and the less populated areas along the coast.



Flow-weighted nitrate concentrations in major rivers over four time periods.

The greatest increases in river nitrate levels coincided with increased nitrogen inputs from livestock and agricultural fertilizer, which grew rapidly from 1945 to the mid-1980s. In recent decades, nitrate changes have been smaller as the increase in fertilizer use has slowed in the Midwest and large amounts of farmland have been converted to forest or urban land along the East coast.

Additional information on analyses of long-term monitoring data by the USGS National Water-Quality Assessment Program is available online. Contact Ted Stets (estets@ugs.gov) for more information.

Spotlight on States

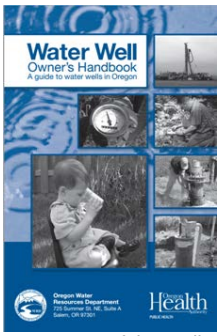
New Interactive Mapping Tool a Boon to Florida's Monitoring Professionals

A sophisticated new interactive Water Quality Monitoring Activity Tracker (MAT) has been developed by the Florida Department of Environmental Protection Division of Environmental Assessment and Restoration (DEAR). MAT displays scheduled monitoring events and basic site information, including an ID number, date, and program name, at a minimum, for each of DEAR's monitoring programs. Sites sampled previously during the year also are mapped.

MAT is driven by a web application that allows staff to enter information associated with each site visit, which is stored and available as a scheduling and reporting mechanism for sampling staff and environmental managers. The tool replaces multiple spreadsheets, providing a one-stop shop for monitoring activities.

MAT is available to the public from DEPs interactive map gallery at fdep.maps.arcgis.com/home/index.html. For more information, email Julie Espy at Julie.Espy@dep.state.fl.us.

A Guide to Water Wells: New Oregon Well Owner's Handbook



Front cover of the Well Owner's Handbook.

An updated Well Owner's Handbook was released by the Oregon Health Authority's Domestic Well Safety Program (DWSP) and the Oregon Water Resources Department (OWRD) in late Spring 2015. Together, OWRD and DWSP worked to include health information on common contaminants, testing recommendations, additional construction setbacks for new wells, updated graphics, and more in the new edition. The information found in the handbook is valuable to individuals who own, wish to construct, or plan to abandon a water well in Oregon. It may also be helpful to people who rent, sell, or buy property where wells are or will be located to meet water supply needs. Wells used for a public water system have different standards not included in this handbook. The Water Well Owner's Handbook is available digitally online and is distributed to owners of newly constructed or newly registered wells within the State of Oregon. For more information about the Handbook or the DWSP, visit www.healthoregon.org/wells or email domestic.wells@state.or.us.

Indiana Groundwater Focus Committee Ramps Up with Arsenic Analysis

Early on, arsenic was identified as a priority topic for the Indiana Groundwater Focus Committee (InGWFC) due to its widespread occurrence and unpredictable concentrations above the Maximum Contaminant Level of 10 ppb. To date, the InGWFC has produced outreach materials, including a general fact sheet on Arsenic in Groundwater. A more specific fact sheet on Arsenic in Residential Drinking Water provides resources for homeowners, including where they can have their drinking water tested for arsenic. Additionally, the group initiated a Statewide search of available arsenic data. Arsenic results gathered from various sources produced a sizable assemblage of data collected and analyzed with a variety of methods. The next step will be to characterize and separate out the good, the bad, and the ugly (so to speak) to confidently use the information for various purposes. It is anticipated that the "good" data will help the InGWFC quantify the distribution of arsenic in groundwater across Indiana and to determine the next steps necessary to build on the current knowledge about arsenic in Indiana's groundwater.

The InGWFC is a subcommittee within the Indiana Water Monitoring Council, which was introduced to the readership in the Fall/Winter 2013 issue of National Water Monitoring News. Since its inception, the InGWFC has met monthly and has emerged as an effective work group, taking on groundwater projects considered significant to public health and water resources for the citizens of Indiana. For additional information, contact Jim Sullivan, jsulliva@idem.in.gov, (317) 234-7476.

Advancing Ecosystem Science with an Aquatic Sensor Network

The National Science Foundation established EPSCoR, the Experimental Program to Stimulate Competitive Research, to strengthen science and engineering infrastructure in states that historically have received less in Federal research grants. The New Hampshire EPSCoR's Ecosystems & Society project uses sensors to build a robust network of scientific infrastructure providing high frequency data streams and fueling research. An interdisciplinary team of researchers, students, teachers, and volunteers built an environmental sensor monitoring network to document temporal and spatial variability in stream chemistry with unprecedented resolution. "There are few places in the country that have this level of intensity in terms of numbers of sensors; it may be the densest array of sensors around," said Professor Bill McDowell, Director of the Water Resources Research Center at the University of New Hampshire.

Aquatic sensor deployment at the Lamprey River in Durham, NH.

The integrated sensor network operates year round and includes state-of-the-art water quality sensors connecting eight headwater sites spanning forested, urban, and agricultural land uses to two major river sites (the Merrimack and Lamprey Rivers). The sensors measure nitrate, fluorescent dissolved organic matter, temperature, specific conductance, pH, dissolved oxygen, turbidity, and stage every 15 minutes. Terrestrial soil sensors at the headwater sites also measure soil temperature, moisture, and CO_2 flux. The multiple aquatic and terrestrial signatures create a unique land use/headwater "fingerprint" that can subsequently be identified downstream. Additionally, a citizen science component has approximately 42 active volunteers who host sensors at an additional 80 river and stream sites across the State where temperature, conductivity, and stage are recorded. This project brings together researchers and students from institutions statewide and engages hundreds of citizen scientists, including grade school teachers and their classes. "These sensors take measurements every 5-15 minutes," said Mark Green, associate professor of hydrology at Plymouth State University. "Students are able to talk to people in the field about changing water conditions, and then think about what they've seen and heard as they analyze a statewide data set with millions of data points. It's a novel research project and a phenomenal opportunity for students and researchers alike."

Aquatic sensor deployment at the Merrimack River in Manchester, NH.

The overarching objective of the research is to understand the mechanisms that control stream water quality, including nitrogen concentration and flux, over a range of land uses and climate and flow conditions so that local land use planners and decision makers can craft mitigation strategies to protect water quality and reduce nitrogen delivery to sensitive downstream coastal ecosystems. The sensor network can also help identify where and when road salt is reaching stream water. The team is examining the role of storm events, since storm flow can flush nitrogen and road salt from the watershed to streams or can dilute concentrations of stream water constituents. A better understanding of how storms interact with different types of land and across different watersheds is needed. The climate variability aspect of the project ties into the projected changes the region will see as a result of climate shifts in the coming years, bringing higher temperatures, drought, and more intense precipitation events. The sensor data, available through the project's Data Discovery Center (www.epscor.unh.edu/data-discovery-center), are being used to design models to help municipal, State and Federal officials who make decisions affecting towns and water resources.

Missouri Stream Team Enhances Communities

The Missouri Stream Team Program is a partnership between the Missouri Department of Conservation, the Missouri Department of Natural Resources (DNR), and the Conservation Federation of Missouri. This volunteer-based program participates in stream clean-ups and conducts chemical monitoring sampling at the same river and stream locations. The Missouri Stream Team Program was started in 1989 by the DNR and Mark Van Patten (a fisheries management biologist with the Missouri Department of Conservation) and resulted in Stream Team 1. Now there are over 5,000 Stream Teams in Missouri. The Stream Team Program provides local communities opportunities for education, stewardship, and advocacy through hand-on projects like streambank restoration, water monitoring, and storm drain stenciling, while also giving volunteers a chance to be the voice of their waterway, should a water-quality issue be discovered.

More information about the Missouri Stream Team Program can be found at: www.mostreamteam.org/ and mstwc.org/.

Mike Swoboda and Mark Kuechenmeister check stream flow with a tennis ball and a 10-foot rope. *(Photo by David Kuechenmeister)*

Mark Kuechenmeister tests a water sample for hardness. *(Photo by David Kuechenmeister)*

Volunteers Monitor Storm Drain Runoff as Part of First Flush

Each fall the Coastal Watershed Council, in partnership with the Monterey Bay National Marine Sanctuary and community volunteers, prepares to collect water samples from storm drain runoff as part of a regional monitoring effort in the Monterey Bay called the First Flush Event.

The goal of the First Flush Event is twofold: first, to serve as an education and outreach tool for the community regarding the impacts residents have on local water quality through urban runoff; and second, to collect scientifically valid water quality data to support environmental management decisions at the local and State levels. Results from First Flush Event are compared to the Water Quality Objectives in the Central Coast Regional Water Quality Control Board's Basin Plan.

Since the inception of First Flush in 2001, nearly 400 volunteers have been trained to collect water samples that are sent to a certified lab to assess levels of non-point source pollutants such as nutrients, metals, bacteria, and total suspended solids. Across those 15 years more than 1,300 analyses have been performed from samples collected in the cities of Santa Cruz and Capitola, California. For more information about First Flush contact the Coastal Watershed Council at info@coastal-watershed.org or (831) 464-9200.

Ian Hunter and Larry Detloff collect samples. *(Photo by Debi Chirco Macdonald)*

Jamie Heisch, Dave Hunter, and Shelby Skeezylas. *(Photo by Jim Tonolen)*

Christina Hayes collecting samples. *(Photo by Dan Kocher)*

Tribal News

Chippewa Tribe Removes Dam, Helps Fish Populations

In the 1920s, a dam was built to provide a water source for the Red Lake Band of Chippewa Indians' Fish Hatchery in northwestern Minnesota. Due to poor water quality, the reservoir has not been used as a hatchery in over 50 years. In 2008 an opportunity arose when a highway running over the dam was to be moved, requiring the dam to be removed or repaired. The Tribe elected to remove the dam and restore the stream to as near a natural state as possible. In 2014, the Red Lake Band of Chippewa Indians, in cooperation with the U.S. Environmental Protection Agency, the Minnesota Department of Natural Resources, and the Minnesota Department of Transportation, restored the Mud River in Redby, Minnesota, through the removal of the dam and the rebuilding of a series of rock riffles to accommodate the drop and allow fish passage.

Before removal, bioassessment of the stream indicated that 90 years of dam presence had taken its toll. Only 6 species of fish were found above the dam, and 3 species of freshwater mussels located immediately below the dam were not found above the dam. In addition, the mussel catch at sites above the dam were the lowest of all mussel survey sites on the Reservation. This came as no surprise since the mussels require a host fish in order to move, and with the dam creating an impassable 10-foot barrier, no fish had migrated upstream in nearly 100 years.

After dam removal, bioassessment surveys indicated immediate success. Between 2014 and 2015 the number of fish species upstream of the former dam site increased from 6 to 21. While mussel species have not yet had the opportunity to become established, the presence in the river of all necessary host species of fish is cause for great optimism. Biologists from Red Lake were especially excited to find freshwater drum in the stream since they are the sole known host species for the pink heelsplitter (a freshwater mussel found below the dam but not above). While the short-term data have indicated great improvement in the fish community health and diversity, a longer-term data set is expected to show improvements in other biological indicators, including mussels and other invertebrates.

Tools and Technology

Nutrient Sensor Challenge: Fall 2015 Updates

Attendees at the Nutrient Sensor Challenge Summit in Washington, D.C.

There has been a flurry of activity since the Nutrient Sensor Challenge launched in December 2014. A total of 29 teams registered to take on the Challenge goal of developing sensors that accurately, reliably, and affordably measure nutrients in water. To kick off the first phase of the Challenge, a Challenge Summit was held in Washington, D.C., on August 12th. The Summit served as an exciting gathering place for participants to learn how to succeed in both the Challenge and in the steps that come after winning. Beta testing began the following day on August 13th at the Chesapeake Biological Laboratory in Solomons, MD, and will continue at sites in Hawaii and Michigan in the coming months.

In addition to the Nutrient Sensor Challenge, several other innovative efforts are underway within the Challenging Nutrients Coalition. The Coalition convened in Solomons, MD, on August 13th to share successes and discuss future collaborations on innovative approaches to measure, understand, and reduce nutrient pollution. This work continues the Coalition's efforts to accelerate the development of affordable sensors to improve nutrient measurement, expand monitoring and forecasting of nutrient pollution, and ensure the effectiveness of nutrient management policies.

For more information, contact Denice Shaw at shaw.denice@epa.gov or visit www.nutrients-challenge.org.

Challenge participants using technology in the field in Solomons, MD.

Next-Generation Sensors Development Continues

Because the Nutrient Sensor Challenge has thus far been a great success, organizers would like to keep the momentum going by applying what is being learned to another set of parameters. This second effort, aimed at speeding the development of new technologies, will culminate in a workshop, or "Round Table" as it is being called, at the 2016 National Monitoring Conference (NMC) in Tampa. Denice Shaw, EPA-Office of Research and Development, and Mario Tamburri, Alliance for Coastal Technologies, are working with stakeholders including the Council's Aquatic Sensors Workgroup in this effort.

Between now and the 2016 NMC, the plan is to determine what the performance requirements should be if sensors could be developed for each of the following: Total N (nitrogen) and Total P (phosphorous); E. coli; Metals; and Harmful algal blooms (HABs). Calls and webinars will be held to identify the parameters with the greatest interest and potential for development of sensors. At the 2016 NMC, the group will meet and discuss the next steps towards affordable sensors in 3-5 years. Not all sensors will follow the same path; the hope is that this effort can help to push innovation forward.

For more information contact Denice Shaw (Shaw.Denice@epa.gov).

New Online Tool Tracks Water Quality in the Nation's Rivers and Streams

A new USGS online tool provides graphical summaries of nutrients and sediment levels in rivers and streams across the Nation. The online tool can be used to compare recent water-quality conditions to long-term conditions (1993-2014); download water-quality datasets (streamflow, concentrations, and loads); and evaluate nutrient loading to coastal areas and large tributaries throughout the Mississippi River Basin.

Graphical summaries of nutrients and sediment are available for 106 river and stream sites monitored as part of the USGS National Water-Quality Network for Rivers and Streams.

This tool was developed by the USGS National Water-Quality Assessment Program, which conducts regional and national assessments of the Nation's water quality to provide an understanding of water-quality conditions, whether conditions are getting better or worse over time, and how natural processes and human activities affect those conditions. Visit the tool at cida.usgs.gov/quality/rivers/home. For more information, contact Jeff Deacon (jrdeacon@usgs.gov).

See Past Webinars on Our YouTube Channel!

Visit our YouTube channel (www.youtube.com/user/NWQMC) to view recordings of our most recent webinars:

- Quality of Our Nation's Groundwater: Where and Why Is It Vulnerable to Contamination
- Microplastics in Great Lakes Tributaries
- Effective Science Communication with emphasis on visual science communication tools

Webinars are hosted frequently and cover a broad range of topics. New webinars are uploaded to this site shortly after the initial broadcast, and slides are available on the NWQMC's website. To subscribe to our Webinar Announcement Listserve, email chopkins@usgs.gov.

Nutrient Sensors Paper to Appear in Special Issue of JAWRA

Sensors and enabling technologies are becoming increasingly important tools for water quality monitoring and associated water resource management decisions. In particular, nutrient sensors are of interest because of the well-known adverse effects of excessive nutrient enrichment on coastal hypoxia, harmful algal blooms, and impacts to human health. An article to appear in an upcoming special issue of the Journal of the American Water Resources Association (Technical Paper - Open Water Data Initiative Feature Collection) authored by a multi-agency group that includes several members of the Council's Aquatic Sensors Workgroup, discusses the role of nutrient sensors and presents a vision for a future network in the United States.

The authors, from USGS, EPA, NOAA, USDA-ARS, and the Corps of Engineers, highlight the types of applications in freshwater and coastal environments that are likely to benefit from continuous, real-time nutrient data. They point out that the concurrent emergence of new tools to integrate, manage, and share large data sets is critical to the successful use of nutrient sensors and has made it possible for the field of continuous nutrient monitoring to rapidly move forward.

Several near-term opportunities for Federal agencies, as well as the broader scientific and management community, are highlighted that will help accelerate sensor development, build and leverage sites within a national network, and develop open data standards and data management protocols that are key to realizing the benefits of a large-scale, integrated monitoring network. The authors write that investing in these opportunities will provide new information to guide management and policies designed to protect and restore our nation's water resources. For more information, contact Brian Pellerin (bpeller@usgs.gov).

Spotlight on Harmful Algal Blooms (HABs)

EPA Releases Drinking Water Health Advisories for Cyanobacterial Toxins

Cyanobacteria and their toxins have been found in drinking water systems in the United States. On June 17, 2015, EPA published Drinking Water Health Advisory values for two cyanobacterial toxins, microcystin and cylindrospermopsin. The health advisories identify concentrations in drinking water at or below which adverse human health effects are not anticipated to occur over a 10-day exposure period. For cylindrospermopsin, EPA recommends 0.3 µg/L for bottle-fed infants, 0.7 µg/L for young children of pre-school age, and 3 µg/L for school-age children through adults. The health advisory value for microcystins is 1.6 µg/L for school-age children through adults. Information on testing methods and treatment techniques is also included in the advisory. Health Effects Support Documents provide a comprehensive review of the published literature on the chemical and physical properties of these toxins, the toxin synthesis and environmental fate, occurrence and exposure information, and health effects.

Beach on Marion Lake in Kansas with a posted warning indicating that a potentially harmful algal bloom is present. *(Photograph by Dr. Jennifer L. Graham, U.S. Geological Survey)*

Additionally, EPA has published a cyanotoxin management document as a companion to the health advisories. The document provides a framework that Public Water Systems (PWSs) can use to inform their decisions on managing the risks from cyanotoxins to drinking water. It includes a potential stepwise approach PWSs could use to inform their decisions on whether and how to monitor, treat the resource, and communicate with stakeholders.

To view the Health Advisories and technical documents, see: water.epa.gov/drink/standards/hascience.cfm#chemical.
To view the support document for managing cyanotoxins in drinking water, see: www2.epa.gov/nutrient-policy-data/more-information. For more information, contact Dr. Lesley D'Anglada, Office of Water at (202) 566-1125 or by e-mail at danglada.lesley@epa.gov.

Interagency Working Group Finalizing Research Plan and Action Strategy on HABs, Hypoxia

The Interagency Working Group (IWG) on the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA) is finalizing its first report, *Harmful Algal Blooms and Hypoxia Comprehensive Research Plan and Action Strategy: An Interagency Report.* The report is anticipated to be available by the end of 2015.

Over the past several months, members of the IWG solicited feedback on the needs and gaps related to harmful algal blooms (HABs) and hypoxia in order to develop a set of recommendations forming a research plan and action strategy for addressing these issues. The IWG held a series of five webinars and one in-person meeting, during which they spoke with representatives from a wide variety of industries and interests, including water and tribal resource managers, fishermen and agricultural producers, public health officials, planning officials, the academic community, members of the tourism industry, and members of the general public.

The primary messages that the IWG heard from stakeholders relate to communication. Foremost, groups asked for "one-stop shopping" for information about HABs and hypoxia. Stakeholders also felt that agencies need to collaborate on consistent messaging and expedited release of public health advisories.

Stakeholders mentioned that some of the most important tools for helping communities prepare for and mitigate effects of HAB and hypoxia events include monitoring, early warnings and predictions, and better understanding the causes and effects of such events. Mitigation and preparation also includes making better decisions regarding resource and funding management, as well as working to prevent economic and human and animal health impacts. The recommendations in the report relate directly to this feedback, emphasizing the need to:

- Create and improve testing and reference standards
- Better understand the causes and effects of HABs and hypoxia to improve prediction
- Expand monitoring programs
- Improve collaboration among Federal agencies and with stakeholders on communication efforts

Next steps for the IWG include holding additional webinars and meetings to discuss the formal outcomes and recommendations of this report, and to gather similar information for a plan on reducing, mitigating, and controlling hypoxia and HABs in the Great Lakes. To provide feedback on needs and concerns related to HABs and hypoxia in the United States or specifically in the Great Lakes, contact Caitlin.Gould@noaa.gov. For more information on HABHRCA or the efforts of the IWG-HABHRCA, visit coastalscience.noaa.gov/research/habs/habhrca.

Microcystin Concentrations in Minnesota Lakes

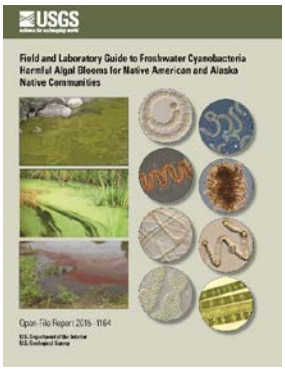
Minnesota has compiled a fairly extensive database on the cyanobacterial toxin microcystin (MC). The data in the database is acquired through targeted lake studies, incident-based investigations, and stratified random surveys as a part of the U.S. EPA's 2007 and 2012 National Lakes Assessments. The data provide a basis for (1) describing the influence sampling regimes have on reported MC values, (2) describing regional patterns in MC across three distinct Minnesota ecoregions, and (3) describing the relative risk of encountering elevated MC with respect to sampling regimes. Using this data, Minnesota has completed a statistical summary of all the Minnesota MC data collected by the Minnesota Pollution Control Agency from 2004 to 2012. This summary places MC concentrations in perspective for Minnesota and also provides a comparative database, which other entities that collect MC may use to place their results in perspective. The summary may be found at: www.tandfonline.com/doi/abs/10.1080/10402381.2014.917347.

Euglena sanguinea Bloom. Poarch Band of Creek Indians, Atmore, Alabama.*(Photograph by Barry Rosen, U.S. Geological Survey)*

Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities

Harmful algal blooms that are dominated by certain cyanobacteria are known to produce a variety of toxins that can negatively affect fish, wildlife and people. Exposure to these toxins can cause a range of effects from simple skin rashes to liver and nerve damage and even death, although rarely in people. The Native American and Alaska Native communities that are dependent on subsistence fishing have an increased risk of exposure to these cyanotoxins. The USGS recently published a guide containing microscopic images of cyanobacteria that are known to produce toxins to aid Native populations that may be exposed to algae blooms and cyanotoxins. Drinking water facilities may also find the field and laboratory guide particularly helpful.

It is important to recognize the presence of an algal bloom in a waterbody and to distinguish a potentially toxic harmful algal bloom from a non-toxic bloom. The new guide, available at dx.doi.org/10.3133/ofr20151164, provides field images that show cyanobacteria blooms, some of which can be toxin producers, as well as other non-toxic algae blooms and floating plants that might be confused with algae. After recognition of a potential toxin-producing cyanobacterial bloom in the field, the type(s) of cyanobacteria present need to be identified. Species identification, which requires microscopic examination, may help distinguish a toxin-producer from a non-toxin producer. This guide also provides microscopic images of the common cyanobacteria that are known to produce toxins, as well as images of algae that form blooms but do not produce toxins. For more information, contact Barry Rosen (brosen@usgs.gov).



The Indiana Department of Environmental Management Begins Fifth Year of Cyanobacteria Surveillance

2015 marks the fifth year that the Indiana Department of Environmental Management (IDEM) sampled select Indiana Department of Natural Resources (DNR) swimming areas for cyanobacteria (blue-green algae) and the toxins they produce.

When the program began in 2010, IDEM staff collected samples at 10 lakes and only analyzed the water for the microcystin toxin. Today, samples are collected from 16 swimming sites at 14 DNR lakes and checked for microcystin, anatoxin (a) and cylindrospermopsin.

IDEM scientists identify and count the cyanobacteria cells, and perform the toxin analysis using an Enzyme-Linked Immunosorbent Assay (ELISA) process. The sampling season coincides with DNR's swimming beach season, from Memorial Day through Labor Day. Water samples are collected on Mondays and Tuesdays, analysis is done on Tuesdays through Thursdays, and results are posted on Indiana's Blue-green Algae website (www.Algae.IN.gov) on Friday mornings.

DNR staff post signs at the swimming beaches and provide various alerts when cell counts and/or toxin levels are of concern. To date, no DNR swimming area has ever closed due to cyanobacteria.

For more information, contact Cyndi Wagner, Chief of the Targeted Monitoring Section, Office of Water Quality at cwagner@idem.in.gov.

Water samples are collected by IDEM Staff.

Example of sign posted at a swimming beach.

Nowcasting Cyanobacterial Harmful Algal Blooms at Freshwater Lakes

Predicting the occurrence of cyanobacterial harmful algal blooms (cyanoHABs) and associated toxins, such as microcystin, is an important goal for public health protection. A study led by the U.S. Geological Survey (USGS) was done at Ohio recreational lakes in 2013-14 to identify factors that could be used to develop models to predict microcystin concentrations. Water quality and environmental measurements were used to identify the potential for a system to quickly estimate microcystin levels and provide advisories to swimmers and boaters. This type of system has been used at Lake Erie beaches as part of the Ohio Nowcast (www.ohionowcast.info) for predicting *E. coli* concentrations, but has not been tested for cyanoHABs. Two different modeling scenarios were used: (1) real-time models that included easily- or continuously-measured factors and readily available environmental data and (2) comprehensive models that use results from discrete samples analyzed in a laboratory along with real-time factors. For real-time models, statistically significant correlations were found between microcystin concentrations and environmental factors including phycocyanin, turbidity, pH, inflow, and lake level change. Continuous water-quality measurements over 3–14 days up to the date of sample collection showed the highest correlations to microcystin concentrations. For comprehensive models, statistically significant correlations were found between microcystin concentrations and laboratory-measured factors including nutrient constituents, cyanobacterial genes (molecular methods), and measures of cyanobacterial biovolume or abundance. The relations between these factors and microcystin concentrations were site specific and even differed at the same site depending on whether data were continuously or discretely measured. Models with high R^2 values (0.82–0.91), 100% sensitivities, and high specificities (91–96%) were developed at one of the study sites for predicting microcystin concentrations above or below the Ohio Recreational Public Health Advisory level of 6 µg/L. Future studies should focus on collecting more frequent data on several consecutive days each week before, during, and after the cyanoHAB season to develop site-specific models to use in cyanoHAB nowcasts.

Agencies cooperating with the USGS on the project included Ohio Water Development Authority, University of Toledo, Clermont County Soil and Water Conservation District, Erie County General Health District, Ohio Department of Natural Resources, Ohio Environmental Protection Agency, and the U.S. Environmental Protection Agency.

The final report for the project, "Water Quality, Cyanobacteria, and Environmental Factors and Their Relations to Microcystin Concentrations for Use in Predictive Models at Ohio Lake Erie and Inland Lake Recreational Sites, 2013-14," is available at pubs.er.usgs.gov/. For more information, contact Donna Francy (dsfrancy@usgs.gov).

Recent Publications

The U.S. Geological Survey recently published a manual *Techniques and Methods Book 4, Chapter C4 "Design, Analysis, and Interpretation of Field Quality-Control Data for Water-Sampling Projects"* by David K. Mueller, Terry L. Schertz, Jeffrey D. Martin, and Mark W. Sandstrom. The manual describes how to incorporate quality control (QC) design into environmental sampling programs and is available on-line (water.usgs.gov/admin/memo/QW/qw2015.03.pdf). The types of field QC samples discussed in this report include various types of blanks, spikes, and replicates. Project-specific considerations, such as the objectives and scale of the study, and hydrologic and chemical conditions within the study area are a major emphasis. Project personnel can use this guidance to determine where and when QC samples should be collected as well as how many QC samples are necessary to achieve a given level of statistical confidence.

Upcoming Conferences and Workshops

North Dakota Water Quality Monitoring Council Annual Conference

North Dakota Water Quality Monitoring Council will host its 2016 North Dakota Water Quality Monitoring Conference -- March 2-4, 2016. The conference will be held at Bismarck State College's National Energy Center of Excellence. **For more information, visit:** www.ndwatermonit.org or contact: Mike Ell, North Dakota Department of Health, mell@nd.gov.

10th National Monitoring Conference - Working Together for Clean Water
May 2-6, 2016 - Tampa, Florida

Join us this coming spring in vibrant Tampa, Florida, for the biennial National Monitoring Conference, which provides many opportunities for water stakeholders to network, develop new skills and partnerships, and learn and exchange new information about water monitoring. The forum is designed for Federal, State, tribal, and local water professionals, non-profits, academia, and volunteer citizen scientists.

The 2016 conference will include oral presentations, posters, workshops, panels, short courses, and facilitated round-table discussions that cover topics related to monitoring rivers and streams, lakes, wetlands, coastal waters and estuaries, groundwater, and drinking water on the following topics:

- Monitoring Designs for the 21st Century
- Connecting Coasts, Estuaries, and Freshwater Ecosystems
- Innovations in Monitoring and Assessment
- Identifying and Assessing Emerging Risks
- Measuring Effectiveness of Water Management Actions
- Managing, Sharing, Communicating, and Mining Data
- Building Monitoring Collaborations
- Assessing Trends in Water Resources

For more information see the National Monitoring Conference website at acwi.gov/monitoring/conference/2016/

To submit an article, announcement, or photo for our Spring 2016 Newsletter, please contact: chopkins@usgs.gov