

National Water Monitoring News



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Dr. Christina Kellogg, USGS, collects water and sediment samples from North Shore Beach in St. Petersburg, FL with the iconic "St. Pete Pier" in the background. (Photo by Peter Richardson)



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 Scientists Christopher G. Smith (above), Nancy DeWitt (not shown), and Marci Marot (photographer) collect pore water from a shallow back-barrier tidal flat to help quantify groundwater fluid and constituent fluxes to bays and adjacent shelf along west-central Florida.



National Water Quality Monitoring Council

Working together for clean water



Words from the Council Co-chairs

Welcome to the 12th edition of the National Water Quality Monitoring Council's Newsletter!

By the time this newsletter is issued, many of you will be preparing to travel to Tampa Bay, Florida, to attend the 10th National Monitoring Conference. There you will have the chance to interact with nearly 700 fellow water-quality professionals, citizen scientists, and vendors who share a passion for monitoring, studying, protecting, and restoring our Nation's water resources. We'd like to thank members and friends of the Council who have worked tirelessly to make the upcoming conference a success, particularly those who participated on the Conference Planning Committee and its various subcommittees.

Conference attendees will network, develop partnerships and new skills, and exchange information and technology related to all water resources, including rivers and streams, lakes, wetlands, coastal waters and estuaries, groundwater, and processed water at concurrent technical sessions, poster sessions, exhibitor booths, at discussion panels and workshops, a new networking session, and a variety of field trips that highlight the varied water-quality issues and monitoring efforts in the Tampa Area. We also have an exciting slate of plenary speakers and will be honoring two individuals and one watershed group who have made significant contributions to the water-quality monitoring field. For those that can't make the conference, we'll provide a summary of conference highlights in the Fall 2016 newsletter and will post copies of presentations and posters to our website.

Despite all the hard work spent preparing for the 10th National Monitoring Conference, we are pleased to report that progress on other Council business and activities continues to be made. For example, the Water Information Strategies (WIS) work group worked with Council members to develop a 5-year strategic plan for enhancing the Water Quality Portal. This plan will be rolled out at the Conference in Tampa. The WIS work group is also working to complete additional fact sheets that are part of a series called "Water-Quality Monitoring – A Guide to Informed Decision-Making." Look for these at the Council booth in Tampa. We are also pleased to report that the Council has approved the formation of a new work group that will focus on the volunteer monitoring community (see page 3). Last, the Council continues to support outreach and communication on important water quality issues and has sponsored several well-attended webinars on a wide range of water-quality topics; such webinars are then posted on YouTube.

In closing, we hope you find the contents of our Spring 2016 newsletter of use in your water-quality monitoring work. We also invite you to submit your water-quality news, announcements, successes, challenges, and finding to our newsletter editors for the Fall 2016 edition of the Newsletter.

Best Regards,

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National Council Highlights

10th National Monitoring Conference – See You There!

We hope you're joining us in Tampa, Florida May 2-6 for the 10th National Monitoring Conference. Field trips, extended workshops and training, ample opportunities for networking, and a cavalcade of concurrent platform sessions on topics ranging from Harmful Algae Blooms to continuous monitoring to long term trend analysis...we've got it all! This popular biennial conference is sponsored by the National Water Quality Monitoring Council and organized by volunteers who work very hard to make it a special event. Registration is open through April 22, 2016 (or pay at the door). Visit our Conference website for more information, or contact conference co-chairs mayio.alice@epa.gov or oblinger@usgs.gov.



New! Council Establishes Volunteer Monitoring Working Group!

Volunteer water-quality monitoring or aquatic-based citizen science is a field in which community members volunteer their time to assess the status of our waterways. General goals of volunteer monitoring programs are to collect data of known quality and use those data to understand, protect and restore aquatic resources. Across the U.S., more than 1,700 volunteer water monitoring programs with over 1.3 million participating volunteers are sponsored by universities; local, state, tribal and federal government agencies; and nonprofit organizations. They use diverse operational models and answer a myriad of water quality and quantity questions. Many valuable outcomes have resulted from the data collected by these programs.

In February 2016, the Council agreed to create a new working group focused on volunteer monitoring (VM). The establishment of this new working group is timely for a number of reasons. First, there is a growing national interest in citizen science activities. Second, the volunteer monitoring community lacks the resources to connect on a national scale, and has a need for increased communication and collaboration, which the NWQMC is in a position to support. The purpose of the new work group is to engage in volunteer monitoring-related discussions with the intent to integrate

volunteer monitoring activities with ongoing water-quality monitoring conducted by local, state, and federal agencies. The VM Work Group's goals include:

- examine existing avenues and develop new approaches to most effectively support volunteer monitoring initiatives across the country;
- increase the volunteer monitoring opportunities at the National Monitoring Conference;
- assist with national communication (web site, newsletter articles, webinars, etc.);
- maintain a national directory of volunteer monitoring entities; and
- promote volunteer monitoring as a viable tool for agencies and organizations.

Stay tuned for more information on the VM work group and for potential opportunities to engage volunteer monitoring initiatives around the nation!

If you or your organization is interested in participating on the new Volunteer Monitoring Working Group, please contact Danielle Donkersloot at Danielle.Donkersloot@dep.nj.gov or Julie Vastine at vastine@dickinson.edu



Federal Partnerships

2010 National Coastal Condition Assessment

More than half of the nation's coastal and Great Lakes nearshore waters are rated "good" for biological and sediment quality, while about one-third are rated "good" for water quality, according to the 2010 *National Coastal Condition Assessment* (NCCA), released by U.S. Environmental Protection Agency (EPA) in January 2016. In almost all coastal waters, contaminants in fish tissue pose a threat to sensitive predator fish, birds, and wildlife. The NCCA is part of a series of National Aquatic Resource Surveys (NARS) designed to advance the science of coastal monitoring and answer critical questions about the condition of waters within the United States.

According to the NCCA, excessive phosphorus from sources such as sewage and fertilizer runoff is the most widespread water quality stressor. Selenium, which occurs naturally but may be increasing due to human activities, is the contaminant most widely found in fish tissue.

The NCCA is based on samples collected in 2010 at 1,104 coastal and Great Lakes nearshore sites across the country. EPA partnered with a broad group of stakeholders including state environmental and natural resource agencies, tribes, federal agencies, academia, and other organizations to help inform the many components of the assessment.

For more information, visit [EPA's NCCA website](#).

Algal Toxins Detected In One-Third of Streams Assessed In Southeastern United States

The USGS is working with the Federal Advisory Committee on Cyanotoxins, a class of toxins produced by various forms of blue-green algae, are a known public health concern. Public health practitioners and medical researchers have observed a range of symptoms in humans after exposure to the cyanotoxin microcystin. Symptoms include nausea, dermatitis and, in severe cases, liver failure. Toxicity issues have been reported for humans, companion animals, livestock and wildlife.

In a recent study that looked at 75 streams in portions of Alabama, Georgia, North Carolina, South Carolina and Virginia, USGS scientists detected microcystin in 39 percent of the streams they assessed. Although the maximum microcystin concentration measured in this study (3.2 µg/L) did not exceed the World Health Organization's moderate risk threshold (10 µg/L), further research is needed to understand the potential effects on water quality and related environmental health.

More information about this study can be found at the [USGS Toxics website](#).

USDA Forest Service Releases Findings on the Effects of Drought on Forests and Rangelands

A recently published report by the U.S. Department of Agriculture (USDA) Forest Service, [Drought Impacts on U.S. Forests and Rangelands: A Comprehensive Science Synthesis](#); presents current information on the impacts of drought on forests and rangelands throughout the U.S. The synthesis provides methods to quantify and monitor drought, assesses the consequences of drought, and identifies potential adaptation strategies for drought-impacted forests and rangelands.

The report establishes a comprehensive baseline of available data that land managers can use to test how well their efforts to improve drought resilience and adaptation practices are working nationwide. Major findings from the report include the following:

- Drought projections suggest that some regions of the U.S. will become drier and that most will have more extreme variations in precipitation.
- Drought and warmer temperatures may increase risks of large-scale insect outbreaks and larger wildfires, especially in the western U.S.



- Drought and warmer temperature may accelerate tree and shrub death, changing habitats and ecosystems in favor of drought-tolerant species.

The assessment, a broad review of drought research, provides input to the reauthorized National Integrated Drought Information System (NIDIS), established by Congress in 2006, and the National Climate Assessment (NCA), produced every four years to project major trends and evaluate the effects of global climate change on forests, agriculture, rangelands, land and water resources, human health and welfare, and biological diversity. Together these serve as key, science-based resources for anyone working to maintain or improve public and private lands in the face of a changing environment.

The synthesis was led by Forest Service scientists in partnership with Duke University and included the participation of more than 70 scientific experts from the federal agencies, research institutes, and U.S. universities.

Recent USGS Research on Coal-Tar Based Pavement Sealcoat Highlighted in New USGS Fact Sheet—Potential Concerns for Human Health and Aquatic Life

Sealcoat is the black, viscous liquid sprayed or painted on many asphalt parking lots, driveways, and playgrounds to protect the underlying asphalt and enhance its appearance. The coal-tar-based formulation, commonly used across the central and eastern parts of the United States, contains elevated levels of polycyclic aromatic hydrocarbons (PAHs) and related chemicals. Friction from vehicle tires abrades sealcoat into small particles that can be tracked indoors or washed down storm drains and into streams, potentially harming human and aquatic life.

Research by USGS scientists and their collaborators indicates that, for people who live adjacent to coal-tar-sealcoated pavement, ingestion of PAH-contaminated house dust and soil results in an elevated potential cancer risk, particularly for young children. Runoff from coal-tar-sealcoated pavement is acutely toxic to fathead minnows and water fleas, two species commonly used to assess toxicity to aquatic life, and exposure to even highly diluted runoff can damage DNA and impair DNA repair.

For more information, see tx.usgs.gov/sealcoat.html. Contact Barbara Mahler at bjmahler@usgs.gov or 512-927-3566 to request a printed copy of the Fact Sheet.



Academia and Other Water Organizations

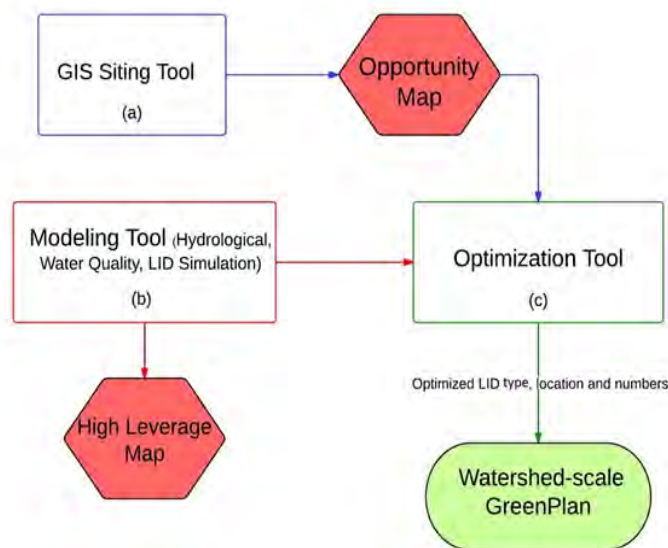
GreenPlan-IT: A Green Infrastructure Planning and Tracking Toolkit

The benefits of greening the urban landscape through Green Infrastructure (GI) are numerous, including water quality improvements derived from filtering storm water runoff, reduction of urban flooding risks, and increased groundwater recharge. Other benefits may include traffic calming effects, improvement of the bike/pedestrian environment, improved connectivity of green spaces

(and habitats for birds and wildlife), as well as beautification of neighborhoods and increased property values. The challenge for communities is to install GI practices that ensure their placement is optimized to yield the water quality and flow reduction outcomes mandated by National Pollution Discharge Elimination System (NPDES) permits.

Planners in the San Francisco Bay Area can rely upon GreenPlan-IT, a free tool that

is designed to support the cost-effective selection and placement of GI in urban watersheds. The GreenPlan-IT Toolkit is comprised of three tools: (a) a GIS-based Site Locator Tool to map and rank potential GI sites; (b) a Modeling Tool to determine baseline conditions and project runoff and pollutant load reduction from GI scenarios; and (c) an Optimization Tool that uses cost-benefit analysis to identify the best GI installation scenario within a watershed for achieving flow/load reduction goals. Tool outputs are used by municipalities to develop watershed master plans to guide future GI implementation to address water quality and quantity targets.



Phase I GreenPlan-IT Structure

The Modeling Tool is built on EPA'S SWMM, a spatially distributed hydrologic and water quality model. It is used to simulate the current baseline conditions (spatial distributions of storm water runoff and associated pollutants loads) and to quantify any reduction made from GI implementation across a watershed. The Modeling Tool can also support analyses of future flow and load conditions in relation to phased GI implementation (with reasonable assurance).

The Optimization Tool helps storm water managers select the best GI placement alternatives (among the many scenarios available) that satisfy user-defined management targets. An evolutionary optimization technique (Non-dominated Sorting Genetic Algorithm II) is used in conjunction with outputs from the Locator Tool and the Modeling Tool to evaluate the benefits (i.e., runoff and pollutant reductions)

and costs associated with various GI

implementation scenarios (i.e., location, number, type, and size of GIs), and to identify the most cost-effective options to achieve desired flow mitigation and pollutant reduction.

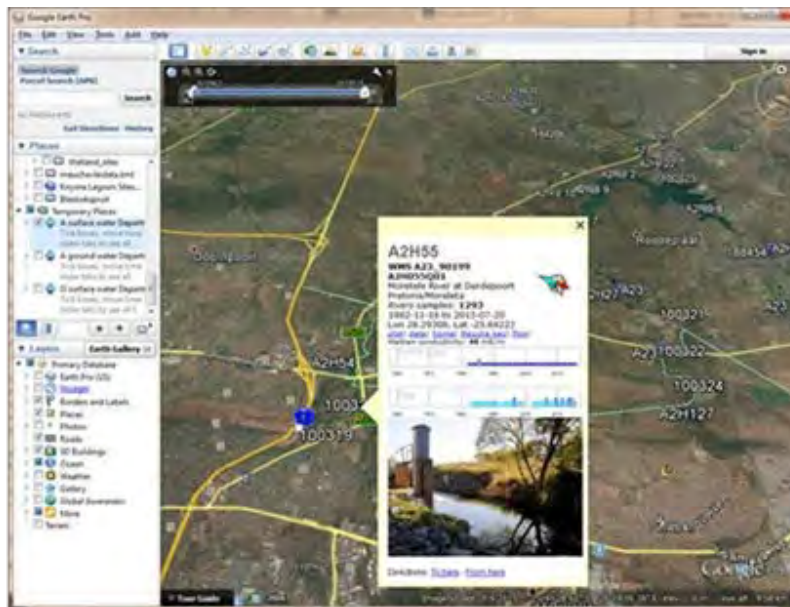
The Locator, Modeling, and Optimization Tools are currently available to download from a dedicated web site (greenplanit.sfei.org) where you will also find supporting user documentation. For more information, contact Jennifer Hunt at jhunt@sfei.org.



Water Quality Data Visualisation in South Africa

The South African Department of Water and Sanitation operates a number of water monitoring programs across the country. The Department has been using free software (Google Earth) since 2005 to make its national water quality database more accessible. Water managers, scientists and citizens download KML files for any of the major watersheds, and can view the various kinds of monitoring sites with imagery Earth in the background. Pollution sources are immediately revealed in relation to water supplies, helping in assessment of risk and management of monitoring networks.

Clicking on a monitoring site brings up an information panel with a summary of the water quality record and links to more detailed information, including graphs, tables and flow data, if available. A Maucha diagram, similar to a Stiff diagram, symbolises the composition of the major ions, quickly showing any deviation from "natural" conditions (for example, higher than normal sulphate from acid mine drainage).



An example of the image produced from a site that receives runoff from a residential catchment with moderate pollution; the Maucha diagram symbolizes calcium-magnesium-bicarbonate water type expected for this region.

Behind the scenes, R scripts run at regular intervals to query the water quality database and generate the static web pages, KML files and images required for the system to work. Local Internet connection speeds and firewall limitations have made this approach more suitable than a system providing interaction with the live dataset. More recently, the Department has experimented with the JavaScript leaflet library for mapping microbial water quality, and with dashboards for showing data from multiple sources. To improve response times, the dashboards use subsets of the contributing data sources.

For more information, contact Mike Silberbauer at SilberbauerM@dws.gov.za. Examples of leaflet maps are available [here](#), and information about the data dashboards is available on the Department's [webpage](#).

Spotlight on States

Documenting Baseline Radiochemistry in the Delaware River Basin

The oil and gas industry, and the regulatory agencies that oversee them, have long recognized that naturally occurring radioactive materials (NORMs) can be released to the environment through natural gas extraction processes. On February 26, 2011, the *New York Times* (NYT) published an article and provided a supplemental spreadsheet documenting radioisotope activities in spent hydraulic fracturing water, a byproduct of natural gas development activity. The Delaware River Basin Commission (DRBC) compared the NYT data set to its own surface water quality standard for gross-alpha radioactivity and found that all but one of the measurements were above DRBC's standard.



DRBC staff prepare and document radiochemistry samples.



Some natural gas development activities (e.g., development of well pads, hydraulic fracturing) are not currently permitted in the Delaware River Basin; DRBC staff recognized that there was a limited window of opportunity to characterize pre-gas drilling baseline conditions in the upper section of the Delaware River Basin. From January 2014 through May 2015, DRBC collected surface water samples from 32 sites on the Delaware River and in major tributaries where hydraulic fracturing would be most likely to occur if allowed. This work was performed with financial support from the William Penn Foundation. Samples were analyzed by the New Jersey Department of Health Laboratory for the following parameters:

- Gross alpha & gross beta (Method: NJDHSS ECLS-R-GA & GB evaporation)
- Radium-226 + Radium-228 (Method: NJDHSS ECLS-RQA-RA226/228)



DRBC staff collect water samples from the Delaware River for radiochemistry analysis.

The data show that all results in all locations were well below DRBC water quality standards for alpha emitters and beta emitters. Monitoring results acquired under this program have allowed DRBC to establish a solid radiochemistry baseline for comparison with future radiochemistry levels, including levels that could occur if natural gas development activities are permitted in the Delaware River Basin.

For more information on this project contact John Yagecic (John.Yagecic@drbc.nj.gov). The final report from this project, including access to the analytical data, is available on the DRBC web site at [this link](#).

Emerging Contaminant Causes Concern: 1,4-Dioxane in Surface Water

1,4-dioxane (C₄H₈O₂) is an emerging contaminant of concern that was monitored in drinking water throughout the U.S. as part of the EPA's Third Unregulated Contaminant Monitoring Rule (UCMR3). 1,4-dioxane is a clear, highly miscible liquid used or produced as a byproduct during certain industrial and manufacturing processes, and is found in low concentrations in many consumer products; it is also classified as a probable human carcinogen, with an EPA drinking water health advisory level of 0.35 µg/L.

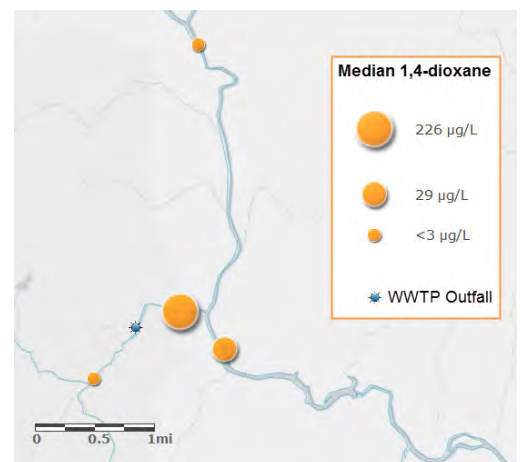
In September 2015, the North Carolina Division of Water Resources completed the first year of an ongoing study designed to measure ambient surface water concentrations of 1,4-dioxane and identify potential sources of it in Cape Fear River Basin, North Carolina's largest river basin. According to UCMR3

data, this river basin exhibits some of the highest concentrations of 1,4-dioxane in finished drinking water in the nation.

Study results indicated that most elevated 1,4-dioxane concentrations occurred in surface waters downstream from domestic wastewater treatment facilities. Mean concentrations in these areas ranged from 79 µg/L to 350 µg/L, while in other areas of the state the mean ranged from <3 µg/L to 42 µg/L. As no known inputs of 1,4-dioxane occur in the treatment process itself, and conventional wastewater treatment processes have varying levels of removal efficiency, it was determined that wastewater treatment plants act merely as conduits for this contaminant. The Division is working with wastewater dischargers and industries to reduce, eliminate and/or capture and treat 1,4-

dioxane at the sources, and will continue to monitor this contaminant, potentially expanding the study into other North Carolina river basins.

A brief report on the initial 1-year study can be found [online](#). For additional information, contact Carrie Ruhlman (carrie.ruhlman@ncdenr.gov).



Concentration of 1,4-dioxane in samples collected from the Cape Fear River Basin.

First Annual Great Swamp Watershed Report Card Published

The Great Swamp Watershed Association (GSWA) has been involved in monitoring streams in New Jersey's Great Swamp Watershed since 1999. For much of that time, a thorough investigation of stream health has been done through water quality monitoring for chemical, visual, and biological components. In an effort to better communicate the results of these monitoring programs and answer the common question "How's the water?" GSWA recently published the first annual *Great Swamp Watershed Report Card*.

The Report Card grades each of the five major streams in the watershed based on all of the data collected during the calendar year. Results are laid out in an easy-to-read format that is accessible to the general public, local officials, and others with a non-technical background. The Report Card notes where issues are present, potential reasons why, and recommendations to improve local water resources.

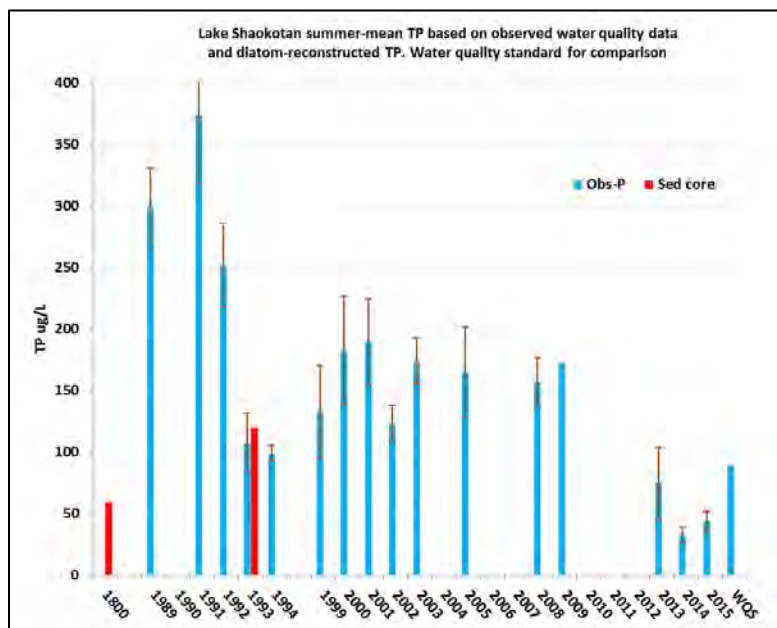
To create the Report Card, GSWA staff and volunteers researched report cards, water quality indices, and guidance documents published by other organizations and then created grading scales based on existing standards and ecological impact. All data that was collected during the year, as well as the methods and grading scales used to create the Report Card, are available at www.GreatSwamp.org. For more information about the Great Swamp Watershed Report Card, contact Laura Kelm, GSWA Director of Water Quality Programs at lkelm@greatswamp.org.

SLICE of Monitoring Shows Lake Improving in Minnesota

The Minnesota Pollution Control Agency (MPCA) uses a long-term monitoring program called Sustaining Lakes In a Changing Environment (SLICE) to track water quality and health of aquatic life habitats. The program has proven valuable in tracking improvements to Lake Shaokatan, a shallow prairie lake in an agricultural watershed in western Minnesota.

The lake has a history of water quality problems, including severe nuisance blue-green algal blooms, low oxygen levels in summer and winter, and periodic fish kills. Starting in the early 1990s, local and state partners worked to address agricultural, residential, and urban sources of pollutants. Now the lake is healing, as evident in these monitoring results:

- Phosphorus concentrations in 2013-2015 registered some all-time lows, well below the impairment level (see chart), and resulted in less frequent algal blooms.
- Inflow monitoring in 2014 indicated much lower phosphorus, compared to the early 1990s.
- Water clarity averaged 6.3 feet (1.9 meters) in both 2013 and 2015.
- In 2014 and 2015, chlorophyll-a remained below 20 parts per billion (ppb) all summer, a level indicative of nuisance blooms; the average was 10 ppb, a stark contrast to typical summer-means of 60-70 ppb.
- In 2014 and 2015 the composition of the algae shifted, with diatoms and other forms present on all sample dates, in contrast to most summers when the blue-greens *Anabaena* and *Aphanizomenon* were the dominant forms.
- Rooted plants were evident in 2014-2015, and a Minnesota Department of Natural Resources survey indicated many native species.



Mean Total Phosphorous in Lake Shaokatan over time.

It is too early to tell if the 2014 and 2015 phosphorus and chlorophyll-a concentrations will become the new norm for Lake Shaokatan. Monitoring will continue in 2016 through SLICE and provide an opportunity to continue to track changes in the condition of this lake. For more information, contact Steve Heiskary (Steven.Heiskary@state.mn.us).



Alaska Water Quality Map

The Alaska Department of Environmental Conservation Division of Water has developed an interactive Water Quality Monitoring Map. The map displays results of marine and freshwater quality monitoring surveys conducted throughout the state. Types of data displayed include parameters for water quality, habitat characterization, fish assemblage, benthic macroinvertebrates, diatoms, plants, and sediment and soil data.

The interactive map pulls data from the Ambient Water Quality Monitoring System (AWQMS) database, which contains data from various state, federal, non-governmental, and Tribal entities working in Alaska. Data are extracted from AWQMS nightly and the resulting map is published online. A pop-up in the map allows users to see information about the specific monitoring location, while a link allows results to be downloaded in a variety of formats.

The map is [available to the public](#) through the Alaska Department of Environmental Conservation Web Maps page. For more information contact Amber Bethe at amber.bethe@alaska.gov.



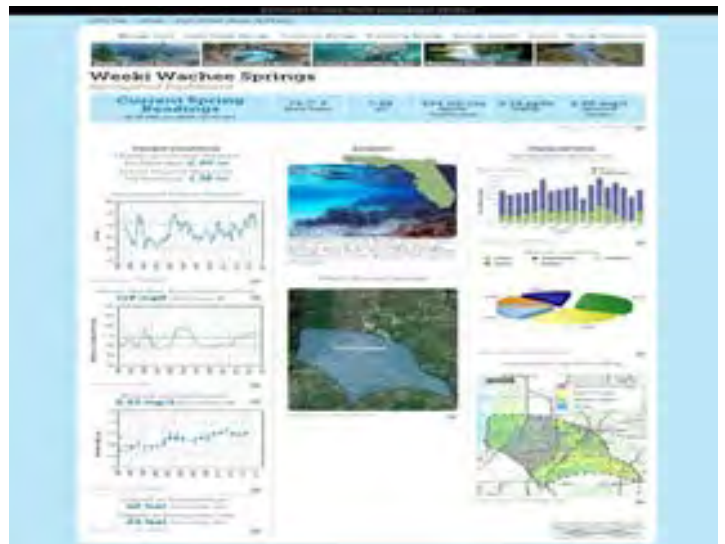
Map showing sites in AWQMS.

Water District Keeps the Public Informed About Spring Systems through Real-Time Dashboards

Florida has the largest concentration of natural springs in the world. Springs have tremendous ecological value, are a “window” to the aquifer which provides the majority of potable drinking water to the state, provide a variety of recreational opportunities and are important to the local economy. Over time, springs throughout Florida have been threatened by human activities, climate change and other factors. As a result, the Southwest Florida Water Management District (District) has implemented a variety of techniques including research, water resource monitoring, restoration and education to address each spring system’s unique challenges.

In an effort to provide the public with greater information about the health of the five first-magnitude spring systems in its region, the District developed a series of springs dashboards. The dashboards feature interactive land-use maps, water-use charts and graphs that portray trends in hydrologic and water quality conditions, as well as real- and near-time scientific data.

To view the dashboards, visit the [District’s website](#).



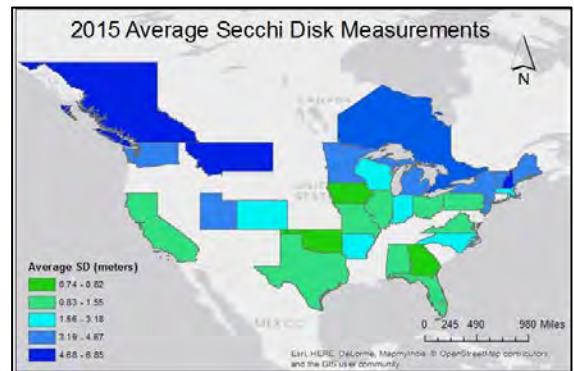
The Southwest Florida Water Management District utilizes dashboards to post land-use maps, water-use and water resource data to inform and educate the public on conditions of first magnitude springs.



Volunteer Monitoring News

The 2016 Secchi Dip-In

The Secchi Dip-In is an ongoing program using trained volunteers to gather long-term water clarity data in the summer of every year. Secchi Dip-In participants are primarily trained volunteer monitors who are interested in citizen science and enthusiastic about their local lakes. The Dip-In was started in 1994 by eminent limnologist Dr. Robert Carlson to enable volunteers to submit water clarity measurements to a national database and to evaluate water clarity conditions on a variety of scales, from local to national. Over the past 20 years, the Dip-In database has grown to include more than 41,000 records on more than 7,000 individual waterbodies. In 2015, Dr. Carlson transferred the operation of the Secchi Dip-In to the North American Lake Management Society (NALMS). For a snapshot of the 2015 lake condition findings, see the [2015 Secchi Dip-In report](#).



Average Secchi measurements collected as part of the 2015 Secchi Dip-In by state.

The 2016 Secchi Dip-In organizers are committed to expanding citizen science across the United States. This year's Dip-In will include recruitment of individuals and volunteer monitoring programs to gather water clarity measurements on waterbodies not currently being monitored. A Lake Observer mobile app, developed under collaboration with the USEPA, NALMS and the Global Lake Ecological Observatory Network (GLEON), will enable citizen scientists to easily submit water quality data collected during the Secchi Dip-In using their smart devices. Program leaders are motivated to address the gaps in waterbody monitoring and analyze trends in data under a changing climate.

This year's Dip-In will take place in July, Lakes Appreciation Month. A variety of water quality parameters are accepted, including transparency, temperature, dissolved oxygen, and pH. Anyone can view data on the [Dip-In's website](#) but an account is required to submit water parameters. For more information, contact Lauren Salvato at secchidipin@nalms.org

Iowa Volunteer Cleanup Effort Surpasses 1,000 Mile Benchmark

In 2003, the adventure known as Project AWARE set forth to connect Iowans with the water resources they love. Project AWARE, which stands for A Watershed Awareness River Expedition, is the Iowa Department of Natural Resources volunteer river cleanup. Each year since 2003, volunteers have cleaned up a different river and watershed. People come together to paddle, learn about the river and the communities along it, conduct IOWATER testing, and experience firsthand the water quality opportunities and challenges across Iowa. The group enjoys the Iowa summer weather while doing their part to clear trash and debris so others can enjoy these waters in the future.

From the first mile paddled in 2003 to the 1,000th mile in 2015, the Iowa river cleanup event and its volunteers have made a massive impact: 337 tons of trash removed (*with 76% recycled!*) from Iowa's rivers by 3,700 volunteers with the support of 1,000 sponsors.

Project AWARE was inspired by Chad Pregracke, creator of *Living Lands and Waters*, and his efforts on the Mississippi River. Chad demonstrated how an individual cleaning up the Mississippi River could transform the power of one into the power of many. Historically, Project AWARE has averaged 80-100 river miles each summer during the weeklong event.

For more information, visit the Project AWARE website at www.iowadnr.gov/aware.



Volunteers at Project AWARE with removed trash.



The Saginaw Chippewa Indian Tribe Source Tracks *E.coli* Contamination in the Chippewa River

The Saginaw Chippewa Indian Tribe (SCIT) Water Quality Monitoring Program has consistently found elevated levels of pathogens (coliform and *Escherichia coli* or *E.coli*) in the Chippewa River since 2008. The Chippewa River is a partial source of drinking water for the City of Mount Pleasant, Michigan and is used frequently for recreation in the summer. The Water Quality Team suspected human waste as a primary source for the *E.coli* contamination in the Chippewa River.

In 2015, the SCIT received funding from the EPA to investigate the source of the contamination. The objective of the investigation was to determine whether human waste contributed to the problem; source tracking and DNA analysis created a powerful approach to understanding the source of contamination. The SCIT, with assistance from Central Michigan District Health Department (CMDHD) and the Michigan Department of Environmental Quality (MDEQ), identified over 20 sites to investigate including streams, creeks, and county drains. The samples were analyzed for levels of *E.coli* and total coliform by the SCIT. The SCIT utilized Environmental Canine Services, LLC (ECS) for the source tracking portion of the investigation. ECS canines are trained to detect the presence of human waste in a water body while ignoring any animal waste contamination. Saginaw Valley State University (SVSU) conducted the DNA analysis to confirm the presence of human waste in the water. DNA samples were analyzed at locations where canines gave positive alerts for human waste.



Canine Kenna with ECS, LLC using scent-tracking to search for human sewage in a drain during field investigations. (Photo taken by ECS.)

Two canines (K9), were brought to locations with previously identified elevated *E.coli* levels. Out of 20 sample sites, both canines responded similarly on 17 sites. The canines alerted more strongly at some sites than others. Many of these sample sites exceeded the *E.coli* Michigan Water Quality Standards of 300MPN for the Daily Geometric Mean. DNA data confirmed human waste for 8 of the 14 samples canines indicated. The DNA analysis detected levels of human DNA greater than or equal to 24.199 target sequence copies per five microliters, indicating human sewage leads to *E.coli* contamination in the Chippewa River Watershed. The SCIT and CMDHD are working to address the issue. For more information on this project, contact Aiman Shahpurwala, Water Resource Technician, at ashahpurwala@sagchip.org.

Tools and Technology

Water Quality Data Sheds Light on Coral Bleaching

Vibrant coral reefs bustling with life have faded into pale underwater ghost towns, threatening biodiversity around the world. Over the past 30 years, massive bleaching events in the Caribbean caused by algal blooms have alarmed scientists. Especially in the face of increasingly warm El Niño weather cycles, researchers are concerned about the ability of reef ecosystems to recover from these events. Continuous monitoring at the Smithsonian Tropical Research Institute (STRI) in Bocas del Toro is shedding light on water quality in these sensitive coral habitats. Water quality sondes continuously gather data from a platform in Panama's Almirante Bay, revealing seasonal changes in water temperature, salinity, turbidity, pH, blooms of plankton or algae, and other variables.



Sonde measuring water quality parameters on a coral reef.

Study locations are visited every two weeks to measure depth, dissolved oxygen, pH, chlorophyll and turbidity, shedding light on water quality parameters that can impact the health of coral and algae. Nutrient (using chlorophyll as an indicator), sediment



(measured as turbidity) and heavy metal levels in the bay are heavily influenced by human activity. In 2010 and 2011, a study examined the effects of pollution from banana farms along the Changuinola River and discovered that flushes of nutrients from fertilizer runoff fed large blooms of plankton. The easy availability of microscopic food temporarily decoupled the symbiotic relationship between algae and the bay's dominant coral species, which thrives when it can feed itself. Additional studies are striving to document the effect of fertilizer runoff on both coral and zooanthellae in the bay, and to study how nearby plant communities can help restore water clarity.

This study is just one in the Smithsonian's Marine Global Earth Observatory (MarineGEO) program, a detailed, long-term survey of coastal water conditions and life forms. The program, launched in 2015, is channeled through the Smithsonian's web servers to provide near-real-time data to scientists and other interested people around the world. For more information, please visit www.stri.si.edu or an article on the monitoring data at www.ncbi.nlm.nih.gov/pubmed/24254491.

Upcoming Conferences and Workshops

2016 Tribal Lands and Environment Forum

The annual Tribal Lands and Environment Forum (TLEF) will be taking place at Mohegan Sun Resort in Uncasville, Connecticut on August 15-18, 2016. The forum will feature special trainings, field trips, and breakout sessions focused on solid/hazardous waste management, brownfields, UST/LUSTs, Superfund sites, and emergency response. Breakout sessions include trainings and field trips related to tribal water programs – water quality, drinking water, and habitat restoration (including wetlands, streams and fisheries).

Please visit our website at www7.nau.edu/itep/main/Conferences/confr_tlef for more information, or contact Todd Barnell: todd.barnell@nau.edu

Publications of Interest

Emerging Tools for Continuous Nutrient Monitoring

A new open-access article on nutrient sensors was published in the February 2016 issue of [the Journal of the American Water Resources Association](#). The article was authored by an interagency team led by Dr. Brian Pellerin of the U.S. Geological Survey and coauthored by other leaders in nutrient sensor development and applications from the U.S. Environmental Protection Agency, the National Oceanic and Atmospheric Administration, the University of Louisiana-Lafayette, the Department of Agriculture's Agricultural Research Service, and the

U.S. Army Corps of Engineers. The article describes a vision for the broad application of nutrient sensors to a variety of eutrophication problems in fresh and marine waters. Using nitrate sensors as the primary example, the article highlights the types of applications in freshwater and coastal environments that are likely to benefit from continuous, real-time nutrient data. 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

monitoring to rapidly move forward. The article also highlights several near-term opportunities for the scientific and management community 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. For more information, contact Brian Pellerin (bpeller@usgs.gov).



U.S. Forest Service R&D Newsletter

A monthly newsletter from USDA Forest Service Research and Development features news and updates from the Washington Office and Research Stations. This monthly newsletter series contains articles on water, fish, wildlife, invasive species, and climate change. Recent issues include reports of interest to water professionals such as research on trout hybridization in the western mountains, effects of riparian vegetation on water temperature in streams, and impacts of drought on U.S. forests and rangelands.

Click here for the [January issue](#) of the USDA Forest Service R&D Newsletter. Please distribute it via your social media channels (i.e. Twitter, Facebook, etc.) and encourage your followers to subscribe!

Managing California's Environmental Information

Researchers who study water resources often end up “reinventing the wheel” when trying to reach conclusions, in part because data management and exchange mechanisms within the local science community remain in an infancy stage. Streamlining the collaboration of environmental data collected by various State and federal agencies in California's Sacramento-San Joaquin Delta is the goal of a white paper synopsis entitled “Enhancing the Vision for Managing California's Environmental Information.”

The paper outlines how each day monumental amounts of environmental data are collected by various State and federal agencies. Information is often inaccessible to others either because of its sheer size or the incompatibility of competing information systems. This inability to retrieve large amounts of data from so-called “agency silos” creates inefficiencies for decision-makers who require more timely facts and figures. While resolving data integration challenges will not, by itself, produce better science or better natural resource outcomes, progress in this area will provide a strong foundation for decision-making. Various mandates ranging from the California Water Action Plan to the President's executive order demanding federal open data policies demonstrate the consensus on the merits of modern data sharing at the scale and function needed to meet today's challenges.

Visit this [website](#) to download the paper, or direct any questions about the paper to Tony Hale at tonyh@sfei.org.

Natural Inquirer Focused on Freshwater

The Freshwater issue of Natural Inquirer, a journal written for middle school students, contains seven articles focusing on freshwater topics. Articles include research on drinking water watersheds, freshwater mussels, quality and movement of organic matter in Caribbean watersheds, stream temperature and Chinook salmon, and chemicals in urban waterways. Access the issue [here](#).

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