



Selected Accomplishments and Priorities Through 2010



The National Water Quality Monitoring Council (Council) provides a national forum for coordination of consistent and scientifically defensible methods and strategies to improve water quality monitoring, assessment and reporting, and promotes partnerships to foster collaboration, advance the science, and improve management within all elements of the water quality monitoring community. Vital to this role is providing a voice for monitoring practitioners across the Nation and fostering increased understanding and stewardship of our water resources.

The Council was created in 1997 as a vehicle for bringing together the diverse expertise needed to develop collaborative, comparable, and cost-effective approaches for monitoring and assessing our Nation's water quality. The approaches are fundamental to the successful management and sustainability of our waters, and are increasingly important because water issues are becoming more complex, resources are tighter, and the demand for high-quality water continues to grow in order to support a complex web of human activities and fishery and wildlife needs.

Each year, thousands of government agencies, academic researchers, volunteers, industry and other organizations throughout the U.S. dedicate significant resources to monitoring, assessing, protecting, and restoring our water resources and watersheds. Despite such efforts, understanding the condition of the Nation's waters has been limited and fragmented by differences in monitoring designs, sampling and analytical methods, metadata, data management, and information dissemination.

This briefing sheet highlights selected accomplishments and Council priorities through 2010 to improve data comparability and reliability; data management, sharing, and reporting; and collaboration through its three workgroups *Methods and Data Comparability Board*, *Collaboration and Outreach*, and *Water Information Strategies* (see pages 2-4).

Also highlighted are updates to the design and implementation of the National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries ("Network"), which was initiated by the Council in 2004 in response to a recommendation by the U.S. Commission on Ocean Policy, and provides critical information for the management of coastal waters and their tributaries at regional and national scales (see pages 4-6).

As demonstrated in this briefing sheet, Council goals pursued by the three workgroups and Network are increasingly achievable as technology and expertise advance in data collection and exchange, assessment, and reporting.

The Council is representative of federal, state, interstate, tribal, local, and municipal governments; watershed and environmental groups; the volunteer monitoring community; universities; and the private sector, including the regulated community.

The Council is co-chaired by the U.S. Geological Survey and U.S. Environmental Protection Agency and is chartered as a subgroup of the Advisory Committee on Water Information (ACWI) under the Federal Advisory Committee Act.

Council members are organized into work groups including on Collaboration and Outreach, Water Information Strategies, and the Methods and Data Comparability Board.

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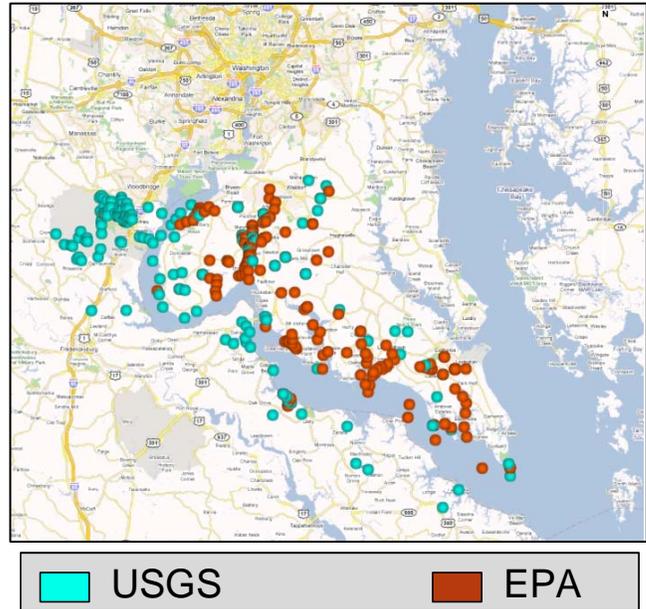
Compatible web services for water quality exchange

A USGS/EPA Agreement on the Management of Water Quality Data, signed January 13, 2003, has resulted in compatible web services allowing retrieval of data from multiple sources in common formats for direct use in mapping, statistical, and modeling applications. The ability to retrieve data in common formats simplifies the task of bringing together a wide range of information that can be used to describe and better understand the status and trends of water quality in watersheds and aquifers across the Nation. In addition, these web services enhance the efficiency and comprehensiveness of water-quality information delivered to water managers, policy makers, and the public.

In 2008, chemical, physical, and biological data from the National Water Information System (NWIS) of the USGS (<http://qwwservices.usgs.gov>) and data housed in the Storage and Retrieval (STORET) of the EPA

(<http://www.epa.gov/storet/wqx.html>) were made readily accessible online in a compatible format. The shared data exchange format is called the Water Quality Exchange (WQX), which employs data elements developed through the Council. Data collected by USGS and by states and tribes (submitted to EPA-STORET) thereby conform to a common nomenclature for biological and physical elements, chemical substances, chemical groups, sites, types, and sampling media. In total, over 150 million water-quality results are available from the two systems.

A top priority is to continue the development of the web services for more user-friendly provision of data and interactive mapping, as well as access from a single, national, water-data portal. The Council supports the continued development of the web service, and recognizes it as a key element in achieving Council and Network goals.



Application of the Water Quality Exchange (WQX) along the lower Potomac River, yielding a merged dataset that includes 161 USGS-NWIS sites and 169 EPA-STORET sites.

Collaboration and Outreach Workgroup – Works to build partnerships that foster collaboration and communication within the water-quality monitoring community.

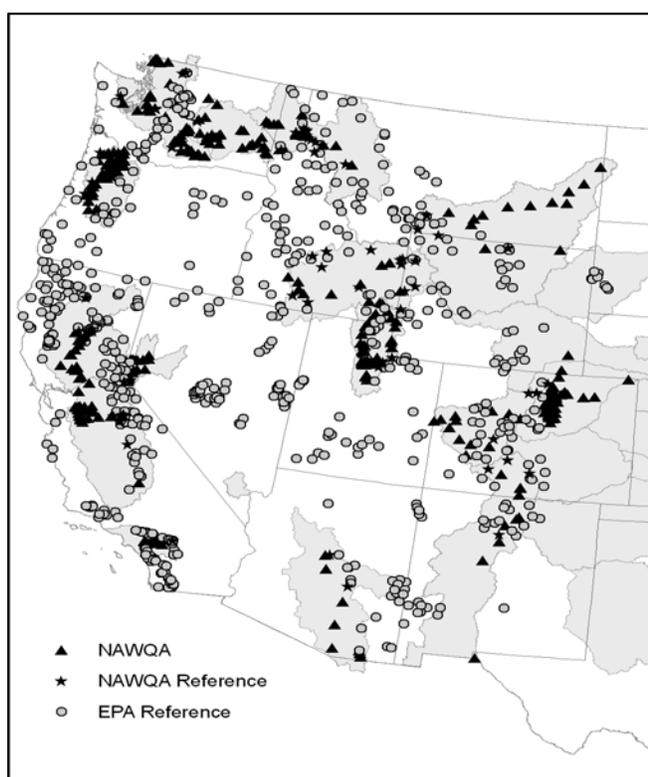
- **National conferences:** One of the main drivers for Council activities and centerpiece forum for communication and collaboration among the monitoring community is the Council's biennial national conference. In May 2008, the 6th biennial national monitoring conference, held in Atlantic City, NJ, provided a national forum for more than 400 monitoring practitioners from all backgrounds to present improved strategies for water quality monitoring, assessment, and reporting, as well as to foster collaboration and coordination among governmental organizations, volunteers, academia, watershed and environmental groups, and the private sector. A top priority of the workgroup is to plan and host the 7th national conference in April 2010 in Denver, Colorado.
- **Online newsletter:** Starting in 2009, a bi-annual, online newsletter—*Monitoring News*—will provide another forum for communication to the water community, and will highlight Council and workgroup updates, success stories and relevant topics on monitoring and assessments, related upcoming events and conferences, and grant timelines.
- **Support for state and regional councils:** Actions are planned to develop a “How to Tool Kit” for initiating and maintaining successful councils, and to create communication forums for sharing successes and challenges among the different state and regional councils across the U.S. (currently around 17). Communication forums could include, for example, the web, cyber seminars, articles in the Council newsletter, and national conferences.

Water Information Strategies Workgroup – Defines and promotes strategies for monitoring designs; data management, access, and exchange; data integration and analysis; and information reporting to address water needs.

- **Integrated assessments:** In 2009, an issue paper will be developed on the benefits and challenges associated with integrated assessments that include data collected from different programs and monitoring schemes. Companion materials are planned to communicate the information to meet different audience needs, including a detailed technical paper for the active monitoring and management community and a fact sheet for policy makers. The goal is to illustrate the range of objectives and water issues addressed by different monitoring designs, and the value of integrating the different data (such as linking probabilistic surveys with data from fixed and targeted stations) into an integrated assessment that can answer questions beyond what the individual programs can address. Case studies will be included to highlight the benefits of integrated assessments, including enhanced geographic coverage, improved temporal understanding (seasonal and long-term trends), and enhanced understanding of the natural and human factors that affect water quality and biological condition (see example below). Examples will also show relevance to management questions and needs, such as Total Maximum Daily Loads (TMDLs), regulations, compliance, assessment, trends, and indicators.

Integrated Assessment of Biological Condition in Western Streams

An integrated assessment of invertebrate communities in streams in the western U.S. is based on data from the U.S. Environmental Protection Agency (EPA) Wadeable Stream Assessment (WSA) and from the U.S. Geological Survey (USGS) National Water-Quality Assessment (NAWQA) Program. NAWQA data represent invertebrates sampled in approximately 400 streams within 16 large river basins (or study areas), including 87 reference sites (which are sites that represent the best possible stream ecological condition for a particular region). EPA data represent invertebrates sampled at more than 640 reference sites. Ecologists assessed comparability of the two sets of data and developed a modeling tool that allowed for quantification of bias due to any methodological differences and model uncertainty (or level of confidence) in assessing biological condition. The integrated assessment provides a regional context for NAWQA data and allows direct comparisons among the different NAWQA study areas, as well as an increased understanding of the factors that can affect water quality and biological condition throughout the western region. The findings showed how land use has influenced the presence and abundance of native invertebrates, which, thereby, helps to anticipate the types of invertebrates expected in streams and the relative health of invertebrate communities. Similar integrated assessments of different types of data are also underway in the eastern U.S.



- **National indicators:** Actions are ongoing to assess state interests in defining and applying national indicators to meet their management and data needs and the potential for integration of state data in national indicator efforts, such as the National Environmental Status and Trends (NEST) effort and the Heinz Center's Roadmap to the Future (http://www.heinzctr.org/ecosystems/2008report/pdf_files/Roadmap_Future_Report.pdf).
- **Volunteer monitoring:** Actions are planned to actively promote volunteer monitoring through interaction with state and regional monitoring councils and other stakeholders involved in volunteer monitoring. The goal is to develop an online forum to communicate and exchange information on existing volunteer monitoring, available methods and resources, the status of volunteer monitoring in state monitoring strategies, and benefits and challenges associated with volunteer monitoring.

Water Information Strategies Workgroup, continued

- **Monitoring and assessment clearinghouse:** Plans are to analyze potential technologies and level of interest for a monitoring and technique clearinghouse and expert system that facilitates sharing of statistical and other assessment and reporting tools and monitoring designs.

Methods and Data Comparability Board – Provides a forum for evaluating and promoting methods that facilitate comparability among water-quality monitoring and analytical methods.

- **Data elements:** A Water Quality Data Elements User Guide was published in 2006 and includes key data elements (or “core metadata”) for chemical, microbiological, toxicity testing, and biological population/community data (http://acwi.gov/methods/pubs/wdqe_pubs/wgde_trno3.pdf). The data elements help to facilitate comparisons and integration of data collected by multiple organizations. In May 2008, data elements for physical habitat were completed for streams, and following approval by ACWI, will be incorporated in the Water Quality Data Elements User Guide. A priority of the Methods Board is to promote the visibility and use of the new data elements among the water community.
- **Comparable methods:** In 2008, the National Environmental Methods Index (NEMI) (<http://www.nemi.gov>) celebrated its 8th year as an online resource of laboratory methods and field protocols, including more than 1,100 methods for chemical, biological and physical monitoring. Recent improvements to NEMI include a more user-friendly format for enhanced accessibility by stakeholders. A priority of the Methods Board is to continue inclusion of new methods, including “green” methods with reduced environmental impact.
- **Sensors:** A sensors workgroup has formed plans to (1) develop standardized methods and product guidance (with support from sensor manufacturers); (2) develop quality assurance and quality control protocols; (3) incorporate sensor technologies into NEMI; (4) develop capabilities for managing data through the common water quality exchange (described above), and (5) explore the relevance and utility of sensor data to meet management needs.

National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries (“Network”)

The National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries (“Network”) (<http://acwi.gov/monitoring/network/>) integrates physical, chemical, and biological characteristics of water resources and extends from the uplands to the coastal zone. The Network, which was initiated in response to the recommendation of the U.S. Commission on Ocean Policy in 2004, provides critical information for the management of coastal waters and their tributaries at regional and national scales. The original design is described in a report—*A National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries, 2006* (accessible at http://acwi.gov/monitoring/network/design/Entire_Report_v18_060506.doc) and summarized in a brochure (http://acwi.gov/monitoring/network/network_brochure.pdf). Representatives from NOAA, EPA, USGS, Tennessee Valley Authority, selected states, and academia continue to refine and develop priorities for the Network; selected accomplishments through fiscal year 2008 and priority actions are described below.

The implementation of the Network is aligned with Council goals and activities, including, for example, with the development of data elements, NEMI, and compatible web services for data exchange. Additional national efforts, independent of Council activities, continue to contribute to the Network, including the:

- **USGS national surface-water network:** In 2008, USGS surface-water networks were combined and managed as a national network to provide geographic coverage of our Nation’s rivers and streams and trends. Large rivers and the status and trends in quality of water entering receiving waters are monitored routinely at 31 stations through the National Stream Quality Accounting Network (NASQAN) (<http://water.usgs.gov/nasqan/>). Status and trends in water quality at smaller rivers and streams are monitored routinely at 113 stations through the National Water-Quality Assessment (NAWQA) Program (<http://water.usgs.gov/nawqa>).
- **USEPA National Aquatic Resource Surveys:** USEPA surveys provide statistically valid, “snapshot” assessments of water quality in estuaries, lakes, streams and rivers, which are repeated every five years (<http://www.epa.gov/NHEERL/arm/designpages/aqresmonitoring.htm>). These surveys are increasingly supported by probabilistic approaches in monitoring by the States.

- *The State of the Nation's Ecosystems – 2008*: The Heinz Center report serves as an update to its original 2002 summary (<http://www.heinzctr.org/ecosystems/>). The 2008 report is accompanied by *Environmental Information: A Roadmap for the Future*, which emphasizes the need for collaboration, a national system of indicators, and monitoring to fill significant environmental data gaps (http://www.heinzctr.org/ecosystems/2008report/pdf_files/Roadmap_Future_Report.pdf).
- *Integrated Ocean Observing System (IOOS)*: The U.S. Integrated Ocean Observing System (IOOS) is a partnership comprised of 17 federal agencies and 11 regional associations along the coastal borders of the U.S., the Great Lakes, and the Caribbean (<http://ioos.noaa.gov/>). The regional associations partner with federal, state, and local agencies and universities to help coordinate physical, chemical, and biological monitoring in ocean, near-shore, and estuarine environments within their respective regions, and improve data dissemination and reporting (continuous and near real-time) to scientists and the public. Combined data from IOOS and the Network will help improve monitoring of water quality and protection of public health with early warning; describe status and trends; and link inland activities to changes in coastal and estuarine water quality.

Status of the Network and Accomplishments

- Five stations were added to the Network in 2008, following protocols used for monitoring large rivers and the quality of water at the terminus of large watersheds associated with the USGS NASQAN Program. These sites include the Brazos River near Rosharen, TX; Mississippi River above Vicksburg, MS; Apalachicola River near Sumatra, FL; Delaware River near Trenton, NJ; and the Hudson River below Poughkeepsie, NY. Continued resources are needed to maintain the five stations and ensure water-quality sample collection continues beyond fiscal year 2009.



- The pilot phase of the Network was completed for three geographic areas, including the Delaware Bay, Lake Michigan, and San Francisco Bay. Reports are available that examine current monitoring and gaps in relation to the proposed Network design (<http://acwi.gov/monitoring/network/pilots/>).

Additional monitoring was initiated by the USGS in fiscal year 2008 in each of the three pilot study areas to fill in gaps needed to address water-quality issues. In the Delaware Bay pilot, monitoring and assessment of nutrient and carbon were added to current USGS tidal stations and estuary boat run sites, and real-time monitoring (such as for temperature, specific conductance, pH, dissolved oxygen, and turbidity) were added to selected river and estuary sites. In the Lake Michigan pilot, three new monitoring sites were added; nutrient monitoring was enhanced at 17 existing USGS sites; and toxicity testing was conducted at selected stations using semi-permeable membrane devices. In the San Francisco Bay pilot, real-time monitoring for suspended-sediment was conducted, and nutrient and phycotoxin monitoring was enhanced at selected sites. Overall, the additional monitoring and assessment support an understanding of nutrient and sediment loads to some of the Nation's largest coastal estuaries and bays and help to identify critical toxic algal dynamics in selected watersheds. The enhanced work is supported through fiscal year 2009. Continued funding is needed to continue the monitoring and complete the assessments.

- A portion of the fiscal year 2008 funding for the Network was used to develop compatible web services for exchange of water-quality data from the National Water Information System (NWIS) of the USGS (<http://qwwwebservices.usgs.gov>) and data housed in the Storage and Retrieval (STORET) water-quality system of the EPA (<http://www.epa.gov/storet/wqx.html>). Continued resources are needed to maintain and update the online services and capabilities beyond fiscal year 2009.
- A national summary, *National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries: Summary of the Results of Pilot Studies*, was completed with recommendations on Network management issues, data integration, monitoring gaps, wetlands monitoring, and role of local and state expertise. The report and supporting tables are accessible at <http://acwi.gov/monitoring/network/pilots/summary.report.02.12.pdf> and http://acwi.gov/monitoring/network/pilots/tables_network_report.pdf.

- Recommendations for a refined Network design were developed as pilot studies were underway. A national report, *Summary of Refinements to the Design of the National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries*, proposes refinements to the original design on (1) nutrient parameters and detection limits; (2) additional contaminants to be monitored; (3) a coastal wetlands monitoring strategy; (4) parameters and ancillary data needed for biological assessments; and, (5) atmospheric contributions (either through monitoring or modeling). The report is accessible at http://acwi.gov/monitoring/network/Network_refinement_summary.pdf.

Future Directions—Continued implementation and refinements of the Network, as described above, are dependent on continued funding. To the extent possible, future implementation will also integrate other initiatives, as described below.

- *National Ground Water Monitoring Network (NGWMN)*: The NGWMN has been proposed by the ACWI Subcommittee on Ground Water (SOGW), which would complement the Network. The Network does not include ground water and, hence, integration of the NGWMN with the Network would provide a more comprehensive understanding of ground water and surface water resources. Available Council tools and elements—including, for example, NEMI, data elements, and the Water Quality Exchange—can help to facilitate the implementation and success of the NGWMN and a future combined national Network.
- *National Environmental Status and Trends (NEST)*: NEST is a call to produce water indicators for the Nation's coastal and inland waters, which underscores the need for long-term, and consistent and comparable national monitoring of status and trends, such as inherent in the Network design.
- *Wetlands Surveys*: Wetland surveys are planned as part of USEPA National Aquatic Resource Surveys for the year 2011. These surveys are supportive of the proposed refinement to the Network for wetlands monitoring.
- *Advancing Sensors*: The Methods Board's sensor workgroup joins ongoing EPA and USGS interests in advancing monitoring using sensors, and specifically, to better understand their capabilities in water assessment, regulations, and management.
- *Global Earth Observation System of Systems (GEOSS)* (<http://www.epa.gov/geoss/>) is designed to produce and manage global information. The Group on Earth Observations (GEO) is coordinating efforts to build the GEOSS web portal (<http://www.earthobservations.org>). Both systems will help to facilitate accessibility to spatial and monitoring information needed in water quality assessments of status and trends.

Additional information can be obtained through the
<http://acwi.gov/monitoring/>

and

through the National Water Quality Monitoring Council Co-Chairs

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