Update on the National Water-Quality Monitoring Council:

Recent Progress and Future Plans

August 20, 2014

Advisory Committee on Water Information
Reston, VA

Gary Rowe
USGS Co-Chair

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Acronym Bingo!

- **ACWI, USEPA, USGS, USDA**—already on the list
- **Council**—National Water-Quality Monitoring Council
- **NEMI**—National Environmental Methods Index
- **WQP**—Water Quality Portal
- **NNRW**—National Network Reference Watersheds
- **NMN**—National Monitoring Network
- **Volmon**—Volunteer Monitoring,
- **C&O**—Collaboration and Outreach Workgroup

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Council History

- 1991-USEPA and USGS began talks to address problems caused by different water-quality sampling, analytical, data storage, reporting, and assessment methods in use by local, state, & Federal agencies.
- 1992-1997- Intergovernmental Task Force on Monitoring evaluated status of Nation's monitoring programs and recommended the Council be formed.
- 1997- ACWI formed; Council officially approved by ACWI.
- 1998-1st National Monitoring Conference in Reno, Nevada.
- 2002- NEMI launched.
- 2010- First Council Newsletter published.
- 2012- Water-Quality Portal launched.
- 2014- 9th National Monitoring Conference in Cincinnati, Ohio.

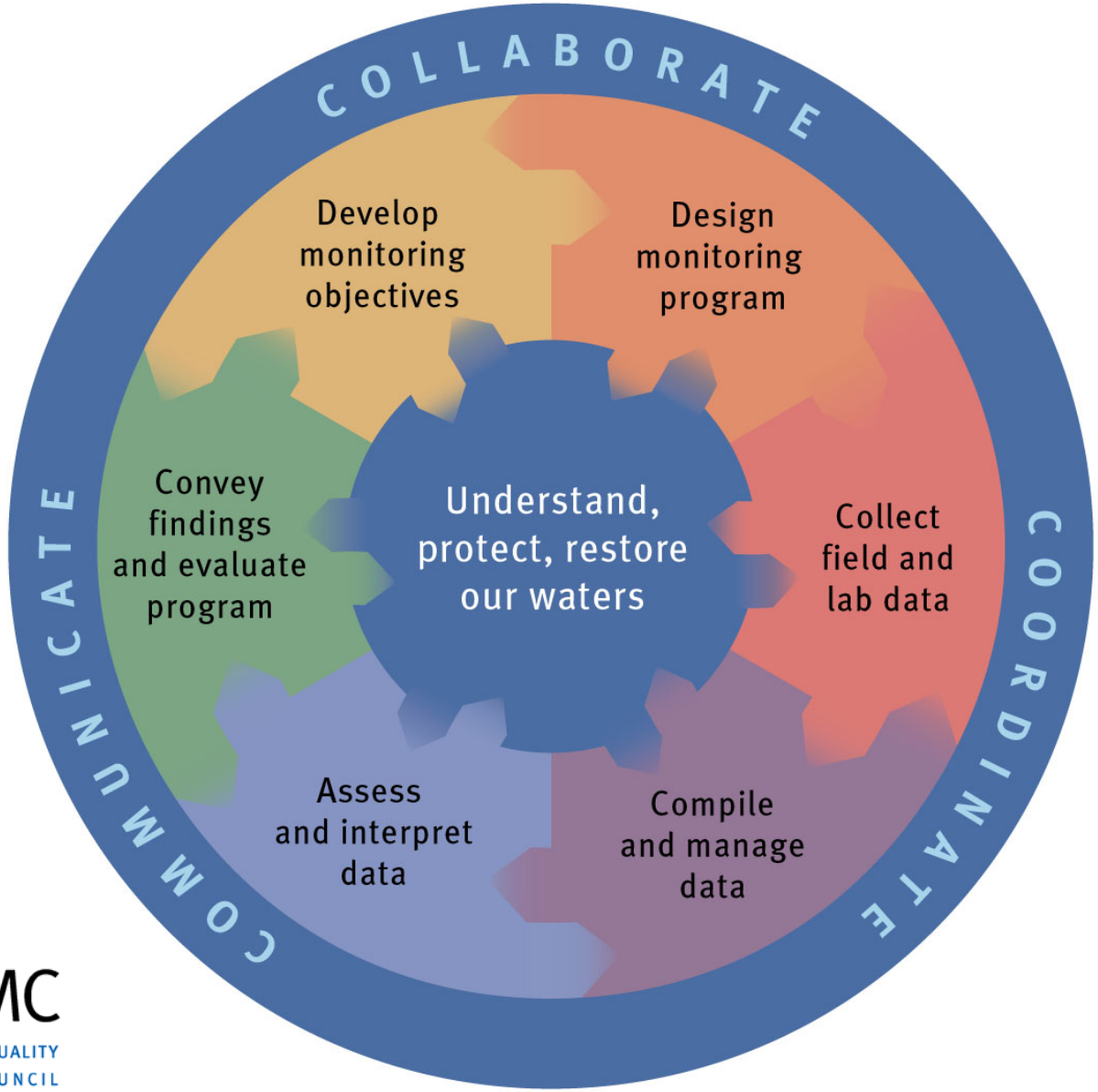
NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Council Goals

- Provide a national forum for coordination of comparable and scientifically defensible methods and strategies for improving water quality monitoring, assessment, and reporting.
- Bring together scientists, managers, and citizens to ensure information about the quality of our waters is accurate, reliable, and comparable.
- Foster collaborative and cost-effective approaches to improve and advance the science of water-resources monitoring.

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

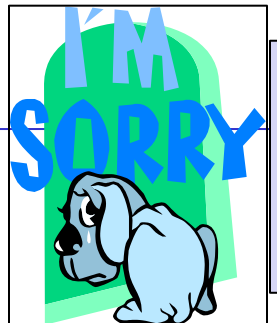
National Monitoring Framework



NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Council Membership*

- Federal Agencies
  - USEPA, USGS, NOAA, USDA (NRCS, USFS), USFWS, NPS, TVA, and USCOE
- States and Tribes
  - States representing USEPA Regions 1-10 (current states include NH, NJ, PA, SC, MN, OK, IA, UT, AZ, OR)
  - National Tribal Council (Fond du Lac Band of Lake Superior Chippewa)
- Other Interests
  - Professional Organizations: ACWA, NACWA, NALMS, AASG, WEF, NCASI
  - Interstate Organizations-ORSANCO, Great Lakes region, Gulf of Mexico Alliance
  - Academia-ASLO, CUAHSI



*OK! I had to use lots of acronyms here to fit all the info on this slide!

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Council Products

- National Monitoring Conference (held biennially)
- Water Quality Portal
- National Environmental Methods Index
- Statistical Methods option for NEMI
- Coordination with volunteer monitoring groups, and State, Regional and Tribal Councils,
- National Network of Reference Watersheds
- National Monitoring Network (Pilot Studies)
- Council newsletter, webinars on various monitoring topics, coordinate with volmon newsletter
- Fact Sheets, Technical Reports and White Papers on Monitoring Issues

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

9th National Monitoring Conference

By the Numbers: Another Successful Conference!

- ~650 Attendees
- 280 talks
- 80 posters
- 30 exhibitors and 38 exhibit booths
- 27 Workshops or Panel Sessions
- 13 demos of WQP, NEMI, NNRW websites, and EPA/USGS products
- All-day R statistical training

Cincinnati, Ohio

Great local support from Ohio River Valley Sanitation Commission

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

NEW *Who's working my backyard? networking session*

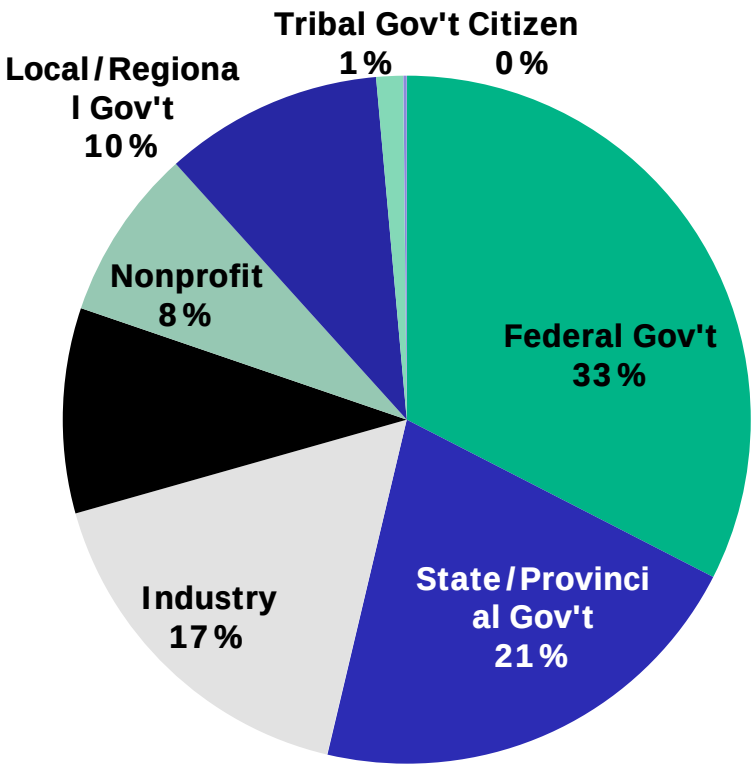
Hot Topics at the Conference

- Continuous monitoring—methods, quality assurance/control, data handling and storage, and applications
- Results of EPA-States National Aquatic Resource Surveys including National Coastal Assessment
- Volunteer monitoring—collaboration, databases, web technology, use of volmon data by the states
- Nutrients — monitoring, modeling, nutrient trading
- Training on data portals, trend analysis, statistical packages (R)
- Effective communication of science to managers/public
- Effects of climate/extreme hydrologic events on water quality
- New/emerging contaminants (hydraulic fracturing)

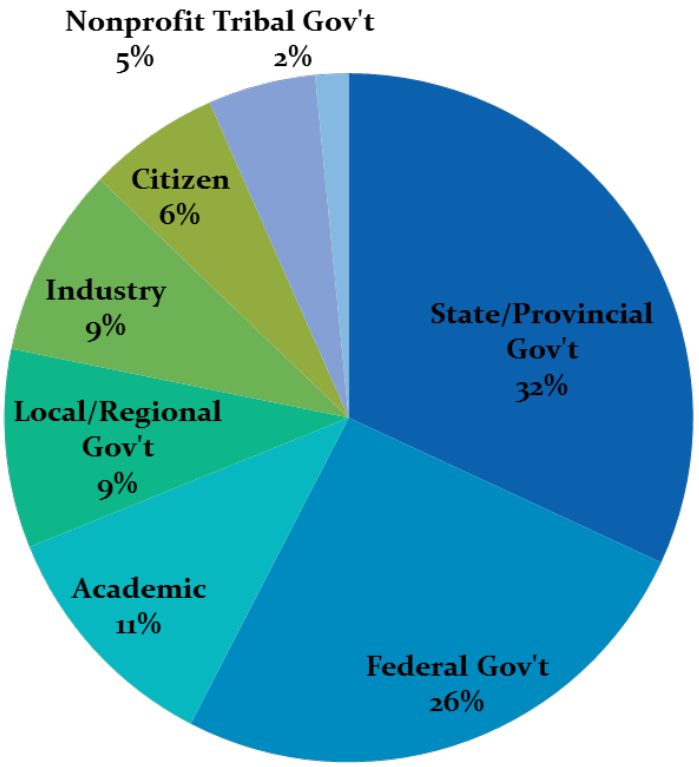
NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Attendee and Conference Survey Breakdown

648 Attendees

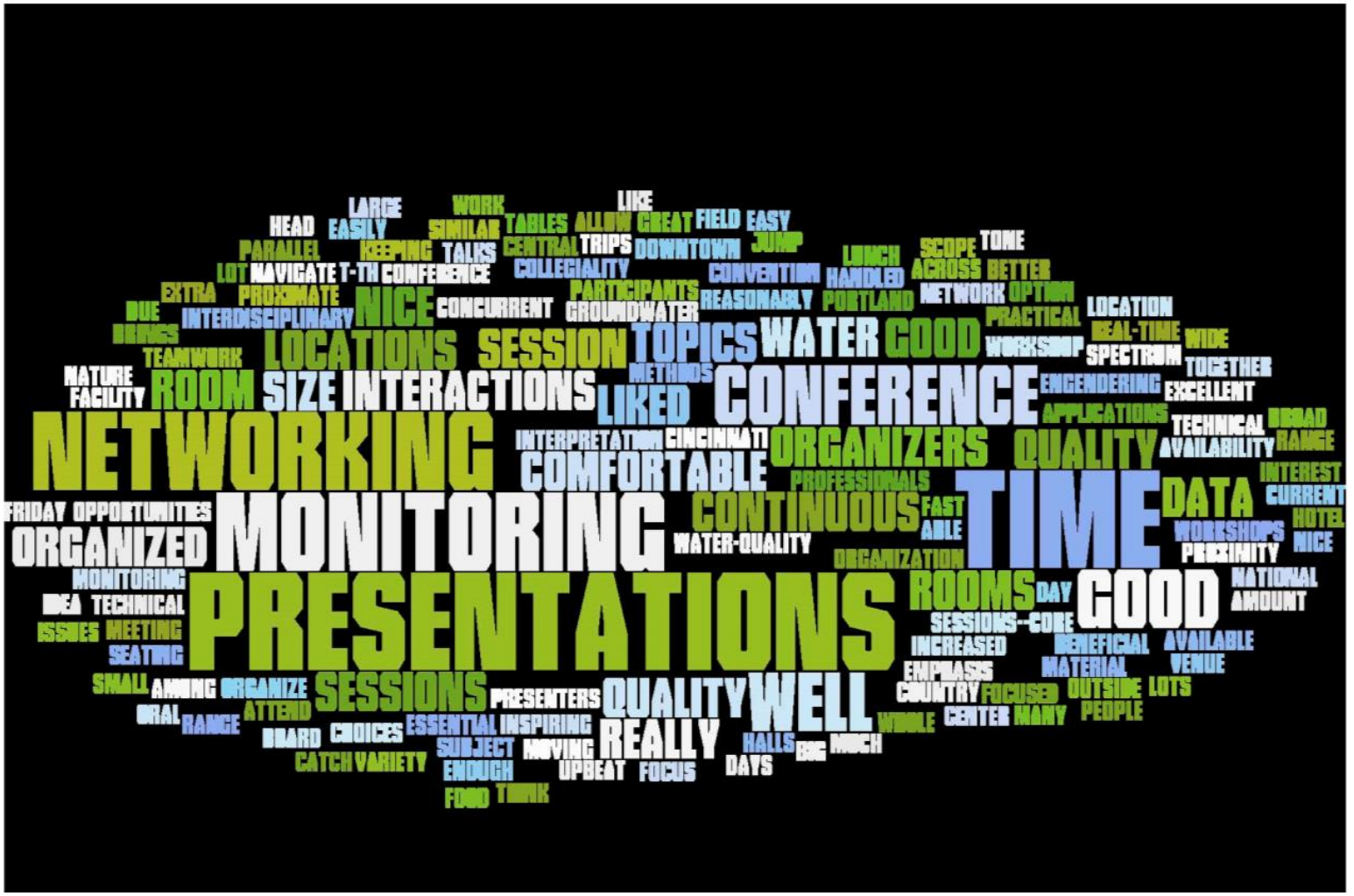


218 Surveys



NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Survey Results: What did you like best?



NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What did you like best ?

- Size, Location, Conference Focus/Scope
- Presentations-Format, Quality, Quantity Speakers
- Networking Opportunities
- Learning and Take Aways
- Specific Tracks/Sessions/Talks/Training

Example response:

"This conference has been the most relevant conference I have ever attended as a young professional. I greatly appreciated the focus of many talks and workshops on managing and analyzing large datasets, particularly through the use of open-source software applications."

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What did you learn?

- Bigger picture, what other states and feds are doing - 15
- Monitoring Specifics/QA/Applications - 14
- Data management, Sharing and Analysis - 16
- Emerging Tech, Methods, products - 14
- Vol. Monitoring and Community Engagement - 10
- R programming and applications - 7
- Other responses - 14

Example responses:

"WOW! I could write a book here!"

"My hope is to take what I learned about other states' monitoring strategies and approaches and work with my management to rethink ours."

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Possible Venues for 10th National Monitoring Conference

- Leading contender is Tampa Bay, Florida. Expect decision by October 2014.

- Alternates being explored include:
  - Providence, Rhode Island
  - Portland, Maine

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Council Teams and Workgroups[1]

- Water Quality Portal Team
  - Charles Kovatch (USEPA), Jim Kreft (USGS)
- Methods and Data Comparability Board
  - Dan Sullivan (USGS), April Dupre (USEPA)
- Aquatic Sensor Workgroup
  - Dan Sullivan (USGS), Chuck Dvorsky (TCEQ)
- Water Information Strategies Workgroup
  - Mary Skopec (IA DNR), second co-chair vacant
- National Network of Reference Watersheds
  - Mike McHale, Bill Wilber (both USGS)
- National Monitoring Network
  - Hugh Sullivan (USEPA), Dennis Apeti (NOAA)
- Collaboration and Outreach (C&O) Workgroup
  - Danielle Donkersloot (NJ DEP), Candice Hopkins (USGS)

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

[1] **Versus 10 subgroups for ACWI overall**

A Few Words on the WQP

- The WQP **is** standalone web-service that allows users to easily download USGS, USEPA, and USDA water-quality data from a single website.
- The WQP **is not** an actual database**;** instead it retrieves data from over 400 local, state, and federal databases (USGS-NWIS, USEPA-STORET, USDA-STEWARDS).
- The WQP **includes** water-quality data only (physical, chemical, biological, and monitoring site metadata).
- The WQP **does not include** climatic (precip/snowpack), hydrologic (flow, groundwater levels), or water-use data.
- Data **must be** organized and formatted using the Water-Quality Exchange (WQX) template.
- Adding an interpretative component **is not** a near-term goal.

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Water Quality Portal Stats

1.4 Billion

Automated Web Retrievals
Downloaded

4,155 visits from 2,600 users

100 million

Maximum number of
Records downloaded in a single day

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What does the Methods and Data Comparability Board do?

- Develop water-quality monitoring approaches that facilitate collaboration and data comparability across all data-gathering organizations.
- Develop products that enhance our ability to make the best use of the limited resources for water-quality monitoring including:
  - National Environmental Methods Index (NEMI)
  - Minimum Water-Quality Data Element checklists for various types of water-quality monitoring
  - Tools to develop comparable Data Quality Objectives (DQOs) and Measurement Quality Objectives (MQOs)

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Methods Board Progress

- 12th year National Environmental Methods Index marked by release of NEMI 4.0
  - 1200 monitoring methods (chemical, physical, and biological)
- Linked NEMI methods to data in WQP
  - 526 methods associated with data in the WQP
  - Additional methods identified in crosswalk to be added to NEMI
- Protocol library developed to provide access to field protocols and related methods
  - Started with USGS and USEPA protocols

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Methods Board Plans

- Finish crosswalk linking NEMI methods to data in WQ Portal.
- Add additional field collection methods to the protocol library.
- Explore possibility of adding published volmon program methods to NEMI.
- Collaborate with WIS workgroup to continue work on Statistical NEMI.

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What is the Aquatic Sensors workgroup?

- A workgroup of government, academic, and industry experts convened to address the challenges of using on water-quality sensors with goals to:
  - Develop SOPs for the calibration, QA/QC, maintenance, and the deployment of field-based environmental sensors.
  - Create a data base to store relevant information on sensors to allow potential users to make informed decisions on the use of sensors for their projects.
  - Recommend types of sensors that are appropriate for the National Monitoring Network in freshwater, estuarine and coastal environments.
  - Started with established sensors for basic parameters such as temperature, pH, specific conductance, DO, and turbidity.

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Aquatic Sensors Workgroup Progress

- Developed Continuous Monitoring technical sessions at Cincinnati meeting
- Sponsored workshop examining issues associated with "megadata " sets
- Built website (http://watersensors.org) to disseminate info on emerging sensors including
  - Continuous monitoring methods (NOAA Alliance for Coastal Technology and NEMI)
  - Checklist for deploying continuous sensors in the field
  - QA guidelines for collecting, storing, and reporting continuous sensor data

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Aquatic Sensors Workgroup Plans

- Develop improved guidance on how to incorporate continuous sensor data into existing monitoring programs
  - Develop examples of continuous sensor applications
  - Develop guidelines for interpretation of large, time-dense datasets
- Participate in EPA Nitrate Sensor Challenge
  - Develop white paper on state of the science
  - Attend September workshop

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What does the Water Information Strategies (WIS) Workgroup do?

- Defines and promotes strategies for
  - monitoring designs, data management, access, and exchange, data integration and analysis, and information reporting
- Provides technical support to other workgroups
- Recent WIS workgroup products include:
  - NEMI Statistical Methods
  - Survey of water-quality indices/report cards
  - "What your manager needs to know" fact sheet series
  - "Lessons Learned" when monitoring extreme hydrologic events" technical session

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Approaches for Disseminating Water Quality Information: Development and Use of Applied Water Quality Indices and Report Cards

Brian Henning and Leslie McGeorge
New Jersey Department of Environmental Protection
Division of Water Monitoring and Standards
Bureau of Freshwater and Biological Monitoring
Trenton, NJ 08625

Abstract - A questionnaire was developed by the New Jersey Department of Environmental Protection with input from the National Water Quality Monitoring Council to gather available information on composite water quality indices and report cards used by governmental environmental agencies and other water quality practioners to disseminate results to various audiences. We received 17 completed questionnaires from state and federal agencies and academia from across North America. The goal of our survey was to better our understanding of the uses, strengths and limitations, development process, and the applicability of each method to convey water monitoring information in an integrated manner. Several participants in the survey utilized Water Quality Indices(WQI) in freshwater rivers and streams, estuarine, coastal embayments, and Laurentian Great Lakes. The most popular parameters used in a WQI are dissolved oxygen, pH, chlorophyll *a*, total nitrogen and total phosphorus. Contrary to WQI, Water Quality Report Cards were also utilized by participants as an approach to assess the condition of freshwater streams, rivers and lakes. The Water Quality Report Card (WQRC) concept was originally developed by Warren Kimball, formerly of the Massachusetts DEP, and is becoming a popular model used by a number of water resource agencies. The WQRC uses 10 indicators pertaining to aquatic life, recreation, and fish edibility that are color coded to provide an assessment of a waterbody based on standardized 305(b) reporting procedures. Regardless of the approach, both Water Quality Indices and Water Quality Report Cards appear to be useful tools to provide an overall evaluation of a water resource and present the data in a manner that is quickly and easily understood by multiple audiences.

Water Quality Indices

Generally, a single value (score) used to summarize water quality and resource condition for a particular time and location. Indices are typically composed of several parameters (4-12) of importance to water quality and are then aggregated and calculated into an overall score. Indices reported include measures of water column chemistry, sediment, biology and habitat.

Example of a composite water column WQI for Oregon rivers

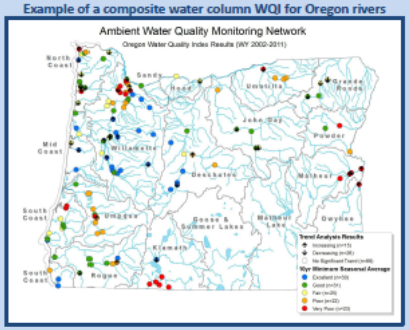


Figure 1. Example of spatial display of Oregon's WQI and trends results. Source: Merrick, L. and S. Hubler, 2013. Oregon Water Quality Index Summary Report, Water Years 2002-2011 and 2003-2012.

Applications and objectives of WQI

Frequently used to communicate water quality conditions to the public, stakeholders, local officials, water resource managers and also to track progress of management practices and strategic goals. Most WQI's are not used for an regulatory purposes in part because many parameters often have no water quality standards.

Table 1. Participants of questionnaire that use a "Water Quality Index." Note: Biological multimetric indices that do not integrate additional water quality parameters were not included here.

Organization	Water Resource	Media	Contact
Iowa Department of Natural Resources	Rivers and streams	Water column	Mary Skopec
Kentucky Department of Environmental Protection	Rivers and streams	Water column, sediment	Katie McKone
McMaster University	Great Lakes coastal marshes	Water column	Patricia -Chow Fraser
Oregon Department of Environmental Quality	Rivers (4th and 5th order)	Water column	Lesley Merrick
South Carolina Estuarine and Coastal Assessment Program (SCECAP)	Coastal tidal rivers and bays	Water column, sediment, biology	David Chesnut
University of Maryland Center for Environmental Sciences-Integration and Application Network	Estuaries,coastal bays	Water column, biology	Heath Kelsey
USEPA (National Coastal Condition Assessment)	Estuaries	Water column, sediment, biology, habitat, fish tissue	Sarah Lehmann
Vermont Department of Environmental Conservation	Lakes	Water column, biology, habitat	Neil Kamman
USGS National Water-Quality Assessment (NAWQA) Program (Pesticides only)	Rivers and streams	Water column	Karen Beaulieu

Parameters generally used in WQI

Chemical/Physical (water column)

- The most common parameters shared among water quality indices are dissolved oxygen, pH, chlorophyll *a*, total nitrogen and total phosphorus
- Additional parameters such as temperature, fecal coliform, total solids, biochemical oxygen demand, ammonia + nitrate nitrogen, specific conductivity and pesticides are often used

Biological

- A few WQI's incorporate a biological component into the overall composite WQI
- A benthic macroinvertebrate index is most commonly used when biological assessments are incorporated into a WQI

Sediment

- Parameters used in WQI's include contaminants, toxicity, total organic carbon, TSS, turbidity, embeddedness

Development Process and Calculation of WQI

- Many are developed by agency scientists with input from a panel of experts, and peer reviewed internally or published in a peer reviewed journal.
- Methods for aggregating subindices/parameters into an overall cumulative index calculation include weighted means, unweighted harmonic square means, and averaging ranked subindices into an overall score
- When standards exist, they are generally applied
- When no standards exist, published findings, best professional judgment, or thresholds derived from percentiles of historical data are commonly used to set breakpoints among rating categories (e.g. good, fair , poor)

Example of a composite index integrating three indices into an overall Habitat Index for the South Carolina Estuarine and Coastal Assessment Program

Figure 2. Percentage of South Carolina's estuarine habitats that scored as good, fair, or poor for the Integrated Habitat Quality Index during 2009-2010. Source: R.F. Van Dolah, D.M. Sanger, G.H.M. Riekerk, S.E. Crowe, M.V. Levisen, D.C. Bergquist, D.E. Chestnut, W. McDermott, M.H. Fulton, E. Wirth. 2013. The Condition of South Carolina's Estuarine and Coastal Habitats During 2009-2010: Technical Report. Charleston, SC: South Carolina Marine Resources Division. Technical Report No. 107. 64 p.

Limitations

- May not align with state's 305(b)/303(d) Integrated Report assessments
- Generally not used for regulatory purposes
- Many do not include toxics, habitat, fish tissue or biological indices
- Single parameters of importance may lose significance in composite index

Strengths

- Summarizes large amounts of data for a variety of audiences
- May include information for parameters for which there are no regulatory standards
- Enables spatial display of ratings
- Enables trends analysis of WQI score
- Generally understood by public, however calculation of index may be confusing

Water Quality Report Cards

The WQRC's described here, use ten indicators pertaining to aquatic life, recreation, and fish edibility uses that are color coded to provide an assessment of a waterbody based on the standardized 305(b) reporting procedures. The ten indicators are biology, chemistry, nutrients, toxics, sediments, flow, habitat, bacteria, aesthesis, and fish tissue.

Applications and Objectives of WQRC

These are used to communicate water quality conditions to public, stakeholders, local officials and water resource managers. The WQRC condenses the 305(b) assessment into a one page summary of a water resource. It can be used to assess the effectiveness of management practices, guide decision makers, identify monitoring needs and coordinate monitoring programs.

Development

The WQRC concept was originally developed by Warren Kimball of the Massachusetts DEP

- Uses ten indicators pertaining to aquatic life, recreation, and fish edibility that are color coded to provide an assessment of a waterbody based on the standardized 305(b) reporting procedures
- Each individual state's water quality standards and criteria are used to determine condition rating

Table 2. Participants of questionnaire that use a "Water Quality Report Card."

Organization	Water Resource	Media	Contact
California State Water Resources Control Board	Rivers and streams	Water column, sediment, biology, habitat	Lilian Busse
Massachusetts Department of Environmental Protection	Rivers and streams	Water column, sediment, biology, habitat	Warren Kimball

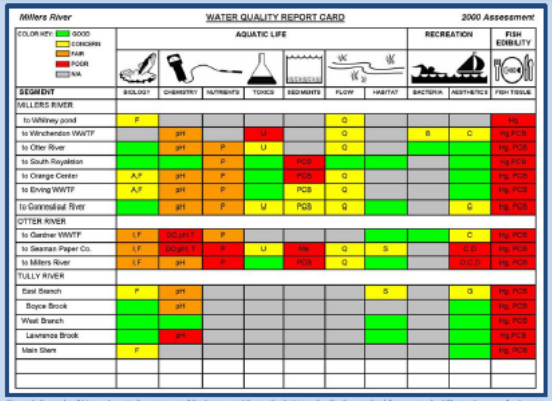


Figure 3. Example of Massachusetts Department of Environmental Protection's Water Quality Report Card for a watershed illustrating use of colors to assess water quality for each indicator and causes of impairment. Source: Kimball, W. (2012, Sept. 12). Water Quality Report Cards- Assessments made accessible, the Massachusetts experience [Webinar]. http://ecwl.gov/monitoring/webinars/index.html. Webinar to the National Water Quality Monitoring Council.

Limitations

- No overall rating category (e.g. good, fair, poor) of waterbody or segment
- Lack of spatial display of rating
- Limited trends analyses

Strengths

- Summarizes large amounts of water quality data
- Complements 305(b)/303(d) Integrated Report
- Identifies monitoring gaps (gray areas in Figure 3)
- Includes toxics, habitat, fish tissue and biological assessments
- Identifies reasons for impairment (e.g. Hg, PCB)
- Generally understood by public

Conclusions and Next Steps

- Both WQI and WQRC approaches seek to provide a integrated evaluation of the condition of the water resources they are assessing
- Many participants felt that the public, stakeholders and policy makers are more likely to get involved to help improve water quality if clear summaries of water resource conditions are made available through WQI's
- Participants expressed that these approaches can be great tools to educate the public about water quality and promote volunteers and watershed groups to protect and restore water quality
- A report will be prepared summarizing all questionnaires received and will be made available on the National Water Quality Monitoring Council 's website

**Thank you to all of the participants that completed the questionnaire. A copy of the WQI questionnaire and a complete list of participants is located in the folder attached to this poster.

***Only questionnaires that were representative of these two approaches (WQI and WQRC) were displayed here. Biological indices alone were not included in this poster.

WIS Workgroup Plans

What Your Manager Needs to Know Fact Sheet Series

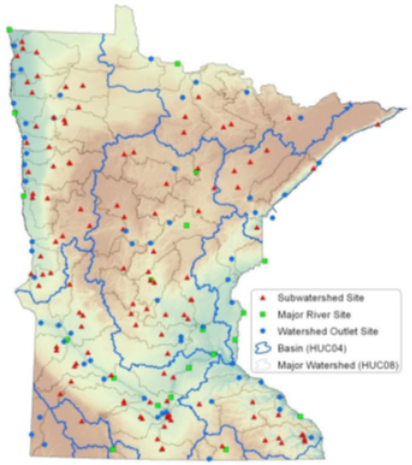
Goal is to explain value of different types of monitoring approaches and value of water-quality data in terms water managers and the public can understand

- **Topics being considered for fact sheets include:**
  - **Probabilistic versus Targeted monitoring designs**
  - **Fixed-site Trends Monitoring**
  - **Program Effectiveness**
  - **Evaluating Uncertainty in Water-Quality Data**

Purposes of a Fixed-site, Trend Monitoring Network

A fixed-site, trend monitoring network is a water monitoring approach that uses a set of monitoring sites that remain in place and are monitored over the course of many years. Such a network is important for describing long term water quality conditions. Depending on frequency of water chemistry monitoring and environmental conditions, statistical trends in water quality can begin to be seen after about a decade of monitoring. Even before statistical trends can be determined, fixed station monitoring yields useful information on on-going water quality conditions. Biological monitoring can also be performed repeatedly at fixed sites to compare changes in biological health over time. Seeing changes in water quality over time through fixed site monitoring can give an indication of positive or negative changes in water quality resulting from land use changes, best management practices implementation, regulations, extreme weather events, or other influences. Quantifying success of implementation efforts can be a major benefit of this type of monitoring. Data from fixed station monitoring, while specific to the site(s) where the data are collected, can be used to create and improve water quality models that can predict water quality conditions in other non-monitored locations.

Minnesota's Watershed Pollutant Load Monitoring Network - each site is permanent, has water samples taken regularly, and includes a flow gage to record water quantity measurements:



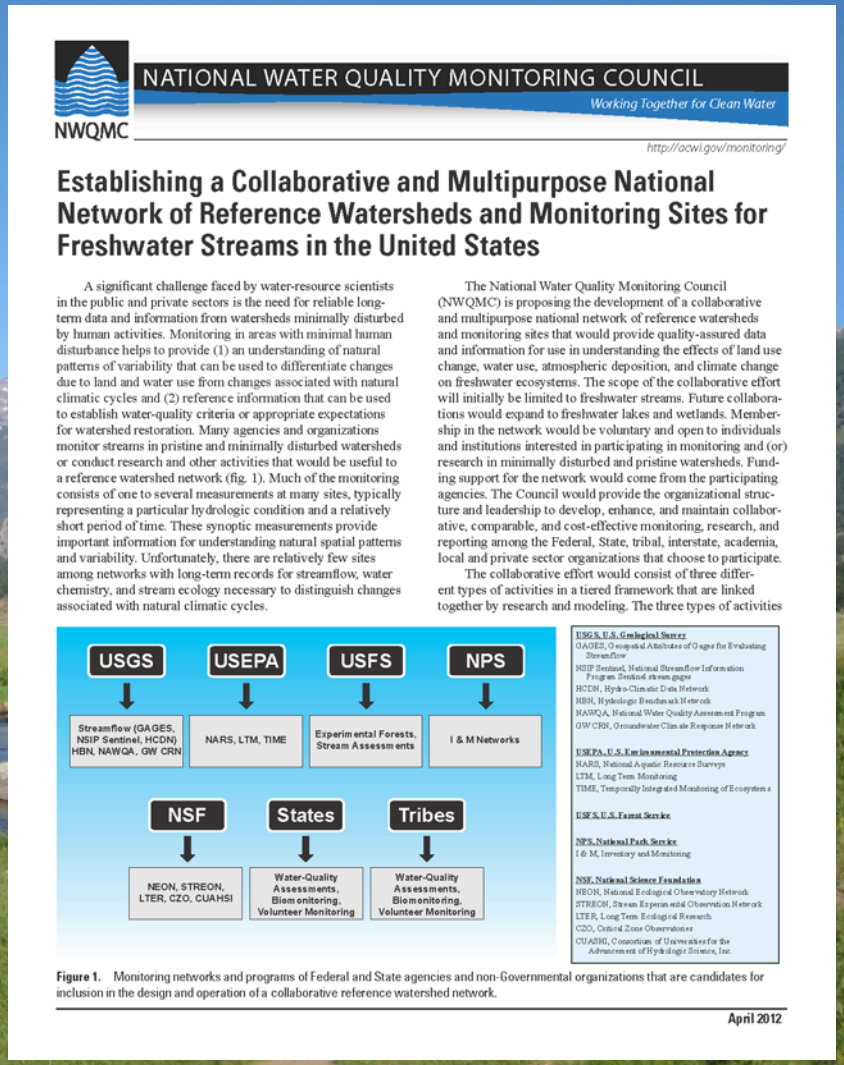
NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

7th Inning Stretch!

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What are goals of the National Network of Reference Watersheds (NNRW)?

- Provide access to data and information of known quality from minimally or least disturbed watersheds to be used in assisting with establishing “background” conditions for select hydrologic variables and water-quality.
- Increase the efficiency of monitoring with improved coordination and collaboration and increased opportunities to leverage existing reference sites, networks, and financial resources.



NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water
NWQMC
http://acwi.gov/monitoring/

Establishing a Collaborative and Multipurpose National Network of Reference Watersheds and Monitoring Sites for Freshwater Streams in the United States

A significant challenge faced by water-resource scientists in the public and private sectors is the need for reliable long-term data and information from watersheds minimally disturbed by human activities. Monitoring in areas with minimal human disturbance helps to provide (1) an understanding of natural patterns of variability that can be used to differentiate changes due to land and water use from changes associated with natural climatic cycles and (2) reference information that can be used to establish water-quality criteria or appropriate expectations for watershed restoration. Many agencies and organizations monitor streams in pristine and minimally disturbed watersheds or conduct research and other activities that would be useful to a reference watershed network (fig. 1). Much of the monitoring consists of one to several measurements at many sites, typically representing a particular hydrologic condition and a relatively short period of time. These synoptic measurements provide important information for understanding natural spatial patterns and variability. Unfortunately, there are relatively few sites among networks with long-term records for streamflow, water chemistry, and stream ecology necessary to distinguish changes associated with natural climatic cycles.

The National Water Quality Monitoring Council (NWQMC) is proposing the development of a collaborative and multipurpose national network of reference watersheds and monitoring sites that would provide quality-assured data and information for use in understanding the effects of land use change, water use, atmospheric deposition, and climate change on freshwater ecosystems. The scope of the collaborative effort will initially be limited to freshwater streams. Future collaborations would expand to freshwater lakes and wetlands. Membership in the network would be voluntary and open to individuals and institutions interested in participating in monitoring and (or) research in minimally disturbed and pristine watersheds. Funding support for the network would come from the participating agencies. The Council would provide the organizational structure and leadership to develop, enhance, and maintain collaborative, comparable, and cost-effective monitoring, research, and reporting among the Federal, State, tribal, interstate, academia, local and private sector organizations that choose to participate.

The collaborative effort would consist of three different types of activities in a tiered framework that are linked together by research and modeling. The three types of activities

Figure 1. Monitoring networks and programs of Federal and State agencies and non-Governmental organizations that are candidates for inclusion in the design and operation of a collaborative reference watershed network.

April 2012

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

NNWR Progress

- Developed site metadata database
- Created interactive map for NNRW website
- Developed plan for linking NNRW site information to the WQP
- Started developing criteria for defining different types of reference watersheds including:
  - Natural Watersheds “Best of the best” (504 sites defined by agreed upon criteria)
  - Least disturbed urban watersheds
  - Least disturbed agricultural watersheds

NWQMC

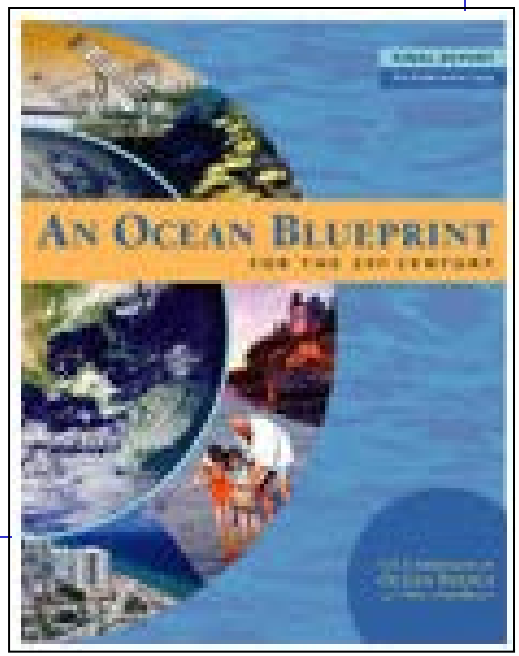
NNRW Workgroup Plans

- Refine NNRW website; connect to WQP
- Identify additional data available for NNRW sites (biology, atmospheric deposition)
- Develop workflow for incorporating additional sites and add identified sites (States/Tribal/Other Federal Agencies/Universities)
- Associate NNRW Core watersheds with National Atmospheric Deposition Program deposition stations
- Write a report/paper describing the network

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

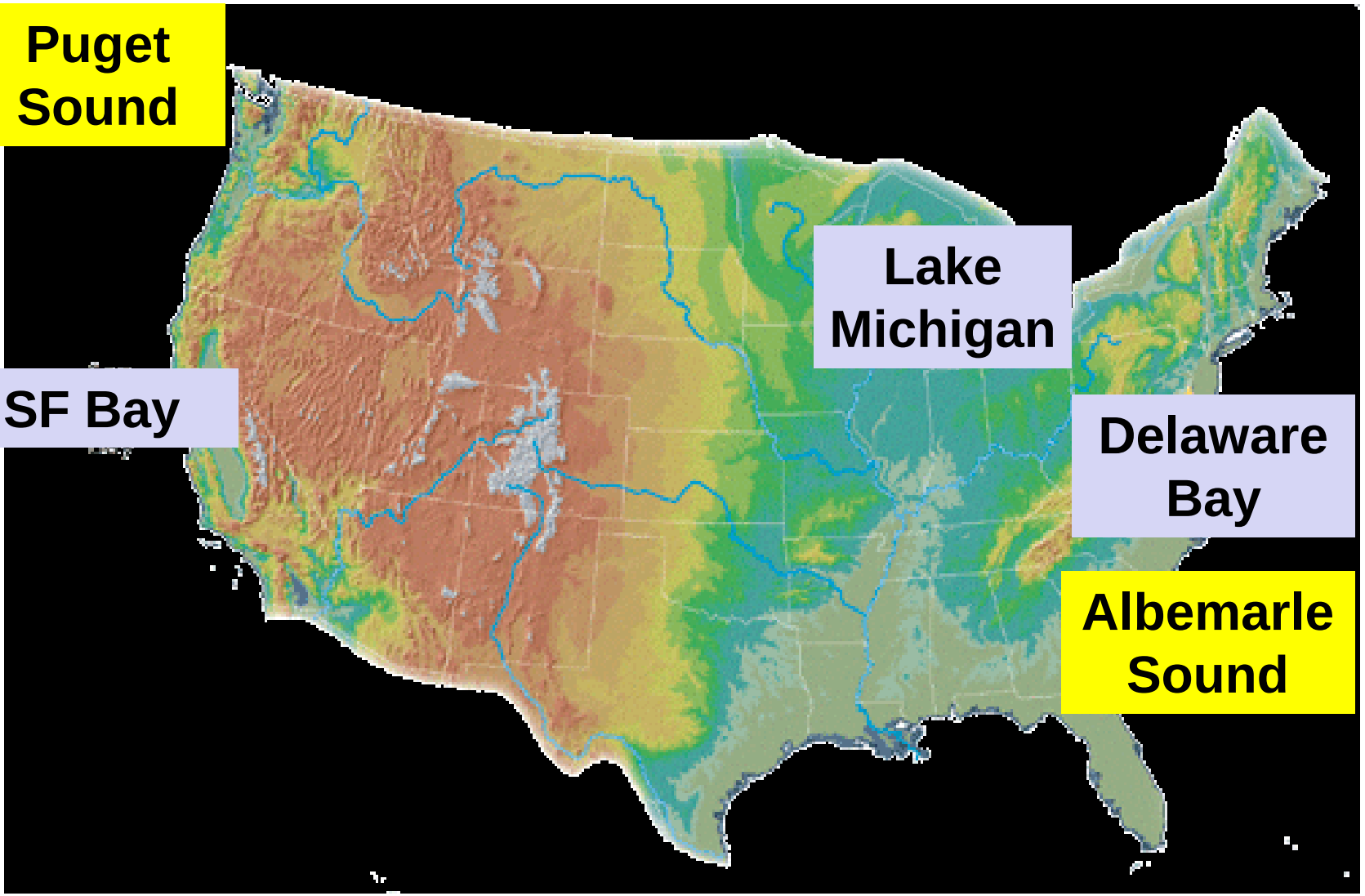
What is the National Monitoring Network and what is it's purpose?

- The NMN is a network of networks intended to integrate biological, chemical, and physical monitoring programs from headwaters to coastal estuaries.
- NMN design involved over 80 stakeholders and addresses monitoring across entire hydrologic cycle (precip to GW)
- Strong linkage to NOAA and regional groups responsible for coastal monitoring such as the Integrated Ocean Observing System (IOOS) associations
- Addresses key management issues such as nutrients, hypoxia, contaminants, beach health
- Implementation efforts focused on several pilot studies conducted across country



NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Where were NMN Pilots conducted?



NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

2007-2011 Pilots

2011-2015 Pilots

What are the outcomes of the NMN pilots?

- Improved estimates of land-based inputs of sediment, nutrients, and contaminants to pilot area estuaries
- New data on sources, amounts, timing, and severity of natural and human stressors
- Application of new monitoring technology including:
  - real-time monitoring with continuous sensors
  - WQ surveys using autonomous underwater vehicles (AUVs)
  - Characterization of suspended sediment contaminant loads and algal toxins in estuaries
- Collaborative agreements for new or enhanced water-quality monitoring in the pilot watersheds
- **Future plans**: Complete Albemarle and Puget Sound pilots and consult with Council on future directions

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

What does the Collaboration and Outreach (C&O) Workgroup Do?

- Works to build partnerships that foster collaboration and communication within the water-quality monitoring community
- Supports state and regional water quality monitoring councils (~20 active Councils)
- Coordinates with Volunteer Monitoring community including Volmon newsletter
- Responsible for sharing publications (newsletter), meetings (recorded Webex), and web seminars

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Challenges for the Council

- Lots of activities-Are we doing too much?
  - Do a few things well!
- Balance conference planning against other Council activities
  - Conference planning takes up lots of time!
- Upgrading the WQP
  - Basic upgrades versus “bells and whistles”
- Tackling Continuous Sensor Data
  - Dozens of constituents and surrogate parameters
  - Council role as consensus builder for protocols, QA/QC practices, data storage and handling, and applications
- Communicating the value of WQ monitoring & data to water managers and the public

NWQMC
NATIONAL WATER QUALITY MONITORING COUNCIL
Working Together for Clean Water

Additional Information

USEPA Co-Chair: Susan Holdsworth:
susan.holdsworth@USEPA.gov

USGS Co-Chair: Gary Rowe

glrowe@usgs.gov

Council Executive Secretary: Candice Hopkins

chopkins@usgs.gov

Council website:
http://water.usgs.gov/wicp/acwi/monitoring/

Water Quality Portal:

http://www.waterqualitydata.us/

Council Workgroup websites:

http://acwi.gov/monitoring/workgroups/index.html