



Methods & Data Comparability Board

NWQMC - National Water Quality Monitoring Council

Collaboration and Comparability

Why focus on collaboration and comparability?

Each year, government agencies (local, state, tribal, and federal), industry, academic researchers, and a wide variety of private organizations in the United States devote enormous amounts of time and several billion dollars to the monitoring, protection, and restoration of water resources and watersheds. This work includes:

- monitoring the status and trends in water quality
- identifying and ranking existing and emerging problems
- designing and implementing resource management programs
- determining compliance with regulatory programs

The information gathered through these activities is certainly useful to the data collectors themselves. However, critical differences in project design, methods, data analysis, and data management have often made it difficult for monitoring information to be shared by other potential data users. Accurate, cost-effective and efficient assessment of the nation's water resources—within and among watersheds—requires that monitoring entities work collaboratively and strive for comparability in methods and data management. The design and implementation of assessment and management programs should be a cooperative product of the various monitoring agencies and organizations active in any given watershed. One of the Intergovernmental Task Force on Monitoring's (ITFM's) principal conclusions was that true collaboration among programs is possible if there is both the technical and institutional framework to promote data comparability to assure data of known quality.

Methods and Data Comparability Framework

Element	Element Considerations	Product or Activity
Identify Objectives and Design of Monitoring Project ↓	<ul style="list-style-type: none"> • Study Objectives • Monitoring Questions • Data Quality Objectives • Measurement Quality Objectives • Sampling Design 	<ul style="list-style-type: none"> • DQO Paper (future activity) • Expert System (ongoing) • NEMI (beta release) • PBMS Paper (NWQMC Tech Report 01-02) • COD Pilot Paper (submitted to E,S&T)
Collect Data in the Field ↓	<ul style="list-style-type: none"> • Field Certification and Training • Field Protocols • Field Method Performance • Sample Handling and Preservation 	<ul style="list-style-type: none"> • Field Certification Position Paper (future activity) • NEMI (phase 3 — 2002 start) • Field Biology PBMS Paper (draft 2002) • Nutrient PBMS Pilot (2002 start) • Macroinvertebrate PBMS Pilot (2002 start)
Collect Data in the Laboratory ↓	<ul style="list-style-type: none"> • Method Comparability • Laboratory Accreditation • Reference Materials Availability • Laboratory Method Verification 	<ul style="list-style-type: none"> • NEMI (beta release) • Federal Laboratory Accreditation Position (ACWI approval 2002) • Coordination with NELAC (ongoing) • State Laboratory Accreditation Position (future activity) • PBMS Position Paper (NWQMC Tech Report 01-02) • COD Pilot Paper (submitted E,S&T)
Manage Data	<ul style="list-style-type: none"> • Required Metadata • Data Quality Documentation 	<ul style="list-style-type: none"> • Water Quality Data Elements • Chemical and Microbiological List (ACWI approved 2001) • Biological List (2001 start) • NEMI coordination (ongoing)

The Methods and Data Comparability Board (MDCB)

In order to work toward the goal of comparability, the Methods and Data Comparability Board (MDCB) was formed in 1998.

The Methods Board is a partnership of water-quality experts from federal agencies, states, tribes, municipalities, industry, and private organizations. It is chartered under the National Water Quality Monitoring Council.

The Board's challenge is to identify, examine, and recommend monitoring approaches that facilitate collaboration and yield comparable data and assessment results. Four key elements anchor the framework of the Board's efforts. This framework is displayed on the previous page.

Methods Board activities

The Board is a product-focused organization whose activities are designed to promote and support the key elements of the framework. Activities of the Board include:

Development of a National Environmental Methods Index for method selection and comparison of critical method parameters (NEMI Workgroup)

The selection of analytical methods is a critical part of environmental monitoring program planning. During planning, monitoring objectives lead to criteria for the monitoring program. Field procedures and analytical methods are selected based upon these criteria, often in conjunction with sampling designs. Limitations of analytic techniques often determine the evaluative powers of the entire program, and hence proper selection of analytical methods is paramount.

NEMI is a web-based searchable compendium containing chemical, physical, radiochemical, and microbiological laboratory methods, including method summaries. It allows the rapid communication and comparison of critical parameters of methods for use with methods selection and (or) methods modification and data comparability. It includes more than 40 data fields such as instrumentation, media and matrices, sampling information, sample preservation and storage conditions, detection levels, bias, precision, and other QA/QC requirements. The NEMI database ensures that the consideration of analytical methods is a more active part of planning and implementation of programs. Typical users of NEMI are expected to include regulators, regulated parties, scientists, volunteer monitoring groups, and watershed planning organizations. NEMI was strongly endorsed by the Advisory Committee on Water Information (ACWI) in May 2001. The beta release of NEMI can be accessed at <http://www.nemi.gov>.

The database is being developed in three phases. The first phase, which was completed in March 2001, involved looking at similar databases used by other groups to develop a data

dictionary, business rules, user requirement rules, and design development using an Oracle database structure. The second phase incorporated reviewer comments of Phase 1 and created the functional, web-enabled user interface with the NEMI database design to meet user requirements. Phase 2 is expected to be completed by June 2002. Phase 3 includes updating methods and continuing to add new methods (including field protocols and biological methods) to the database.

Develop and recommend a core set of data elements for reporting water quality monitoring results and for allowing data comparison (WQDE Workgroup)

In a cooperative effort, the USEPA and the Methods Board have developed and recommended a core set of data elements for reporting water quality monitoring results, to be voluntarily implemented, that would allow data to be compared regardless of, but recognizing, the purpose of the monitoring activity.

A core WQDE list (containing about 30 elements) has been developed for chemical and microbiological data (<http://wi.water.usgs.gov/pmethods/elements>). The list is comprised of several types of information that provide the who, what, where, when, why, and how for monitoring data. The list has undergone broad agency and organization reviews by the USEPA, the Methods Board, and the National Water Quality Monitoring Council. The list was announced in the Federal Register in March 2001 and public meetings were held in Chicago, Denver, San Francisco, and Washington, D.C. to accept public comment on the list. The list was endorsed by ACWI in May 2001.

An additional list of core elements for field and laboratory biological methods is currently being developed by the Board.

Advocate performance-based methods (PBMS Workgroup)

The PBMS Workgroup has investigated numerous aspects of performance-based systems with the goal of developing the most straightforward set of criteria to allow laboratories and monitoring program designers to affect cost savings by using state-of-the-art methodologies, and being able to compare results from different programs in a consistent manner, while strengthening quality assurance standards. In 1999, the workgroup developed a criterion document outlining the critical factors necessary to ensure that PBMS-based programs would meet these goals and distributed this document among interested parties. A copy of the PBMS Position Paper is available on the MDCB website (<http://wi.water.usgs.gov/pmethods/PBMS>) and available as a National Water Quality Monitoring Council Technical Report (01-02).

In 2000, the workgroup undertook a pilot study to test these criteria, using a new mercury-free COD test method as

the basis for the pilot study. In this study, conducted with the cooperation of eight laboratories representing a variety of user types, the new method was evaluated using two separate approaches. The new method was evaluated against a set of DQOs/MQOs (Data Quality Objectives/Measurement Quality Objectives) established by the workgroup, and evaluated by comparison to a currently USEPA-approved COD reference method. Both approaches to evaluating a performance-based system proved to be viable as techniques to determine whether a new analytical method for a given parameter could be used for monitoring purposes. The results of this pilot study will be described in a peer-reviewed publication. Pilot studies that will examine performance and comparability of stream benthic macroinvertebrate field sampling methods and nutrient field and analytical methods will be implemented during 2002 and 2003.

Develop and promote a MDCB position on laboratory and field accreditation, and coordinate with the National Environmental Laboratory Accreditation Conference (NELAC) Accreditation Workgroup)

The MDCB recognizes that the consistent, rigorous accreditation of laboratories which report data is necessary to the collection of better water data. Currently, efforts are underway through the National Environmental Laboratory Accreditation Conference (NELAC) to establish a national reciprocal accreditation program in the U.S. The MDCB developed a position paper and primer that explains to the monitoring community the importance of accreditation and provides background for recommendations on federal participation in an accreditation program.

ACWI endorsed these MDCB recommendations in May 2002:

1. All federal agencies performing routine analytical water testing should be accredited under a recognized program.
2. NELAC is the Board's recommended program.
3. The MDCB will periodically re-evaluate NELAC's suitability to serve as a national accreditation program.

The position paper and primer are available on the Board's website at <http://wi.water.usgs.gov/pmethods/accreditations>.

Members of the MDCB Accreditation Workgroup are active participants in the development of NELAC. The expansion of the program to accreditation of field activities is an important next step in the ongoing process of data quality assurance.

Develop a framework to compare biological assessment methods and their data (Biology Workgroup)

All monitoring data ultimately require some form of field sampling and sometimes direct field measurements. The per-

formance of many of these methods has not been adequately documented nor has there been a comprehensive framework for characterizing performance of field methods. The MDCB recognizes that field method performance is an area in need of attention as sampling-induced error or bias can often be far larger than that associated with laboratory analysis. The Biological Methods Workgroup of the Board has developed a draft issue paper describing procedures for documenting precision of field collection methods for stream benthic macroinvertebrates. Using case study data derived from several areas of the U.S., this paper specifies several ways in which the precision of a given field collection or taxonomic identification method can be determined. The Board is also assisting USEPA, USGS, and other agencies in developing a framework for characterizing the performance of biological field sampling methods and for determining comparability of data using different methods.

Future Methods Board activities

DQO/MQO development

Data Quality Objectives (DQOs) and Measurement Quality Objectives (MQOs) are or should be the foundation of all monitoring studies as these define the objectives for the monitoring and the data quality needed to respond to those objectives. MQOs are statements that contain specific units of measure such as percent recovery, percent relative standard deviation, standard deviation of X micrograms per liter, or detection level of Y parts per billion. They should be thoroughly specified to allow specific comparisons of data to an MQO. DQOs are statements that define the confidence required in conclusions drawn from data produced by a project.

The MDCB will be compiling relevant information produced by several agencies to develop clear guidance on how to define DQOs and MQOs using real-world examples from the water quality monitoring field. An expert system is being developed to connect the DQO/MQO concept to other Board products (NEMI, WQDEs).

New technologies

Why are new technologies of interest? In part, because data quality is improved through increased sensitivity, specificity, accuracy, and precision. Additionally, new technologies may provide cost savings due to reduced materials and labor costs. In some cases, reduced cost translates into an increase in data quantity (e.g. remote or *in situ* monitoring—increased frequency, distribution of sampling and analysis), which ultimately results in improved data quality. The Methods Board will be investigating new technologies that offer the possibility of improved protection of ecological and human health. The results of these investigations will be integrated into the NEMI, WQDE, Accreditation, and PBMS efforts.

The Intergovernmental Task Force on Monitoring Water Quality

In 1992, the United States Office of Management and Budget (OMB) issued an official statement requiring the review and evaluation of national water quality monitoring activities and the development of recommendations for improvements. Later that year, the Intergovernmental Task Force on Monitoring Water Quality (ITFM) was formed to respond to this challenge. ITFM's charge was to develop a voluntary, integrated, nationwide monitoring strategy.

During its three-year duration, the Task Force was chaired by the United States Environmental Protection Agency (USEPA) and co-chaired by the United States Geological Survey (USGS). Members of the task force included representatives from federal and state agencies. After three years of work, the ITFM produced its final report containing principal recommendations on many issues including:

- monitoring framework
- data collection methods
- environmental indicators
- data management
- assessment and reporting approaches

Creating a framework for collaboration and comparability among programs was identified as one of the goals necessary for the development of a national monitoring strategy.

In May 1997, the National Water Quality Monitoring Council and the Methods and Data Comparability Board were chartered under the Federal Advisory Committee Act (FACA), succeeding ITFM. The Council's charge is to implement a nationwide strategy to improve water quality monitoring, assessment, and reporting, and to oversee the activities of the Methods Board. The Board's role is to provide the framework and forum for comparing, evaluating, and promoting monitoring approaches that can be implemented in all appropriate water quality monitoring programs. Collaboration and comparability are the keystones of the Board's efforts.

Methods Board membership

The Board has 15 voting delegates, up to 15 alternates, and non-voting technical work-group members as needed, representing all geographic areas of the U.S. The members have a wide variety of technical and administrative experience related to monitoring methods issues as well as field and laboratory expertise in chemical, physical, and biological water monitoring methods.

Voting and alternate delegates are equally represented among each of the three major sectors: federal agencies, state/tribal government agencies, and other monitoring interests. Delegates representing these sectors will work to facilitate the Board's efforts to achieve its goals and to promote participation of the private sector as well as governmental agencies.

How can the Methods Board help your program?

The expertise and national representation on the Board will provide many benefits to both data generators and data users including:

- project cost-savings
- strengthened foundation in quality assurance (QA) and quality control (QC)
- potential reduction in number of sites sampled
- technical assistance in study design for methods assessment and analysis
- increased ability to use data produced by other programs
- increased ability to use historical datasets

Additional information, including documents referenced in this fact sheet, can be obtained through the Methods Board web site:

<http://wi.water.usgs.gov/pmethods/>

Information regarding opportunities for involvement with the Board's efforts can be obtained from:

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