9. TOTAL MAXIMUM DAILY LOADS (TMDL)

303(d) IMPAIRED WATERS LIST DEVELOPMENT[1]

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Status: Currently in Place

This monitoring is being done on a limited basis in the state but not yet in a systematic fashion. The regions are asked to monitor about 15 waterbodies each year to help develop the 303(d) list.

Development of the biennial 303(d) list of impaired waters will be based on a number of other monitoring strategy components including ambient water chemistry, contaminated sediment, pathogen monitoring, volunteer monitoring where QA/QC provisions are followed, and monitoring using biological metrics. On some waterbodies, the appropriate listing decision will be apparent after baseline sampling; others will require further investigation. This program targets further monitoring efforts on those waters that have been identified as likely to be impaired by other monitoring components or other agencies, but for which data are insufficient to determine actual impairment and the responsible pollutant(s) or sources. This monitoring component is explicitly created to ensure that monitoring is conducted on those lakes and streams that are highly likely to be impaired.

Monitoring Objectives

Clean Water Act Objectives

- Determining water quality standards attainment
- Identifying impaired waters
- Identifying causes and sources of water quality impairments
- Supporting the implementation of water management programs
- Supporting the evaluation of program effectiveness

Specific Objectives

- Identify whether suspected waters are in fact impaired and should be placed on the 303(d) list
- Identify the pollutant(s) of concern
- Support the development of TMDLs and management plans for impaired waters.

Monitoring Design

The waters to be monitored will be identified by the WDNR 303(d) list coordinator with consultation with Department regional staff. Between 40 and 50 waters will be identified annually with a limit of about 10 to 12 sites per WDNR Region. Waterbodies to be sampled can be identified through a data documentation sheet submitted to the coordinator in the fall of even numbered years. Sampling design and frequency at each site will vary depending on site-specific circumstances. The targeted waters (or segments of waters) will be identified based on:

[1] For purposes of this monitoring strategy component, impaired waters are meant to include threatened waters using EPA's definition of threatened as currently meeting water quality standards but the water quality is declining at a rate where water quality standards will not be met in two years (or a different period if the listing cycle is changed).

- Data collected from other agencies or educational-level volunteers that indicates a problem but does not meet QA/QC requirements for listing.
- Data collected where an insufficient number of samples were collected to meet that listing methodology. For example, based on a single sample collected through the baseline lake monitoring, spring sampling and monthly summer sampling would be needed.
- Data collected by WDNR staff that indicates an impairment, but insufficient information is available to determine the pollutant causing the impairment. (In some cases, the water may be included on the 303(d) list with the pollutant undetermined.)

When the Assessment Methodology is finalized, it will allow a more systematic way of assessing data to determine whether or not a waterbody is considered impaired.

Core and Supplemental Water Quality Indicators

A variety of core and supplemental water quality indicators will be used to assess the 40 to 50 waters identified annually. Data from a number of statewide baseline monitoring efforts is used in the development of the statewide 303(d) list, including chemical analysis such as dissolved oxygen, temperature, pH, sediment, bacteria, nutrients, metals, organic compounds (PCBs) and fish tissue (mercury contamination). Other specific indicators may also be used given specific circumstances of individual waterbodies. It should be noted that the indicators to be used will be those that identify both impairments and pollutants causing the impairments. For example, for streams, the core indicators will likely include measures of the condition of biological communities as well as measures that indicate the pollutant, such as nutrients.

Quality Assurance

All monitoring will be covered under the WDNR's Quality Assurance Plan (QMP). The specific section of the QMP depends on the specific indicators used.

Data Management

Data collected on targeted waters will be entered into the SWIMS datasystem, and will then flow to USEPA STORET. Monitoring sites will be geo-located based on the locational standards for the type of data collected.

Data Analysis/Assessment

Data will be analyzed or assessed based on the methodology used for the particular pollutants and impairments and then compared to appropriate sections of the 303(d) list methodology. Assessment results will be included in the Waterbody Assessment Tracking and Electronic Reporting System (WATERS). The WATERS database is the primary means of storing data for all waterbodies in the state, including those that are on the 303(d) list and those that are recommended for addition to the list. A major effort to validate the quality of data in the database was initiated in 2007.

Reporting

Waters deemed impaired will be included in the next update of the 303(d) list. The information will also be entered into WATERS and will thus be included in the future Integrated Reporting (305b/303d) to USEPA starting in 2010. The results will also be included in the 303(d) list, which is available on the Department's 303(d) list website, http://dnr.wi.gov/org/water/wm/wqs/303d/303d.html.

Programmatic Evaluation

The results of the monitoring will be reviewed as part of the process for updating Wisconsin's 303(d) list of impaired waters. The 303(d) list is subject to public review and EPA review and approval. As such, there will be three levels of programmatic review: Department review, public review and EPA review.

General Support and Infrastructure Planning

Staff and Training: Staff has been trained in the data collection techniques. About 640 hours in staff time is needed annually, based on 50 waters analyzed. The appropriateness of citizen involvement in these monitoring projects will be assessed on a case-by-case basis.
Laboratory Resources: The State Laboratory of Hygiene will conduct all water chemistry analysis.
Funding Needed: $16,000 to $25,000 for lab analysis plus costs for travel and supplies, based on 50 lakes and streams.

SOURCE IDENTIFICATION & LOAD ASSESSMENT

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Status: Partially in Place

Monitoring conducted in support of this effort is expected to increase in the coming years to meet U.S. EPA expectations for submittal of Total Maximum Daily Load reports each year. This program is limited by available funding which is currently based solely upon federal grants. It is anticipated that most of the coming year's projects will be funded using Tier II Special Projects.

Monitoring Objectives

The purpose of this monitoring is to provide supporting information in developing Total Daily Maximum Loads (TMDLs) for waters listed on the state's 303(d) impaired waters list. The range of impairments includes eutrophication, dissolved oxygen depletion, sedimentation, toxic substances and others. This monitoring component will support the implementation of Section 303 of the Clean Water Act.

Clean Water Act Objectives

- Identifying causes and sources of water quality impairments
- Development of plans to address pollutant loads on a water-by-water basis
- Supporting the implementation of water management programs
- Supporting the evaluation of program effectiveness

Specific objectives

Specific objectives of this monitoring category are:

- Identify the extent and source(s) of pollutants that are causing the impairment(s).
- Quantify the total load of pollutants to a waterbody that are causing the impairment(s).
- Measure or estimate the relative contribution of pollutants from point and nonpoint sources in the watershed.
- Provide adequate information to develop water quality models appropriate for the waterbody and identified pollutant(s).
- Evaluate TMDLs during and after implementation. This monitoring will provide an assessment of the effectiveness of individual TMDLs.

Monitoring Design

The level of monitoring needed to accomplish these objectives is greatly dependent on the types and sources of impairments. Another major factor in designing a monitoring effort is the size and complexity of the watershed to be monitored. WDNR has developed technical guidance for monitoring and model selection for TMDL development (WDNR 2001). The guidance suggests using a three-tiered approach (simple, intermediate and complex) in determining the level of intensity and duration of monitoring for specific

TMDLs. Monitoring strategies have been developed for each of the various types of impairments (i.e. nutrients, dissolved oxygen, sediments, etc.) and type of waterbody (lakes, streams, rivers, etc.).

Monitoring intensity may vary from grab water chemistry sampling of a lake or stream for a single growing season to fixed-station, continuous flow and bi-weekly water quality monitoring at multiple sites for 1-3 years. The level of effort and cost of monitoring for TMDLs will greatly depend on the duration and level of complexity of each project. Fixed-station continuous flow monitoring is typically contracted out to the U.S. Geological Survey (USGS) or U.S. Corps of Engineers (USCOE). No other Department monitoring effort currently provides the level of information necessary to develop site-specific TMDLs.

The Department anticipates initiating significant TMDL monitoring efforts at about 30 locations per year, with varying levels of complexity. Funding for these projects is from 319 nonpoint source grants, so chosen sites must be nonpoint-dominated or focus on the nonpoint portion of a "blend" situation.

This monitoring category also includes monitoring the effectiveness of TMDL implementation in meeting established water quality goals. Monitoring may begin immediately after the TMDL has been established, or several years after implementation has been initiated. Generally, evaluation monitoring would replicate the initial water quality monitoring that was use to develop the TMDL.

Core and Supplemental Water Quality Indicators

Core water quality indicators are greatly dependent on the type of impairment that is being addressed by the specific TMDL. Chemical (nutrients, BOD, DO, various toxicants), biological (chlorophyll *a*, bacteria, etc.) and physical measurements (temperature, sediment) are the most commonly used indicators. For example a lake nutrient TMDL may include measurement of in-flowing nutrients, suspended solids and continuous streamflow, and in-lake parameters typically include nutrients (phosphorus and nitrogen), chlorophyll *a*, pH, secchi depth and DO/temperature profiles.

Supplemental indicators may include fish (population estimates, Index of Biological Integrity) aquatic insects (Biotic Index) and habitat assessments on streams where a use designation is being impaired. Additional indicators may include land use, cover type, soils, drainage system characteristics and climate data for land use modeling.

Quality Assurance

The TMDL monitoring plan design does not include a specific Quality Assurance Project Plan (QAPP) but rather relies on the Department's Quality Management Plan (QMP). Flow and pollutant loading data for primary TMDL monitoring sites is collected and quality checked by the USGS. Field sampling and analytical procedures follow established Department protocols in the WI WDNR Field Procedures Manual (1998). The State Laboratory of Hygiene (SLOH) maintains its own quality assurance program for water chemistry analysis.

Data Management

Monitoring data to develop TMDLs will be stored in SWIMS beginning in 2007. Data collected at USGS monitoring sites is entered into the USGS water data management system; USGS collected data are readily accessible via the Internet and the USGS water data reports. Samples analyzed by the SLOH are entered within two months of analysis and the USGS data are entered into the data management system within one year of collection. All STORET sample collection sites are geo-located using WDNR location standards.

Field data are entered on lab sheets and into the SLOH and SWIMS databases. Hard copies of field data are stored in staff files in the individual WDNR regional offices.

Data Analysis/Assessment

Water quality data are used to develop and evaluate TMDLs. Typically, measured pollutant concentrations and continuous streamflow data are used in software programs (such as FLUX) to estimate daily and annual

pollutant loads. These measured loads form the basis of developing a TMDL that will address the identified water quality impairments. Other water quality response models (such as WILMS and BATHTUB) are used to simulate the lake response of reductions in pollutant loads. The response models are used to identify a loading reduction level that will meet the identified water quality goal. Other models such as SLAMM and SWAT are used to estimate pollutant loads from various land uses. More discussion of model selection for developing TMDLs is provided in WDNR (2001).

Reporting

Monitoring results are presented as technical reports prepared by USGS, ACOE or WDNR staff, depending on funding or contract arrangements. Water quality monitoring data are also summarized in each specific TMDL report. Draft and final TMDL reports are prepared by WDNR staff and made available to the public on the WDNR web site.

Programmatic Evaluation

Development of a TMDL generally provides its own feedback mechanism in that if the data are inadequate, the TMDL cannot be adequately determined. There are currently no ongoing programmatic methods used to evaluate the effectiveness of TMDLs.

General Support and Infrastructure Planning

The 2004 303(d) list included approximately 300 impaired waterbodies, not including those that are only impaired by Fish Consumption Advisories (FCAs) due to mercury and/or PCBs. The current level of funding and staffing to monitor and address these 300+ waterbodies over the next 10-15 years is woefully inadequate.

Staff & training – Few permanent WDNR staff are available in the state to perform this work; however, several staff are involved in some aspect of monitoring related to TMDLs. Much of the water quality monitoring has been contracted to outside agencies including USGS and the ACOE. Specific WDNR staff training to support monitoring and development of TMDLs is very limited and more is needed. Staff levels need to be significantly increased to accelerate the development of TMDLs. The appropriateness of citizen involvement in these monitoring projects will be assessed on a case-by-case basis. Until all of these factors can be addressed, WDNR will begin to expand its monitoring efforts for waters on the 303(d) list and will rely on Central Office staff and/or contractor support to prepare the TMDLs.
Laboratory resources – Laboratory resources for developing TMDLs are provided through Special Projects funding. Approximately 25% of the total cost of monitoring to develop TMDLs is needed for laboratory analysis.
Funding – The average cost of monitoring intermediate and complex TMDLs is estimated at about $25,000 each (some over multiple years). The total cost of monitoring all 303(d) waters to develop TMDLs (those that are not impaired by FCAs only) over the next 15 years is estimated at about $7.5 million (or $500,000 per year). The primary source of funding for the current workload is the 319 Incremental Grant.

Portions of several regional and Central Office staff support this activity.

Program Gaps

Staff levels and available funding would need to be significantly increased to accelerate the development of TMDLs (see staffing and funding information in General Support & Infrastructure Planning, above).

References

Wis. Dept. of Natural Resources. 2001. WDNR Technical Guidance – Monitoring and Model Selection for TMDL Development. WDNR, Bureau of Watershed Management, Madison, WI.

Wis. Dept. of Natural Resources. 1998. WDNR Field Procedures Manual. WDNR. Madison, WI.