Analysis of TMDL Implementation Rates in EPA Region 5

FINAL REPORT

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Executive Summary

The U.S. Environmental Protection Agency (EPA) Total Maximum Daily Load (TMDL) program has accounted for the listing of over 44,000 impaired waters nationwide and the development of over 40,000 TMDLs since the program's creation. Case-specific accounts of implementation are widespread, but the actual rate of implementing TMDLs nationally or regionally has remained virtually unknown because full census and tracking of every implemented practice would be an overwhelming if not impossible task. To gain insights on implementation, EPA's TMDL Program Results Analysis Project conducted a sample-based analysis of TMDL implementation rates and characteristics in the six EPA Region 5 states (IL, IN, MI, MN, OH and WI).

A probabilistic sample was drawn from all TMDLs established through FY2007. Sampled TMDLs were allocated proportionally to states based on each state's total TMDL production. Regional but not specific state-level statistics were the goal of the study. Subpopulations of interest contrasted older (through FY2003) versus newer (FY2004 – FY2007) TMDLs, and nonpoint-source (NPS)-only TMDLs versus point source (PS)-only and mixed (PS/NPS) TMDLs. The project team extracted information on each of the 138 sample TMDLs and their proposed NPS and PS controls from EPA data systems in advance of working with each state to verify implementation rates and patterns across the Region.

This assessment demonstrated that, within a +/- 10% margin of error at 90% C.I., an estimated 80.3% of Region 5 TMDLs were at least partially implemented. Full implementation was uncommon. No implementation was observed in approximately 20% of the sample, but the diffuse nature of control practices typical of many TMDLs made complete verification of every practice difficult. Among subpopulations, implementation rates did not differ significantly between older or newer TMDLs, but the mixed TMDLs implementation rate exceeded the NPS-only rate by 16.1%. Implementation plans existed for 79.6% of TMDLs, and NPS-only TMDLs showed more plans than the mixed TMDL subpopulation. TMDLs generated as part of large watershed, multi-TMDL efforts comprised 13.2% more of the newer TMDLs subpopulation than the older TMDLs subpopulation.

Post-analysis steps included exploring GIS data on the watershed traits of each sampled TMDL for other possible associations with patterns of implementation, and evaluation of possible subcategorization of the 'partially implemented' samples to provide more detailed information. Analysis of predominant land cover in the samples' watersheds did not reveal significant differences among implementation rates associated with urbanized, heavily agricultural, lightly agricultural, and rural non-agricultural watersheds. Efforts to further subcategorize samples that were initially classified as partially implemented were partially successful but substantially limited data and by the difficulty of consistently comparing widely variable TMDLs.

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1 INTRODUCTION

The Total Maximum Daily Load (TMDL) Program has accounted for the current listing of more than 44,000 impaired waters nationwide and the development of more than 40,000 TMDLs since the Program's inception. However, the rate of implementing TMDLs – putting into practice the onsite pollution controls called for in the TMDL -- long remained virtually undocumented. The TMDL Program was criticized in a 2007 program review by the Office of Inspector General for not being able to estimate the rate of implementing TMDLs in any way. The U.S. Environmental Protection Agency (EPA) subsequently committed to explore sample-based methods for estimating implementation rates, and specifically to conduct a TMDL implementation sampling pilot study in the six north-central states of EPA Region 5. The purpose of the study was to conduct an analysis of Regional TMDL implementation rates and characteristics as represented in a probabilistic sample of Region 5 TMDLs. The basic TMDL activities of interest in this analysis included:

- Partial to full progress in planning, funding and installing Best Management Practices (BMPs) that address the Load Allocation of a given TMDL, through Section 319 (or, to the extent available, other) projects;
- Partial to full progress in incorporating the Waste Load Allocations (WLAs) of a given TMDL in National Pollutant Discharge Elimination System (NPDES) (or other) permits;
- Identification of each sample TMDL as part of a single-TMDL versus multiple-TMDL development effort; and
- Partial to full progress in developing an Implementation Plan.

The project analyzed a sample of approved TMDLs within Region 5 to estimate implementation status at the Regional level within a +/- 10 percent margin of error at 90 percent confidence. The list of TMDLs was extracted from the National TMDL Tracking System (NTTS) in April 2008 and contained a Region 5 statistical universe of 2,228 TMDLs approved through FY2007. Subpopulations of interest also enabled the comparison of older and newer TMDLs (through FY2003 and FY2004 to 2007), and nonpoint-only and point source related (point-only and mixed) TMDLs. The study was not designed to obtain state-level statistically valid results. Based on the subpopulations, desired accuracy, and desired statement parameters, the estimated minimum sample size was 126. Additional samples (15) were added to compensate for expected non-response or other data issues, yielding a sample selection of 141 TMDLs. Three TMDLs were subsequently deleted from the study as unsuitable samples, and the final study therefore included 138 TMDLs. These samples were proportionally allocated among Region 5 states; the single-state totals thus range from 10 to 42 TMDL samples.

EPA determined the desired accuracy and outputs of the project, developed the project design, selected the sample, and prepared preliminary data about each sample. EPA also contracted with Tetra Tech, Inc. (Tetra Tech) to provide support for several project subtasks. Tetra Tech's scope of effort was limited to developing data collection protocols, collecting the data regarding implementation, and organizing the data into a database. This report summarizes the approach and results of the Tetra Tech subtasks. Section 2 summarizes the technical approach, Section 3 describes the data collection effort for each state, and Section 4 presents the results and observations. Definitions of key terms as they relate to this project are provided in Section 5.

2 TECHNICAL APPROACH

The technical approach for each of the following three project subtasks was carried out by the Tetra Tech project team:

- Subtask A: Project Work Plan and Establishment of Data Collection Protocols
- Subtask B: Collect and Compile Field Data
- Subtask C: Organize Findings and Develop Report

2.1 SUBTASK A: PROJECT WORK PLAN AND ESTABLISHMENT OF DATA COLLECTION PROTOCOLS

This subtask focused on developing the project work plan, establishing the data collection protocols, and identifying quality assurance/quality control (QA/QC) procedures for the consistent, efficient and timely collection of the information identified in the statement of work (SOW). The data elements to be collected were documented in the SOW and serve to fill the following general data needs:

- Identifying basic TMDL information (e.g., waterbody, pollutant, state)
- Identifying point and nonpoint source implementation activities outlined in the TMDL (or Implementation Plan)
- Determining the status of permitting and BMP implementation activities outlined in the TMDL (or Implementation Plan)
- Documenting additional NPDES facilities, Section 319 projects or other nonpoint source projects not included in the TMDL documents

A number of sources of information were used to collect the necessary data, including: the TMDL reports and decision documents; TMDL implementation plans; online web pages and databases; permit and grant documentation; and state TMDL, permitting and nonpoint source personnel. The data collection protocols identified the sources of information relevant to each data element and the priority order for their review. For example, the available TMDL-related reports were reviewed first for any relevant information prior to searching other information sources such as online databases. State personnel were not contacted until after analyzing the readily available reports and other sources of information and identifying the data gaps that required additional inquiry. This was done to eliminate any unnecessary burden on state personnel and to make the most efficient use of their time.

The data collection protocols also relied on the development of a standardized Excel spreadsheet and Access database to compile and organize the information. The spreadsheet was used to document the available data as they were collected. The data were then inserted into the database to standardize data storage and facilitate data querying.

For each TMDL, five categories of data were recorded in the spreadsheet:

- Basic sample reference information
- Preliminary TMDL-level information
- Within-TMDL information (additional data not included in TMDL document)
- Summary TMDL implementation data
- Contact information

Table 2-1 lists these five categories and the associated data elements needed for each. The process for obtaining and recording information for the data elements is explained in the following sections.

Table 2-1. Data elements included in each TMDL analysis form

Basic TMDL Reference Information	
TMDL State	Pollutant Description
TMDL Sample #	TMDL Type
Waterbody Name	TMDL Fiscal Year
TMDL ID	
Preliminary TMDL-Level Information	
General Categories of PS	Status of BMP Implementation
Total WLA	Status of BMP Planning
WLA Units	WLA Allocation Details
NPDES Facility Names	Other Project Names
NPDES Facility IDs	Sponsoring Sources
NPDES Facility Type	Funding
Individual WLAs for each NPDES ID	Status of Project Implementation
Individual WLA Units	WLA Allocation Details
Status of incorporating WLAs into NPDES Permits	Status of Project Planning
Issuance/Reissuance Date	Included in TMDL Report or Post-TMDL
General Categories of NPS	LA Allocation Details
Total LA	LA Units
319 Project Names	319 Project IDs
Year of Funding	TMDL Implementation Status
Funding	Source of Funding Information
Status of BMP Implementation	Status of BMP Planning
Source of BMP Implementation	BMP Planning Source
TMDL Implementation Plan Status	Is Segment-Pollutant Combination Part of Multi-TMDL/Watershed TMDL Analysis?
What Date Did TMDL Implementation Begin?	Total # of TMDLs Finalized in TMDL Document
Within-TMDL Information (Additional Data Not Included In TMDL Document)	
NPDES Facility Names	Status of BMP Planning
NPDES Facility IDs	Project Name
NPDES Facility Type	Sponsoring Sources or Permit Number
Issuance/Reissuance Date	Funding
Status of WLA Implementation	Status of Project/Permit Implementation
319 Project Name	Status of BMP Planning
319 Project IDs	Evidence of Water Quality Improvements, and Source
Funding	Data Mining Contact(s)
Funding Source	Status of BMP Implementation
Project Implementation Source	Data Mining/Compilation Issues
Status of Project Planning	Project Planning Source
Other Project Names	Sponsoring Sources
TMDL Implementation Summary Details	
Overall TMDL Implementation Status	TMDL Implementation Plan Completed?
PS-Related Implementation Status	TMDL Developed as Part of Multi-TMDL or Watershed TMDL?
NPS-Related Implementation Status	TMDL Implementation Within the Watershed but not on TMDL Segment
Overall TMDL Implementation Status Up Through FY 2003	Parallel but Unrelated Implementation
Overall TMDL Implementation Status from FY 2004 Through FY 2007	Evidence of Water Quality Improvements?
Evidence Sources	Data Mining Issues
Contacts and Sources	
Contact Name	Contact Phone
Contact E mail	Source
Source Address	Reason Used

2.1.1 Approved Sources of Information

The following sources of information were used to determine the implementation status of TMDL samples in this study. For all of these approved sources of information, a practice was considered to have been implemented if it was described as currently active or having already occurred. However, when the source referred to future plans to implement, even when those dates had passed, secondary verification was required.

- TMDL Documents or Web sites
- Permit documents or Web sites
- Section 319 Nonpoint Source documents or Web sites
- Other Point Source or Nonpoint Source documents or Web sites
- Point Source or Nonpoint Source project-related files
- Implementation Plans
- Other implementation studies, data systems or Web sites
- Correspondence with State contacts
- Correspondence with other project contacts

2.1.2 Data Recording

The project team determined the status of each of the data elements shown in Table 2-1 through reviewing available documentation and speaking to the appropriate personnel. As information was obtained for each data element, it was recorded in an Excel spreadsheet for each state. Once the state spreadsheets were fully populated the data were migrated into an Access database.

The design of the Access database is shown in Figure 2-1. Separate tables exist for information related to the TMDL itself, point source controls, Section 319 nonpoint source controls, other nonpoint source controls, status of the implementation plan, overall implementation status, and contact information. The use of a database design allowed more efficient recording of information with one-to-many relationships. For example, one TMDL document might include 12 different point sources or two separate Section 319 projects. By using a database design the information about the TMDL itself (e.g., state, waterbody name) can be recorded only once and linked to related tables instead of having to be duplicated for each record of related information. The use of a database also allowed for the standardization of data entries, where possible, through the use of “pick lists” to ensure no errors were made in recording the information. For example, a Yes/No pick list was used to record whether the TMDL includes an Implementation Plan. Similarly, the database required that certain data entries be of a certain type (e.g., all dates must be input in date format). Having all of the information in a database also facilitated the eventual querying of the data to answer the key study questions.

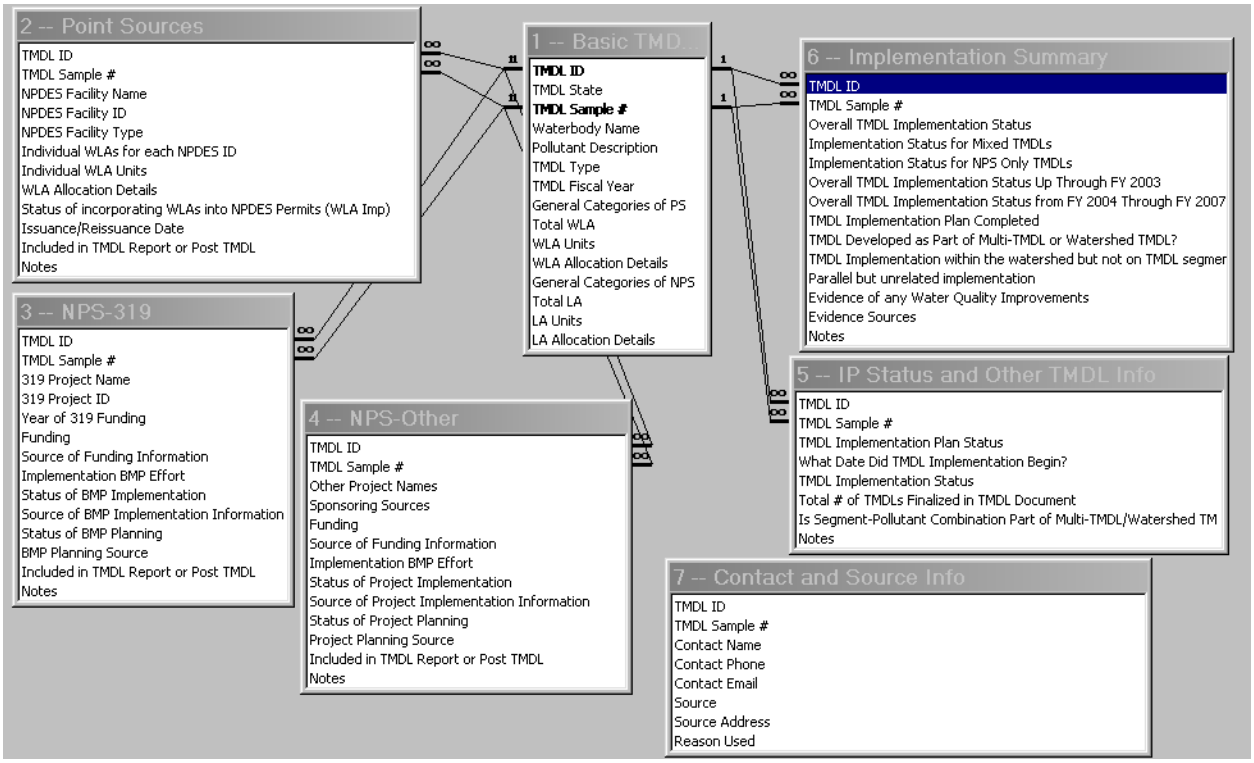


Figure 2-1. Structural relationship of the database for analyzing TMDL implementation rates. Lines connecting each table with a one and the infinity symbol imply a one-to-many relationship.

2.1.3 Description of Source Interactions

This section describes how the project team used various sources to obtain the desired information.

Initial Data Elements Obtained from TMDL Documents:
The project team reviewed the final approved TMDL Document and EPA's decision document (if necessary) to obtain the list of NPDES facilities in the watershed. It was also determined from the final TMDL document which of the facilities received WLAs resulted in a new permit limit compared to those where the TMDL re-affirmed the existing permit limit.

The final TMDL document was also used to obtain a list of any Section 319 projects in the watershed. These were cross-referenced against data from EPA's Section 319 Grants Reporting and Tracking System (GRTS) to determine if there were any other Section 319 projects relevant to the TMDL. Data from GRTS were obtained by querying the following Web site:

http://iaspub.epa.gov/pls/grts/f?p=110:3000:8752660467639323::NO:3000::

Determining Status of Implementation Activities Outlined in TMDL Documents:
A thorough review of each implementation activity (permitting, Section 319 projects, and other nonpoint source projects) noted in the TMDL documents was completed to determine the status of actual implementation. The purpose of the review was to determine the extent to which any referenced implementation activity had actually occurred. Implementation recommendations without any specific evidence suggesting that they had been implemented were noted for later cross-referencing with the appropriate personnel.

Determining Status of WLA Implementation:
The project team reviewed available NPDES permits to determine if any changes resulting from the TMDL had been incorporated into the permit. Permits for some major facilities were found online in some states but no major or minor permits were available online in others. Finally, state personnel were contacted to determine the status of WLA implementation. Personal contact with state personnel proved to be the most frequent method for determining the status of WLA implementation. The team did not need to contact any permittees directly to request that they provide an update on the status of WLA implementation.

Determining Status of BMP Implementation for Section 319 Projects:
The project team first searched the Internet for any documentation related to Section 319 projects known to exist in the TMDL watershed. Information in GRTS proved to be valuable for determining if projects had occurred in a TMDL watershed, but was less valuable for determining specific information about what projects had been implemented and where. Several states post their Section 319 annual reports online and these were valuable sources of information regarding the status of some Section 319 projects. When information about a Section 319 project was not available from the Internet, it was requested directly from state staff and, in a few cases, directly from the local grant recipient. The final sources of implementation about Section 319 projects were about equally split between online databases/reports and contact with state personnel or grant recipients.

Several of the Section 319 source projects were not initiated in response to the TMDL because they did not focus on the TMDL pollutant, were completed more than 3 years prior to TMDL approval, or the practices occurred in the watershed but not upstream of the segment included in this study. The project team used their best judgment to determine if the Section 319 projects represented TMDL implementation, but the information to make a conclusive decision was often not available.

Determining Status of BMP Implementation for Other Nonpoint Source Projects:
The project team requested information on other nonpoint source projects from state TMDL and Section 319 staff but most of this type of information came from direct contact with local Natural Resources Conservation Service (NRCS) and Soil and Water Conservation District (SWCD) personnel. In a few cases a local watershed group was also able to provide information on non-Section 319 nonpoint source projects.

Some of the challenges associated with the Section 319 projects also applied to the other nonpoint source projects such as difficulty determining whether practices were installed upstream of the TMDL segment and whether implementation occurred because of or coincident to the TMDL. As with the Section 319 projects, the team used their best judgment to determine if the other nonpoint source projects represented TMDL implementation.

Additional NPDES Facilities, Section 319 Projects, and Other Nonpoint Source Projects:
Information on NPDES facilities, Section 319 projects, and other nonpoint source projects not listed in the TMDL document was found in various sources, including the TMDL Implementation Plans, the Section 319 annual reports, and on the Internet. All additional facilities and projects found using these sources were cross referenced against those found in the TMDL Documents to avoid duplication. The appropriate data and approved sources were recorded for each facility/project.

Type of Permit (major, minor individual):
Tetra Tech was able to determine the type of permit (i.e., major or minor) for many of the wastewater treatment facilities from the TMDL document, the Permit Compliance System (PCS), the Integrated

Compliance Information System (ICIS), or the actual permit. The type of permit could not be determined for quite a few permits, however, and permit type is thus sometimes left blank in the database.

Status of TMDL Implementation Plan:
The project team first checked online to determine if any Implementation Plans were available and then followed-up with state TMDL and Section 319 staff. Local stakeholders were also contacted in several cases to request information on the existence of Implementation Plans.

Signs of Water Quality Improvement:
This assessment's scope of work did not include the assessment of water quality data to document signs of water quality improvement, although it was to be noted if discovered. The only such information that was identified were references to improved water quality that were made in a Section 319 Nonpoint Source Success Story about Governor Bond Lake in Illinois.

2.1.4 Quality Assurance Procedures

To collect and report accurate information for this project, Tetra Tech staff who conducted the work operated under the Quality Management Plan for Tetra Tech's Fairfax Center, which is based on the quality system requirements of ANSI/ASQC E4-1994, Specifications and Guidelines for Environmental Data Collection and Environmental Technology Programs (ASQC Quality Press, Milwaukee, WI, 1994) and is continually updated in accordance with comments received from EPA under other contracts. The QMP describes quality policy and quality management organization and supports all work conducted, including this project.

Specific additional quality assurance procedures that were identified and implemented for this project included the following:

- All data compilation efforts were performed by Tetra Tech personnel with significant TMDL experience in EPA Region 5. In several cases the Tetra Tech personnel responsible for collecting or reviewing the necessary information actually supported the states in the development of the TMDL. This familiarity with each state TMDL Program, not to mention individual TMDL projects, reduced the likelihood that data were incorrectly recorded due to a misunderstanding of the issues or information.
- Once the initial data compilation effort was completed, senior Tetra Tech personnel (not involved with the original compilation efforts) performed a "spot check" of 10 percent of the entries for each state for potential problems. If any problems were found within the first spot check, an additional 10 percent of the entries were reviewed and this process was repeated until no problems were found.
- As described previously, the use of an Access database allowed for certain data elements to have prescribed "pick lists" to minimize the potential for data entry errors.
- When speaking to state personnel, if the Tetra Tech interviewer was at all uncertain that he or she recorded the interviewees response correctly, the summarized findings were sent back to the interviewee so that they had the opportunity to make corrections.

2.2 SUBTASK B: COLLECT AND COMPILE FIELD DATA

During Subtask B, the project team followed the protocols developed in Subtask A to obtain the necessary information. The project team held several internal meetings to ensure a common understanding of the project goals and technical approach to minimize discrepancies in data collection efforts, and also met regularly during data compilation activities to ensure consistency among efforts and to immediately identify and resolve any issues that arose. For example, during the early data collection efforts, the team

discovered watersheds where Section 319 projects had occurred before the approval of the TMDL. In some cases the projects pre-dated the TMDL by only a year or two, but in other cases the Section 319 projects occurred as many as ten years prior to the TMDL. The project team met to discuss this issue and agreed, as a general rule, that Section 319 projects that were completed within three years of TMDL approval should be counted towards TMDL implementation. This was based on Tetra Tech's experience that TMDLs within Region 5 typically take one to two years to be completed and thus the Section 319 project and the TMDL effort had a good chance of overlapping one another. It was also consistent with the purpose of the study, which was to determine if the terms of the TMDLs are being implemented, not whether the TMDLs prompted implementation after finalization.

To optimize data collection activities and to meet the project schedule, the project team distributed data collection responsibilities by state. Each state lead identified the information needed from TMDLs in his or her assigned state and was responsible for collecting and compiling the information.
In general, the project team initiated all data compilation activities by trying to obtain the necessary data from the TMDL document, EPA decision document, and/or Implementation Plan (when available). Information not available from these three sources was next searched for in publicly accessible federal or state databases such as PCS, ICIS, and GRTS, as well as through general searches on the Internet.

Once each of these sources had been searched, the project team requested missing information from state personnel. The approach for contacting the state personnel was determined through conversations with the following TMDL coordinators in each of the six Region 5 states:

- Illinois EPA (IEPA): Dean Studer
- Indiana Department of Environmental Management (IDEM): Andrew Pelloso
- Michigan Department of Environmental Quality (MDEQ): Brenda Sayles
- Minnesota Pollution Control Agency (MPCA): Jeff Risberg
- Ohio EPA: Trinka Mount
- Wisconsin Department of Natural Resources (WNDR): Nicole Richmond

Illinois and Indiana directed the project team to work with individual personnel with expertise in various subject areas (e.g., NPDES permitting, Section 319 projects). Michigan and Wisconsin provided a central point-of-contact who obtained much of the data directly. TMDL implementation data for Minnesota were obtained from several state Web sites and through conversations with MPCA personnel. For the TMDLs in Ohio some of the necessary information on point sources and nonpoint source implementation activities was available from Dr. John Hoornbeek of Kent State University who had recently conducted a similar study for EPA.

Information not available from federal or state databases or state personnel was requested from persons responsible for the actual implementation in each watershed (subject to approval from the state TMDL coordinators). This included SWCD personnel, NRCS personnel, and watershed coordinators.

2.3 SUBTASK C: ORGANIZE FINDINGS AND DEVELOP REPORT

Upon completion of the data collection and compilation into an organized format, the project team prepared this project report that documents the data collection process and results.

3 STATE SUMMARIES

This section of the report provides a summary by state of the data collection effort. As specified in the SOW, state-level results are not presented; rather, the section describes the general process used to gather the information for each state and identifies any unique issues that were encountered.

3.1 ILLINOIS TMDL SUMMARY

Implementation efforts for a total of 18 Illinois TMDLs (eight lakes and ten streams) were assessed as part of this study (Table 3-1). All of the 18 Illinois waterbodies were listed as impaired by nonpoint sources of pollution. In addition, seven of the 18 TMDLs included WLAs for point sources. Two of the Illinois TMDLs are for fecal coliform, four are for manganese, three are for nitrates, four are for phosphorus, two are for total suspended solids, and one each are for siltation, sulfate, and total dissolved solids. All of the 18 Illinois TMDLs were developed as part of a multi- or watershed-TMDL, and all but one have some form of an Implementation Plan completed. Most of the TMDLs (15 of 18) were developed after 2003.

Table 3-1. Summary of Illinois TMDLs.

TMDL Sample Number	TMDL ID	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
Sample 010	33628	Argyle Lake	Total Phosphorus	Nonpoint Source	2007
Sample 016	33163	N. Fk. Mauvaise Terre Creek	Manganese	Nonpoint Source	2007
Sample 021	31540	Homer Lake	Phosphorus	Nonpoint Source	2006
Sample 024	3836	Governor Bond Lake	Total Susp. Solids	Point/Nonpoint Source	2002
Sample 031	33973	E. Fk. Kaskaskia River	Total Susp. Solids	Nonpoint Source	2003
Sample 034	12240	Kinmundy New Lake	Manganese	Nonpoint Source	2005
Sample 038	10834	Big Muddy River	Sulfate	Nonpoint Source	2004
Sample 050	31659	N. Fk. Kaskaskia River	Manganese	Nonpoint Source	2006
Sample 075	33700	Salt Fk. Vermilion River	Nitrates	Point/Nonpoint Source	2007
Sample 081	3832	Governor Bond Lake	Non-Volatile Suspended Solids	Point/Nonpoint Source	2002
Sample 084	33632	North Fk. Cox Creek	Total Diss. Solids	Nonpoint Source	2007
Sample 088	12250	Paris Twin West	Phosphorus	Nonpoint Source	2005
Sample 099	12283	Flat Branch	Fecal Coliform	Point/Nonpoint Source	2005
Sample 100	33201	N. Fk. Vermilion River	Nitrates	Nonpoint Source	2007
Sample 117	12321	Old Lake Hillsboro	Phosphorus	Nonpoint Source	2005
Sample 121	33564	Little Wabash River	Manganese	Point/Nonpoint Source	2007
Sample 126	33163	Mauvaisse Terre Lake	Nitrate	Nonpoint Source	2006
Sample 127	12283	Sugar Creek	Fecal Coliform	Point/Nonpoint Source	2005

3.1.1 Point Source Implementation

None of the TMDLs and associated WLAs recommended revised effluent limits for the NPDES permits. For several of the TMDLs the state determined that water quality standards could be met without additional reductions in point source loadings; therefore, all the WLAs were set equal to the loading rates specified by existing NPDES permits. In other cases, when the nonpoint source loads were compared to

the point source loads, the NPDES facilities were determined to represent a negligible portion of the overall load and did not receive an explicit WLA (which equates to a WLA of zero).

Several of the Illinois TMDLs recommended that point sources begin conducting additional monitoring so that their impact on the impaired waterbody could be better understood. This requirement was added to several of the permits, but for several permits it was not, apparently due to a lack of communication between TMDL and NPDES staff. Dean Studer of the Illinois EPA provided the following information regarding the state's efforts to integrate TMDL results into the permitting process:

> *"…I am in the process of developing memos and notification to IEPA permit staff so that appropriate conditions can be included in NPDES permits where a TMDL has been approved. Our goal is to develop the process by 12/31/2008. After which we will start with the most currently approved TMDLs working our way back through to the older TMDLs and indicate in memos to permit staff (and notification to the discharger) of what should be included in the next NPDES permit for these facilities."*

3.1.2 Nonpoint Source Implementation

Clean Water Act Section 319 projects were found in 10 of the 18 Illinois TMDL watersheds. However, several of these were not initiated in response to the TMDL because they did not focus on the TMDL pollutant or were completed as early as ten years prior to TMDL approval. Section 319 projects that were completed within three years prior to TMDL approval were counted towards TMDL implementation if the practices matched the pollutant of concern. Of the 10 watersheds with completed 319 projects, six had completed projects that were counted towards TMDL implementation. One waterbody (Governor Bond Lake, TSS) was removed from the Section 303(d) list after the Section 319 projects successfully mitigated the impairment. This was the only Illinois TMDL considered fully implemented.

Local SWCD personnel were also contacted to request information on implementation activities and several of them reported that a number of practices were in place within each watershed to improve water quality. However, it appeared that much of the implementation was occurring independent of the TMDL through ongoing U.S. Department of Agriculture programs such as the Conservation Practices Program (CPP), Conservation Reserve Program (CRP), and the Environmental Quality Incentives Program (EQIP). In these situations the practices were still counted towards TMDL implementation if they addressed the pollutant of concern and were occurring during or after approval of the TMDL. This is an important point that is discussed in more detail in Section 5.

3.1.3 Information Sources

A summary of all the Web sites that were accessed to obtain information on the Illinois TMDLs is provided in Table 3-2. The list of state and local contacts is provided in Table 3-3.

Table 3-2. Summary of online sources of implementation data.

Agency	Web Site Address	Summary of Information Obtained
IEPA	http://www.epa.state.il.us/water/watershed/reports/biannual-319/	Section 319 grant information and project summaries
IEPA	http://www.epa.state.il.us/water/tmdl/	Information on implementation projects, TMDL Documents and Implementation Plans
IEPA	http://www.epa.state.il.us/water/conservation-2000/index.html	Information on Conservation 2000 projects and Priority Watershed Projects
County SWCDs	http://www.aiswcd.org/Guide/links.htm	SWCD programs, projects, education, and other implementation efforts
US EPA	http://iaspub.epa.gov/pls/grts/f?p=110:1:4642271311943480::NO:::	Section 319 Grants Reporting and Tracking System (GRTS)-319 project information
US EPA	http://www.epa.gov/nps/success/	Additional information on 319 projects, specifically for Governor Bond Lake
IEPA, IDNR, and University of Illinois Extension	http://www.watershed.uiuc.edu/getting_involved/group_search.cfm	Watershed group contact information

Table 3-3. List of state and local contacts.

Agency	Contact Person	Information Obtained
IEPA	Dean Studer	NPDES permitting details and 319 project details
Shelby Co. SWCD	Gene Davis	NPS implementation activities occurring in Shelby county
Macon Co. SWCD	Shannon Allen	NPS implementation activities occurring in Macon county
Sangamon Co. SWCD	Terri Nichols	NPS implementation activities occurring in Sangamon county
Montgomery Co. SWCD	CJ Liddell	NPS implementation activities occurring in Montgomery county
Marion Co. SWCD	Burke Davies	NPS implementation activities occurring in Marion county
Clinton Co. SWCD	Annette Ambuehl	NPS implementation activities occurring in Clinton county
Randolph Co. SWCD	Micky Clark	NPS implementation activities occurring in Randolph county
Perry Co. SWCD	Martha Stein	NPS implementation activities occurring in Perry county
Jackson Co. SWCD	Michelle Sullivan	NPS implementation activities occurring in Jackson county
Morgan Co. SWCD	Jill Keeton	NPS implementation activities occurring in Morgan county

3.2 INDIANA TMDL SUMMARY

Implementation efforts for a total of 18 Indiana TMDLs were assessed as part of this study (Table 3-4). All of the Indiana waterbodies were listed in the National TMDL Tracking System (NTTS) as impaired by both point and nonpoint sources. However, further evaluation showed that three TMDL segments do not have any point sources upstream of them (Samples 037, 107, and 139). Fifteen of the Indiana TMDLs are for pathogens/*E. coli* while the other three are for phosphorus. All of the Indiana TMDLs addressed by this study were approved after 2003 and 13 of the TMDLs were approved in 2006 or 2007. All of the Indiana TMDLs were part of a multi-TMDL or watershed TMDL document.

Table 3-4. Summary of Indiana TMDLs.

TMDL Sample Number	TMDL ID	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
Sample 004	12102	White River	E. coli	Point/Nonpoint Source	2005
Sample 019	31036	Jacks Defeat Creek	E. coli	Point/Nonpoint Source	2006
Sample 022	30999	Wabash River Mainstem	E. coli	Point/Nonpoint Source	2006
Sample 030	12102	White River	E. coli	Point/Nonpoint Source	2005
Sample 037	32647	Middle Fork East Fork Whitewater River (Upstream)	E. coli	Nonpoint Source	2007
Sample 039	31567	Junk Ditch And Other Tribs	E. coli	Point/Nonpoint Source	2006
Sample 046	11589	Indian Creek	E. coli	Point/Nonpoint Source	2005
Sample 047	31567	St. Marys River Trib	E. coli	Point/Nonpoint Source	2006
Sample 051	30999	Wabash River Mainstem	E. coli	Point/Nonpoint Source	2006
Sample 057	31036	Beanblossom Creek	E. coli	Point/Nonpoint Source	2006
Sample 062	11316	Eel River	E. coli	Point/Nonpoint Source	2005
Sample 074	30999	Wabash River	E. coli	Point/Nonpoint Source	2006
Sample 091	30999	Wabash River And Tributary	Phosphorus	Point/Nonpoint Source	2006
Sample 107	12102	Raccoon Creek-Little Raccoon Creek	E. coli	Nonpoint Source	2005
Sample 120	30999	Wabash River Mainstem	Phosphorus	Point/Nonpoint Source	2006
Sample 122	30999	Wabash River	Phosphorus	Point/Nonpoint Source	2006
Sample 137	30999	Wabash River	E. coli	Point/Nonpoint Source	2006
Sample 139	32647	West Fork East Fork Whitewater River	E. coli	Nonpoint Source	2007

3.2.1 Point Source Implementation

The Indiana TMDLs addressed point sources of pathogens and phosphorus. Point sources of pathogens included wastewater treatment plants, municipal separate storm sewer system (MS4) communities, combined sewer overflows (CSO), and sanitary sewer overflows (SSOs). Several of the pathogen TMDLs resulted in new permit limits for wastewater treatment plants, and IDEM reported that all of these have been implemented. Other TMDLs made allocations to CSOs and referenced that the CSO allocations would be addressed during the preparation and implementation of Long Term Control Plans (LTCPs). Some CSO implementation efforts were found to have already occurred, but most communities are still in the process of preparing the LTCPs, and no implementation has occurred. Similarly, work is still underway to eliminate existing SSOs, and Indiana MS4 communities are still in a data gathering stage. The MS4 and SSO WLAs specified in the TMDLs have therefore not yet been incorporated into permits.

Point sources of phosphorus in these TMDLs also included wastewater treatment plants, MS4 communities, CSOs, and SSOs. Although phosphorus WLAs were specified in the TMDLs, the permittees are first being asked to monitor and report phosphorus. Therefore implementation for point sources of phosphorus has not yet occurred and these sources were categorized as "not implemented" for the purposes of this study.

3.2.2 Nonpoint Source Implementation

There are several programs in place in Indiana that can be used to implement nonpoint source control practices. These include Clean Water Act Section 205 and 319 programs, the Lake and River Enhancement (LARE) program, and the various USDA programs (e.g., CPP, CRP, EQIP).

The project team learned upon contacting IDEM for this study that it had recently completed a review of its Section 205 and 319 grants for use in their 2007 annual report. Some of the information needed for this project was therefore available from this review. The results indicated that there were 13 Section 319 projects that addressed TMDL segments included in this study. Most of these projects are in the planning phase, however, and have not yet started implementation. Three of the Section 319 projects have resulted in implementation; however the practices for two of these did not focus on the pollutant included in this study.

The team also found that there are seven other implementation efforts going on within the TMDL watersheds. However, similar to the Section 319 projects, most of these efforts are only in the planning phase, and there has not yet been any implementation.

It should be noted that 13 of the 18 TMDLs being studied by this project were from 2006 and 2007, which might explain why so many are still in the planning phase.

3.2.3 Information Sources

A summary of all the Web sites that were accessed to obtain information on the Indiana TMDLs is provided in Table 3-5. The list of state and local contacts is provided in Table 3-6.

Table 3-5. Summary of online sources of implementation data.

Agency	Web Site Address	Information Obtained
IDEM	http://www.in.gov/idem/4342.htm	Implementation grant information and project summaries
IDEM	http://www.in.gov/idem/files/2007_nonpoint_annual_report_final.pdf	Information on implementation projects and Implementation Plans
IDEM	http://www.in.gov/idem/5233.htm	Section 319 grant information and project summaries
EPA	http://iaspub.epa.gov/pls/grts/f?p=110:1:4642271311943480::NO:::	Section 319 Grants Reporting and Tracking System (GRTS)- 319 project information

Table 3-6. List of state and local contacts.

Agency	Contact Person	Summary of Information Obtained
IDEM	Staci Goodwin	NPDES permitting details
IDEM	Ernest Johnson	319 Projects
IDEM	Angie Brown	NPS implementation activities
IDEM	Bonny Elfiritz	NPS implementation activities
IDEM	Linda Schmidt	NPS implementation activities

3.3 MICHIGAN TMDL SUMMARY

Implementation efforts for a total of 15 Michigan TMDLs were assessed as part of this study, and the majority were approved prior to 2004 (Table 3-7). Only one was part of a multi-TMDL project and 11 were for pathogens or *E. coli*. The other four TMDLs were for sediment, mercury, and polychlorinated biphenyls (PCBs).

Table 3-7. Summary of Michigan TMDLs.

TMDL Sample Number	TMDL ID	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
Sample 002	3843	Kawkawlin River	PCBs	Nonpoint Source	2002
Sample 012	12239	River Raisin	E. coli	Point/Nonpoint Source	2005
Sample 017	3847	Saline River	E. coli	Point Source	2003
Sample 035	3838	Coldwater River	Sediment	Nonpoint Source	2001
Sample 043	4156	Pratville Drain & Lime Lake	E. coli	Point/Nonpoint Source	2003
Sample 044	3841	Hammell Creek	Mercury	Nonpoint Source	2002
Sample 045	3844	Lenawee County Drain No.70	E. coli	Nonpoint Source	2002
Sample 048	4271	Wagner-Pink Drain	E. coli	Nonpoint Source	2003
Sample 087	12277	Unnamed Tributary To Grand River	Sediment	Point/Nonpoint Source	2005
Sample 096	3658	Galien River	E. coli	Point/Nonpoint Source	2002
Sample 106	3842	Huron River	E. coli	Point/Nonpoint Source	2001
Sample 108	32213	Albrow Creek	E. coli	Nonpoint Source	2007
Sample 112	4270	Shiawassee River	E. coli	Nonpoint Source	2003
Sample 113	9499	Grand River And Portage River	E. coli	Point/Nonpoint Source	2003
Sample 133	3840	Deer Creek	E. coli	Point/Nonpoint Source	2002

3.3.1 Point Source Implementation

Point sources of pathogens addressed in these TMDLs included a confined animal feeding operation (CAFO), wastewater treatment plants, construction activities, and industrial stormwater. In Michigan waterbodies are listed for *E. coli* impairments, and WLAs are set to *E. coli* standards. However, NPDES permits in Michigan are for fecal coliform with an assumption that a fecal coliform limit of 200 counts/100 mL will result in *E. coli* standards being met. All of the WLAs for wastewater treatment facilities have been incorporated into the required permits. Additionally, all of the industrial and construction permits have the required fecal coliform limits. The only CAFO involved with one of the

Michigan TMDLs is not permitted to discharge, and implementation was therefore considered to have occurred.

One of the sediment TMDLs allocated to three different MS4 communities and Michigan DEQ indicated that all three communities are meeting their WLAs (which the TMDL specified would be expressed as TSS limits and/or flow volume limitations).

3.3.2 Nonpoint Source Implementation

Nonpoint sources for the Michigan TMDLs include agricultural runoff, non-permitted urban runoff, muck farming land uses, road crossings, abandoned mine discharge, pet and wildlife feces, septic systems, atmospheric deposition, and degraded riparian areas.

Sixteen Section 319 projects were found for the Michigan TMDLs included in the study, and most of these were initiated in response to the TMDL and resulted in implementation. For example, within the Huron River watershed several Section 319 projects were used to eliminate illicit sewer connections by rerouting sanitary leads to sanitary sewers.

Fourteen other nonpoint source implementation projects were found for the Michigan TMDLs included in this study. These included several Clean Michigan Initiative Clean Water Fund projects as well as projects funded by municipalities to address failing septic systems or sewer improvement projects. Three of these projects resulted in full implementation as described below:

- Sample 106 is an *E. coli* TMDL for Geddes Pond along the Huron River. Four Section 319 projects have resulted in the installation of various practices to implement this TMDL. One project implemented an Illicit Discharge Elimination Plan to detect and correct non-storm water discharges, including bacteria. As part of this project, more than 100 manholes, waterways and outfalls were sampled, eight subwatersheds were investigated, and video inspections were performed in two subwatersheds. The other projects re-routed sanitary leads to sanitary sewers. It is estimated that as a result of this project, a minimum of 141,000 thousand gallons of sanitary wastewater were removed from the storm sewer network annually. The City of Ann Arbor and the University of Michigan also hold stormwater permits that outline specific requirements for controlling their discharge of *E. coli* to Geddes Pond in accordance with the TMDL.

- Sample 045 is an *E. coli* TMDL for Lenawee County Drain No. 70. The only source of *E. coli* to this drain was found to be an unsewered subdivision in Palmyra Township. The township passed a resolution, dated January 23, 2002, to design and construct a regional treatment plant with neighboring Madison Township. The plant was built, the subdivision was connected to a sanitary sewer system, and the newly constructed WWTP discharges to the Raisin River, removing the source of pollution to Lenawee County Drain No. 70.

- Sample 043 is an *E. coli* TMDL for Prattville Drain and Lime Lake. There is one CAFO located upstream of the impaired segment that was considered a significant source of the *E. coli*; MDEQ reports that it has been addressed through a revised permit. An unsewered area of the City of Prattville was the other significant source of *E. coli* and it was connected to sanitary sewers since the TMDL was completed.

3.3.3 Information Sources

A summary of all the Web sites that were accessed to obtain information on the Michigan TMDLs is provided in Table 3-8. The list of state and local contacts is provided in Table 3-9. Christine Alexander of MDEQ provided much of the information required for the Michigan TMDLs by following up with other MDEQ personnel regarding NPDES permits and nonpoint source projects.

Table 3-8. Summary of online sources of implementation data.

Agency	Web Site Address	Summary of Information Obtained
MDEQ	http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714_31581-104272--,00.html	Coldwater River Implementation Information
MDEQ	http://www.michigan.gov/documents/deq/ess-nps-wmp-coldwater-part1_210565_7.pdf	Coldwater River Watershed Management Plan
MDEQ	http://www.michigan.gov/deq/0,1607,7-135-3308_3323-75185--,00.html	Additional Implementation Information
MDEQ	http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714_31581-104363--,00.html	Upper Grand River Watershed Management Plan
MDEQ	http://www.deq.state.mi.us/csosso	DEQ CSO and SSO Discharge Information to determine permit limits
MDEQ	http://www.deq.state.mi.us/documents/deq-water-npdes-bulletins-Mar_05.pdf	Monthly Water Bulletin-Used to obtain permit information
MDEQ	http://www.michigan.gov/documents/deq/wb-npdes-bulletins-July2007_202961_7.pdf	Stormwater Permit Information
MDEQ	http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3714_4012-95955--,00.html	List of Approved Watershed Management Plans
MDEQ	http://www.deq.state.mi.us/part201ss/	Information on possible PCB implementation within the Kawkawlin River Watershed
River Raisin Watershed Council (RRWC)	http://riverraisin.org/about/management_plan.html	River Raisin Watershed Management Plan

Table 3-9. List of state and local contacts.

Agency	Contact Person	Information Obtained
MDEQ	Christine Alexander	NPDES permitting details, 319 Grant Project Implementation Details, Additional Implementation Details

3.4 MINNESOTA TMDL SUMMARY

Implementation efforts for 27 Minnesota TMDLs were assessed as part of this study (Table 3-10). Of the total, 21 were developed as part of Minnesota's statewide mercury TMDL. In addition to the 21 mercury TMDLs, three of the listed segments were for fecal coliform as part of a larger southeast Minnesota regional TMDL, two were for biochemical oxygen demand (BOD) as part of a watershed TMDL, and one was for sediment.

With respect to the mercury TMDLs, major sources of mercury to Minnesota's waters are the result of atmospheric deposition. Implementation efforts associated with this TMDL are largely focused on emission reductions from coal-fired power plants and mercury minimization. Because of difficulties in

assigning air emission point sources to individual mercury TMDLs, this review focused on point sources associated with wastewater discharges holding NPDES permits.

Table 3-10. Summary of Minnesota TMDLs.

TMDL Sample Number	TMDL ID	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
Sample 009	32413	Rainy River -- Rapid River to Baudette River	Mercury	Point/Nonpoint Source	2007
Sample 011	32413	Little Fork River -- Beaver Brook to Rainy River	Mercury	Point/Nonpoint Source	2007
Sample 013	32413	Murphy Lake	Mercury	Nonpoint Source	2007
Sample 015	2007	Mississippi -- Upper St. Anthony Falls to Lower St. Anthony Falls	Mercury	Nonpoint Source	2007
Sample 018	32413	Snowbank Lake	Mercury	Nonpoint Source	2007
Sample 033	32413	Dam Five Lake	Mercury	Nonpoint Source	2007
Sample 040	3867	S.F. Zumbro River -- Cascade Creek to Zumbro Lake	Fecal Coliform	Point/Nonpoint Source	2006
Sample 053	32413	Pit Lake	Mercury	Nonpoint Source	2007
Sample 055	2007	Le Homme Dieu	Mercury	Nonpoint Source	2007
Sample 064	32413	Benson Lake	Mercury	Nonpoint Source	2007
Sample 067	32413	Clearwater Lake	Mercury	Nonpoint Source	2007
Sample 068	3867	Rush Creek -- Headwaters to Straight River	Fecal Coliform	Nonpoint Source	2006
Sample 071	2007	Lake Harriet	Mercury	Nonpoint Source	2007
Sample 077	32413	Rainy River -- Iron Lake to Lac la Croix	Mercury	Nonpoint Source	2007
Sample 082	32033	Otter Tail River -- Breckenridge Lake to Bois de Sioux River	Sediment (TMDL for Turbidity)	Nonpoint Source	2007
Sample 083	12278	Long Prairie River -- Fish Trap Creek to Crow Wing River	CBOD; NBOD	Nonpoint Source	2005
Sample 089	2007	Blue Earth River -- Center Creek to Elm Creek	Mercury	Point/Nonpoint Source	2007
Sample 093	2007	French Lake	Mercury	Nonpoint Source	2007
Sample 095	2007	Artichoke Lake	Mercury	Nonpoint Source	2007
Sample 102	3867	Garvin Brook -- Class 1B, 2A, 3B portion	Fecal Coliform	Point/Nonpoint Source	2006
Sample 111	32413	Sandy Lake	Mercury	Nonpoint Source	2007
Sample 118	32413	Greenwood Lake	Mercury	Nonpoint Source	2007
Sample 125	32413	Little Iron Lake	Mercury	Nonpoint Source	2007
Sample 128	2007	Mississippi River -- Watab River to Sauk River	Mercury	Point/Nonpoint Source	2007
Sample 134	32413	Potato Lake	Mercury	Nonpoint Source	2007
Sample 138	32413	Rabbit Lake (East Portion)	Mercury	Nonpoint Source	2007
Sample 141	12278	Long Prairie River -- Turtle Creek to Moran Creek	CBOD; NBOD	Nonpoint Source	2005

Further evaluation showed that many of the mercury TMDLs identified in NTTS as point/nonpoint source TMDLs actually do not have NPDES permits on the listed segments. In addition, one of the non-mercury TMDLs listed as nonpoint source only has an NPDES discharge to the segment. The end result is that only six of the TMDLs are affected by both point and nonpoint sources, while the remaining 21 are nonpoint source only. All of the Minnesota TMDLs addressed by this study were written after 2003. Five

of the TMDLs were from reports approved in 2005 and 2006. The 21 mercury TMDLs and one of the non-mercury TMDLs were approved in 2007.

3.4.1 Point Source Implementation

Point sources of pathogens for the Minnesota TMDLs included NPDES facilities, MS4 communities, and CAFOs. WLAs for NPDES facilities were established at existing permit levels. Minnesota has deemed that CAFOs are not permitted to discharge. WLAs for these facilities were set equal to zero. Minnesota MS4 communities are required to meet WLAs under their permit and the WLAs are established as load limits. Each MS4 community is required to review the adequacy of its Storm Water Pollution Prevention Program (SWPPP). Modification of the SWPPP is required if it is not meeting the WLA. Full implementation for point sources of bacteria in these TMDLs is occurring.

Point sources in the mercury TMDLs included NPDES facilities (point source emissions are discussed in the preceding section). It is unknown whether implementation has occurred for these facilities.

3.4.2 Nonpoint Source Implementation

The Minnesota TMDLs reviewed for implementation addressed nonpoint sources of sediment, oxygen demanding material, pathogens, and mercury. There are several programs in place in Minnesota that are used to address nonpoint sources. Included are the programs funded by Section 319, programs administered by NRCS, and programs supported by the Minnesota Clean Water Legacy Act (CWLA). Many of these programs also require local support, either through matching funds or in-kind services.

In addition to the MPCA, the Minnesota Board of Water and Soil Resources (BW&SR) also plays a lead role in supporting nonpoint source TMDL implementation across the state. Both agencies post annual reports on their Web sites, providing detailed descriptions and summarizing the current status of state-funded projects. These reports served as the major source of information for this project.

There are 12 Section 319 projects that address the non-mercury TMDL segments. A number of these projects covered multiple segments because the TMDLs were developed across an entire watershed or region. Several Section 319 projects were also extensions of efforts initiated prior to completion of the TMDL. For these projects, the pre-TMDL effort generally included the planning phase. This enabled post-TMDL work to focus on actual implementation. Each of the projects is targeted specifically towards pollutant reductions for the TMDL parameters and all six of the non-mercury TMDLs were considered partially implemented.

There are six funded CWLA projects that address the non-mercury TMDL segments. Funding levels for these projects are generally larger than the Section 319 projects. In addition to financial support through BW&SR, some project funding also comes through other state agencies (e.g., the Minnesota Department of Agriculture, the Minnesota Department of Natural Resources) and from local match requirements. As with the Section 319 work, these projects typically cover multiple segments to address TMDLs that were developed across an entire watershed or region.

3.4.3 Information Sources

MPCA and BW&SR reports available from their Web sites provided data on each project, as well as a summary of current status. Web sites that were accessed are provided in Table 3-11. Once all of the available implementation data was obtained from the TMDL documents, Implementation Plans, supplemental reports, and online sources, Minnesota's TMDL Coordinator was contacted to review the information (Table 3-12).

Table 3-11. Summary of online sources of implementation data.

Agency	Web Site Address	Information Obtained
MPCA	http://www.pca.state.mn.us/publications/wq-iw5-02c.pdf	TMDL Implementation Plans
	http://www.pca.state.mn.us/publications/wq-iw8-01c.pdf	
	http://www.pca.state.mn.us/publications/wq-iw9-02c.pdf	
	http://www.pca.state.mn.us/publications/wq-iw1-19.pdf	
MPCA	http://www.pca.state.mn.us/water/cwp-319.html#reports	319 & Clean Water Partnership Annual Reports
MBW&SR	http://www.bwsr.state.mn.us/CWL/restoration/07R6_8R03_Wilken.pdf	Implementation Project Fact Sheets
	http://www.bwsr.state.mn.us/CWL/restoration/07R16_b.pdf	
	http://www.bwsr.state.mn.us/CWL/restoration/07R14.pdf	
	http://www.bwsr.state.mn.us/CWL/restoration/07R118_8R1_8R33.pdf	
County SWCD	http://www.mn.nrcs.usda.gov/partnerships/todd/cwp.htm	SWCD Plans

Table 3-12. List of state and local contacts.

Agency	Contact Person	Summary of Information Obtained
MPCA	Jeff Risberg	Review of compiled TMDL implementation data

3.5 OHIO TMDL SUMMARY

Implementation efforts for a total of 42 Ohio TMDLs were assessed as part of this study (Table 3-13). Twenty-seven of the TMDLs were listed in NTTS as point/nonpoint TMDLs, nine were listed as nonpoint source TMDLs, and six were listed as point source TMDLs. Further investigation determined that four TMDLs categorized as point/nonpoint source (Samples 042, 027, 58, and 123) did not include WLAs because there are no regulated sources upstream of the impaired segments. These were therefore corrected to be nonpoint source TMDLs. In addition, TMDL samples 36 and 54 were categorized as point source TMDLs but include LAs. These were re-categorized as point/nonpoint TMDLs.

Twenty-four of the TMDLs were approved before 2004 and the remaining 18 were approved between 2004 and 2007. All the TMDLs were developed as part of a multi-TMDL project. Eight of the TMDLs were written for sediment; seven for phosphorus; four for nutrients; five for nitrogen; three each for metals, siltation and acid; two each for suspended sediment, habitat alteration and fecal coliform; and one each for pH, aluminum, and aldrin. All four of the "nutrient" TMDLs listed in Table 3-13 were written for phosphorus.

3.5.1 Point Source Implementation

Many of the Ohio TMDLs confirmed that water quality standards could be met without additional reductions in point source loadings and were thus considered fully implemented. Of those TMDLs for which one or more WLA indicated a need for reductions in loading from a point source, NPDES effluent limits consistent with these WLAs have been adopted (primarily for total phosphorus). The only one that was not was in the process of drafting the permit. Several TMDLs were considered as partially implemented for point sources because the TMDL included WLAs for CSOs in addition to wastewater treatment facilities and no implementation for the CSOs had as yet occurred.

Table 3-13. Summary of Ohio TMDLs.

TMDL ID	TMDL Sample Number	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
10875	001	Upper Auglaize Watershed (Flat Fork)	Sediment	Nonpoint Source	2004
9664	005	Duck Ck (Road Fork)	Siltation	Nonpoint Source	2003
4292	014	Massies Creek To Beaver Creek	Phosphorus	Point/Nonpoint Source	2002
12248	020	Snake Hollow	Acid	Nonpoint Source	2005
4292	023	Anderson Fork (Grog Run To Caesar Creek Lake)	Phosphorus	Nonpoint Source	2002
9664	026	Duck Ck (Road Fork)	Suspended Solids	Nonpoint Source	2003
4172	027	Sandy Creek (L. Sandy Creek To Nimishillen Creek)	Metals (Other Than Mercury)	Nonpoint Source	2003
12248	028	Whitmore Cemetery	Acid	Nonpoint Source	2005
3898	036	Trib. To S. Fk. Sugar Creek (Rm 14.15)	Nitrogen	Point/Nonpoint Source	2003
9664	041	Duck Ck (Greasy Run)	Suspended Solids	Nonpoint Source	2003
4169	042	Brushy Fork	Metals (Other Than Mercury)	Nonpoint Source	2003
3894	054	Sugar Creek (Headwaters To Middle Fork Sugar Cr.)	Sediment	Point/Nonpoint Source	2003
4172	058	Lake Hope	Metals (Other Than Mercury)	Nonpoint Source	2003
33671	059	Beaver Creek (Grand Lake St. Marys And Tributaries)	Fecal Coliform	Nonpoint Source	2007
3894	060	Indian Trail Creek (Sugar Creek)	Nitrogen	Point/Nonpoint Source	2003
11014	061	Wabash River	Nitrate+nitrite and total phosphorus	Point/Nonpoint Source	2004
9446	070	Middle Fork (Sugar Creek)	Sediment	Point/Nonpoint Source	2003
9446	072	Brush Run (Sugar Creek)	Phosphorus	Point/Nonpoint Source	2003
10878	076	Cuyahoga River Watershed (Sawyer Brook)	Phosphorus	Point/Nonpoint Source	2004
9664	078	Duck Ck (Mare Run)	Siltation	Nonpoint Source	2003
3868	079	Little Beaver Creek	Phosphorus	Point/Nonpoint Source	2002
9664	086	Duck Ck (East Fk. Duck Ck Trib Rm 4.15)	Siltation	Nonpoint Source	2003
3868	090	Flat Fork	Phosphorus	Nonpoint Source	2002
22900	094	Car Bailey Run	Sediment	Nonpoint Source	2006
9562-9563	097	Powers Brook	Fecal Coliform	Nonpoint Source	2003
12274	098	Culver Creek	Phosphorus	Nonpoint Source	2005
12248	101	Salem Hollow	Aluminum	Nonpoint Source	2005

TMDL ID	TMDL Sample Number	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
9562-9563	103	Cuyahoga River (Tinkers Creek To Big Creek)	Phosphorus	Point/Nonpoint Source	2003
22900	104	Trib To Mud Fork (Rm 1.06)	Sediment	Nonpoint Source	2006
22899	109	Hamilton Ditch	Sediment	Point/Nonpoint Source	2006
10863	114	Sandusky River Mainstem (Downstream Tymochtee Creek To Mouth)	Habitat Alteration (TMDLs for total phosphorus and sediment)	Nonpoint Source	2004
33671	116	Beaver Creek (Downstream Grand Lake St. Marys Dam To Mouth)	Nitrate	Nonpoint Source	2007
9446	119	Brush Run (Sugar Creek)	Nitrogen	Point/Nonpoint Source	2003
4172	123	Sandy Creek (L. Sandy Creek To Nimishillen Creek)	pH	Nonpoint Source	2003
22900	124	Sunday Creek (West Branch At Mouth)	Acid	Nonpoint Source	2006
10630	129	Stillwater River (Upstream Swamp Creek To Upstream Greenville Creek)	Phosphorus	Point/Nonpoint Source	2004
9582	130	Crosses Run	Aldrin	Nonpoint Source	2003
3868	131	Little Miami River (North Fork To Massies Creek)	Phosphorus	Point/Nonpoint Source	2002
10863	132	Sandusky River (Headwaters To Upstream Broken Sword Creek)	Sediment	Nonpoint Source	2004
9446	135	East Branch Sugar Creek	Nitrogen	Nonpoint Source	2003
12274	136	W. Branch Alum Creek	Phosphorus	Point/Nonpoint Source	2005
22900	140	Big Bailey Run	Sediment	Nonpoint Source	2006

3.5.2 Nonpoint Source Implementation

Nonpoint sources included in the Ohio TMDLs included agricultural runoff, bank erosion caused by livestock access and removal of vegetation, strip mining and deep mining, disposal of waste products, livestock grazing, abandoned mine areas, installation of subsurface tile systems, habitat modification, construction, and hydromodification.

Thirty-eight Section 319 projects were found that potentially could have been related to implementation of the Ohio TMDLs. However, several of these were not initiated in response to the TMDL because they did not focus on the TMDL pollutant, were completed many years prior to TMDL approval, or the

practices occurred in the watershed but not upstream of the segment included in this study. The project team used their best judgment to determine if the Section 319 projects represented TMDL implementation, but the information to make a conclusive decision was often not available.

A number of other nonpoint source projects were also identified as a result of this study. These included agricultural practices implemented through USDA programs, EPA Targeted Watershed grants, and U.S. Fish and Wildlife Service grants. Some of the challenges associated with the Section 319 projects also applied to these projects such as difficulty determining whether practices were installed upstream of the TMDL segment and whether implementation occurred because of or coincident to the TMDL. As with the other states, projects that were completed within three years prior to TMDL approval were counted towards TMDL implementation if the practices matched the pollutant of concern and were upstream of the impaired segment.

3.5.3 Information Sources

A summary of all the Web sites that were accessed to obtain information on the Ohio TMDLs is provided in Table 3-14. The list of state and local contacts is provided in Table 3-15. The project team also obtained information about many of the TMDLs in this study from Dr. John Hoornbeek of Kent State University who had previously conducted a similar study tracking implementation efforts in Ohio and West Virginia.

Table 3-14. Summary of online sources of implementation data.

Agency	Web Site Address	Information Obtained
Ohio EPA	http://www.epa.state.oh.us/dsw/nps/319Program.html	Section 319 grant information and project summaries
Ohio EPA	http://www.epa.state.oh.us/dsw/permits/permit_list_district.html	NPDES Permit Documents
Ohio EPA	http://www.epa.state.oh.us/dsw/tmdl/index.html	Information on TMDL Documents
County SWCDs	http://www.dnr.state.oh.us/sw/default/tabid/8637/default.aspx	Individual county information
ODNR	http://www.dnr.state.oh.us/H_Nav2/Water/WatershedCoordinatorProgram/tabid/9192/Default.aspx	Watershed coordinator information
USEPA	http://iaspub.epa.gov/pls/grts/f?p=110:1:4642271311943480::NO	Section 319 Grants Reporting and Tracking System (GRTS)- 319 project information
ODNR-MRM	http://www.watersheddata.com/	319 project summaries for Sunday Creek, Monday Creek and Upper Raccoon Creek

Table 3-15. List of state and local contacts.

Agency	Contact Person	Information Obtained
Cuyahoga River Community Planning Organization	Charles Hambly	NPS implementation activities occurring in Lower Cuyahoga
Darke SWCD	Greg McGlinch	NPS implementation activities occurring in Darke county
Delaware SWCD	Kris Bruestle	NPS implementation activities occurring in Delaware county
Geauga SWCD	Carmella Shale	NPS implementation activities occurring in Geauga county
Grand Lake/Wabash Watershed Alliance	Laura Walker	NPS implementation activities occurring in Grand Lake/Wabash watersheds
Green SWCD	Don Leeds	NPS implementation activities occurring in Green county
Kent State University	John Hoornbeek	NPS implementation activities occurring in the watershed under study
Malcolm Pirnie	Kristen Risch	NPS implementation activities occurring in Green county
Monday Creek Restoration Project	Mike Steinmaus	NPS implementation activities occurring in Monday Creek watershed
ODNR	Greg Nageotte	NPS implementation activities occurring in Upper Cuyahoga
ODNR	Jim Mizik	NPS implementation activities occurring in Nobel County
Ohio State University	Richard Moore	NPS implementation activities occurring in Sugar Creek watershed
Paulding SWCD	Joni Franklin	NPS implementation activities occurring in Paulding watershed
Raccoon Creek Watershed	Ben McCament	NPS implementation activities occurring in Raccoon Creek watershed
Sandusky River Watershed Coalition	Cindy Brooks	NPS implementation activities occurring in Sandusky River watershed
Sunday Creek Watershed Group	Kaabe Shaw	NPS implementation activities occurring in Sunday Creek watershed
Tinker Creek Watershed Partner	Mike McNutt	NPS implementation activities occurring in Lower Cuyahoga
Tuscarawas SWCD	Traci Haey	NPS implementation activities occurring in Tuscarawas county
Union SWCD	Terry Travatt	NPS implementation activities occurring in Union county
Washington SWCD	Mary Campbell	NPS implementation activities occurring in Washington county

3.6 WISCONSIN TMDL SUMMARY

Implementation efforts for a total of 18 Wisconsin TMDLs were assessed as part of this study (Table 3-16). All of the Wisconsin waterbodies were impaired solely by nonpoint sources resulting in no point source WLAs in any of the Wisconsin TMDLs. Sixteen of the Wisconsin TMDLs are for sediment and two are for phosphorus. All of the 18 Wisconsin TMDLs were developed as part of a watershed-TMDL, and all but four have some form of an Implementation Plan completed.

Table 3-16. Summary of Wisconsin TMDLs.

TMDL Sample Number	TMDL ID	Waterbody Name	Pollutant	TMDL Type	TMDL Fiscal Year
Sample 003	4234	Perennial Stream B (Tm2)	Sediment	Nonpoint Source	2003
Sample 007	12237	Twin Grove Branch	Sediment	Nonpoint Source	2005
Sample 008	4234*	Perennial Stream A (Spp1)	Sediment	Nonpoint Source	2003
Sample 029	4257	North Branch Spring Brook[1]	Sediment	Nonpoint Source	2003
Sample 032	12237	Dodge Branch	Sediment	Nonpoint Source	2005
Sample 049	1932	Squaw Lake	Phosphorus	Nonpoint Source	2000
Sample 052	4214	Jug Creek	Sediment	Nonpoint Source	2003
Sample 056	12237	Spring Creek	Sediment	Nonpoint Source	2005
Sample 063	3929	Token Creek	Sediment	Nonpoint Source	2002
Sample 065	4226	Welch Coulee Creek	Sediment	Nonpoint Source	2003
Sample 066	4226	North Creek	Sediment	Nonpoint Source	2003
Sample 069	4257	Spring Creek	Sediment	Nonpoint Source	2003
Sample 073	32078	Stillwell Creek	Sediment	Nonpoint Source	2007
Sample 080	4234	Perennial Stream D (B4)	Sediment	Nonpoint Source	2003
Sample 092	3929	Token Creek	Sediment	Nonpoint Source	2002
Sample 105	12237	Jockey Hollow Creek	Sediment	Nonpoint Source	2005
Sample 110	9505	Cedar Lake	Phosphorus	Nonpoint Source	2003
Sample 115	22521	Cochrane Ditch (Rose Valley)	Sediment	Nonpoint Source	2006

[1]Corinne Billings of the WDNR noted that the waterbody in Sample 029 was incorrectly named. The waterbody name was corrected to North Branch Spring Brook.

3.6.1 Point Source Implementation

All of the Wisconsin TMDLs are nonpoint source TMDLs; therefore all point source-related implementation status categories are marked with an "N/A". Implementation tracking efforts were focused on nonpoint source projects.

3.6.2 Nonpoint Source Implementation

One Section 319 project was found in GRTS for the Wisconsin TMDLs—the Dodge Branch streambank restoration project. The lack of other Section 319 projects is believed to be due to WDNR's preference for using Section 319 funding for TMDL development, staff, and monitoring instead of implementation efforts. The implementation projects themselves are more frequently funded through various other state programs (e.g., Priority Watersheds and Priority Lake Program) and are typically managed by local Land and Water Conservation Departments. Because of this, nearly all of the implementation efforts fall under the "other nonpoint source projects" category.

Most of the nonpoint source projects were implemented through the Nonpoint Source Priority Watershed and Priority Lake Program Grant program, other Wisconsin DNR funding sources (non-Priority Watershed Grants), or the Wisconsin Department of Agriculture. Conservation Reserve Enhancement Program (CREP) and EQIP were also cited several times as sources of implementation funding.

3.6.3 Sources of Implementation Information

A summary of all the Web sites that were accessed to obtain information on the Wisconsin TMDLs is provided in Table 3-17. Corinne Billings of the WDNR provided most of the information on the status of implementation for the Wisconsin TMDLs. Because of her experience as WDNR's TMDL implementation coordinator and her close contact with the local Land and Water Conservation Departments, Ms. Billings made contact with the individual counties to determine what, if any, implementation had been completed for each of the TMDLs. Several other WDNR data sources were also mined for implementation information including WDNR watershed management records, WDNR nonpoint source grant records, and WDNR lakes and rivers grant records.

One of the Wisconsin TMDLs (Stillwell Creek- Sample 073) was developed by EPA because the impaired waterbody is located on a federal military base. John Noble, the fisheries biologist at Fort McCoy, was contacted, and he provided implementation information for Stillwell Creek.

Table 3-17. Summary of online sources of implementation data.

Agency	Web Site Address	Summary of Information Obtained
WDNR	http://www.dnr.state.wi.us/org/water/wm/wqs/303d/EAP.html	Wisconsin Environmental Accountability Projects
WDNR	http://www.dnr.state.wi.us/Org/caer/cfa/ef/nps/pwatershed.html	Nonpoint Source Priority Watershed and Priority Lake Program Grant
WDNR	http://www.dnr.state.wi.us/org/water/wm/wqs/303d/Approved_TMDLs.html	Wisconsin Approved TMDL Documents
County LWCDs	http://www.walce.org/county_sites.asp	LWCD programs, Land and Water Resource Management Plans, projects, education, and other implementation efforts
EPA	http://iaspub.epa.gov/pls/grts/f?p=110:1:4642271311943480::NO:::	Section 319 Grants Reporting and Tracking System (GRTS)- 319 project information

4 RESULTS AND OBSERVATIONS

This section of the report summarizes several observations related to the data used for this study and presents the study results.

4.1 DATA UPDATES

The project team found the following errors in the NTTS data system during the research conducted in support of this project:

- Fifty-two TMDLs were categorized as nonpoint source only TMDLs. Three of these TMDL segments were found to actually be point/nonpoint source TMDLs.
- Seventy-eight TMDLs were categorized as point/nonpoint source TMDLs. After further investigation, 35 of these were updated to nonpoint source only because there were no point sources upstream of those segments and no WLAs included in the TMDLs. This error was caused during the NTTS data entry process, when multiple-TMDL documents that addressed nonpoint-only and point/nonpoint segments were coded only as point/nonpoint for all their TMDLs.
- Eight TMDLs were categorized as point source only TMDLs. Three of these were updated to point/nonpoint source TMDLs because the TMDL included LAs. Four additional TMDLs were updated to nonpoint source TMDLs after investigations determined that no point sources discharge upstream of those segments. These four segments were Ohio TMDLs for metals, for which the original point source was considered strip mining and deep mining but they were not assigned any WLAs.
- One Minnesota TMDL was incorrectly labeled as being approved in 2003 when it was actually approved in 2006.

These errors affected the breakdown of the TMDL types originally anticipated by EPA as a result of the NTTS query. Most appear attributable to NTTS data entry errors. Although correction did change the total samples per subpopulation, the range of sample sizes across all subpopulations of interest changed minimally (from an initial range of 52 to 86 samples to a corrected range of 50 to 88 samples.) The following is a summary of the final "TMDL types" list entered into the Access database:

- Nonpoint source only TMDLs = 88
- Nonpoint source and point source TMDLs = 49
- Point source only TMDLs = 1 (statistically considered part of the mixed PS/NPS subpopulation, above)
- Pre-2004 TMDLs = 51
- 2004 to 2007 TMDLs = 87

4.2 PROJECT RESULTS SUMMARY

The study design focused on quantifying the following seven statements concerning the full sample or specific subpopulations of the sample. Results below are presented both as actual frequencies in the sample and population percent estimates after sample weighting. These two forms of results are not intended to be identical, as the former is the straight proportion of the raw sample alone, and the latter is the estimated percent for the whole regional population of TMDLs after adjustment through statistical

weighting. Quantities in parentheses indicate the number of sample TMDLs for which the statement was true (numerator) and the total number of sample TMDLs in the population or subpopulation that the statement addresses (denominator). Estimated percentages were derived after taking into account appropriate sample weighting factors for each subpopulation:

1. The estimated overall rate of partial to full TMDL implementation for all types and dates of TMDLs in Region 5 is 80.3 percent (104/138 samples).

2. The estimated rate of partial to full TMDL implementation for mixed and point source TMDLs in Region 5 is 88.8 percent (46/50 samples).

3. The estimated rate of partial to full TMDL implementation for TMDLs including only nonpoint sources is 72.7 percent (58/88 samples).

4. The estimated rate of partial to full implementation for TMDLs in Region 5 approved in FY2003 or earlier is 76.6 percent (39/51 samples).

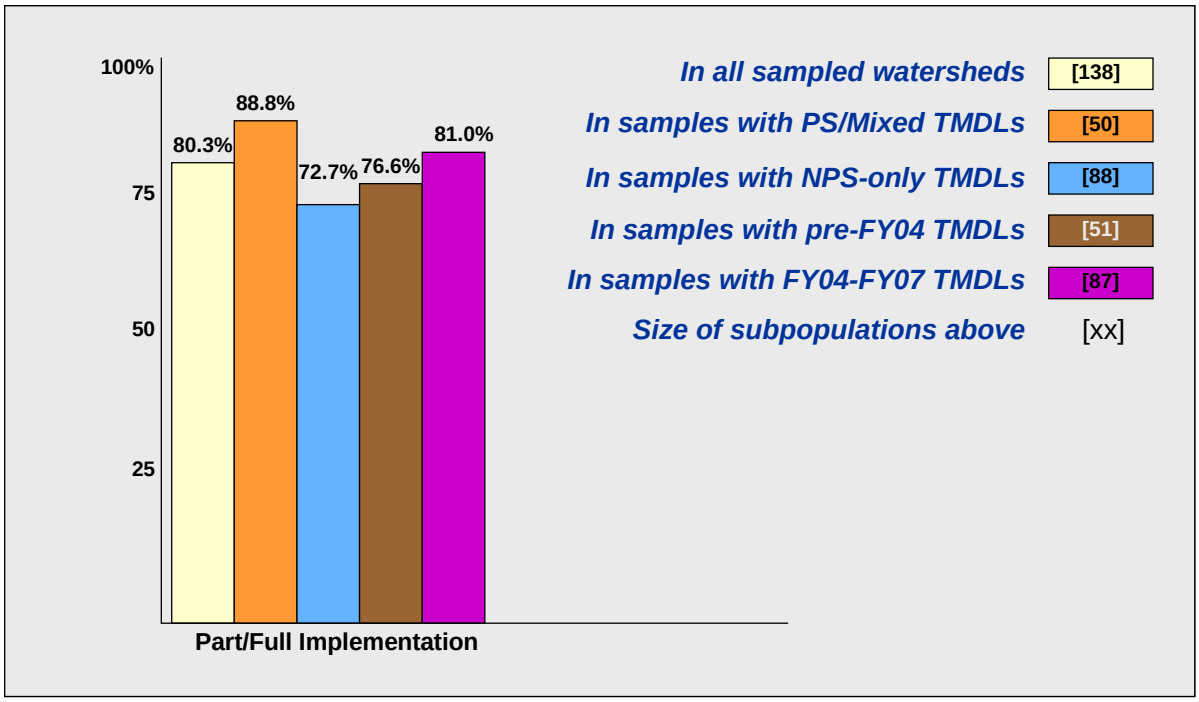
5. The estimated rate of partial to full implementation for TMDLs in Region 5 approved between FY2004 and FY2007 is 81.0 percent (65/87 samples).

6. The estimated proportion of TMDLs in Region 5 with an implementation plan is 79.6 percent (117/138 samples).

7. The estimated proportion of TMDLs in Region 5 that were developed through multi-TMDL or watershed-TMDL analysis is 95.7 percent (123/138 samples).

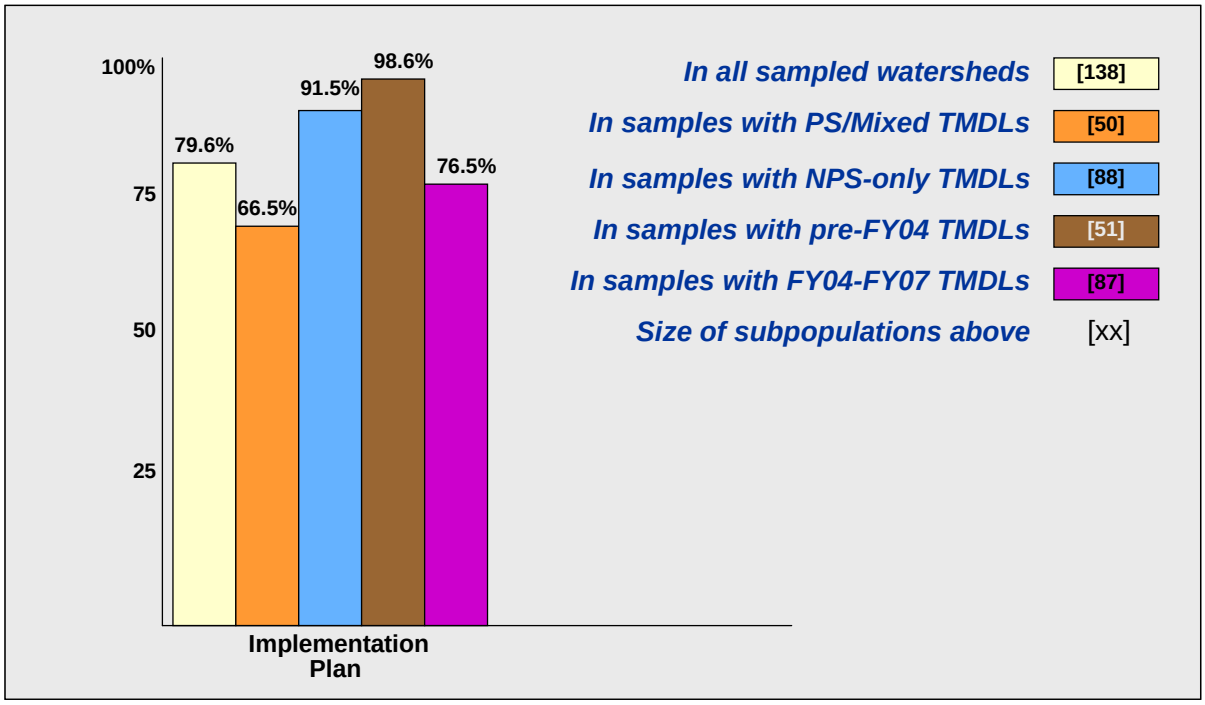
Although full implementation of every practice related to a given TMDL was uncommon (less than 3% of the total), over ¾ of the sample TMDLs had been at least partially implemented. As statements 1 through 5 all address implementation rates, they allow for some comparison among subpopulations (Figure 4.1). One apparent pattern is that older and newer TMDL subpopulations did not differ significantly in implementation rates (76.6% and 81.0% respectively). In contrast, a 16.1% difference was observed in the rates of implementing NPS-only TMDLs (72.7%) and mixed NPS-PS TMDLs (88.8%).

Figure 4.1. Comparison among sample population and subpopulations of estimated percent of partially to fully implemented sample TMDLs. Note rates vary around approximately ¾ partial to full implementation, and the difference of 16.1% between NPS-only and mixed TMDLs.



Statement 6 addressed the rates at which TMDLs in the sample were found to have a finalized implementation plan. Again, the data allow for comparison among the sample and the four subpopulations (Figure 4.2). The estimated overall rate observed in the regional sample was that nearly 80% of the Region's TMDLs have a completed implementation plan. Among the subpopulations, older TMDLs with plans (98.6%) exceeded newer TMDLs with plans (76.5%). The NPS-only TMDLs with plans (91.5%) also exceeded the mixed TMDLs with plans (66.5%).

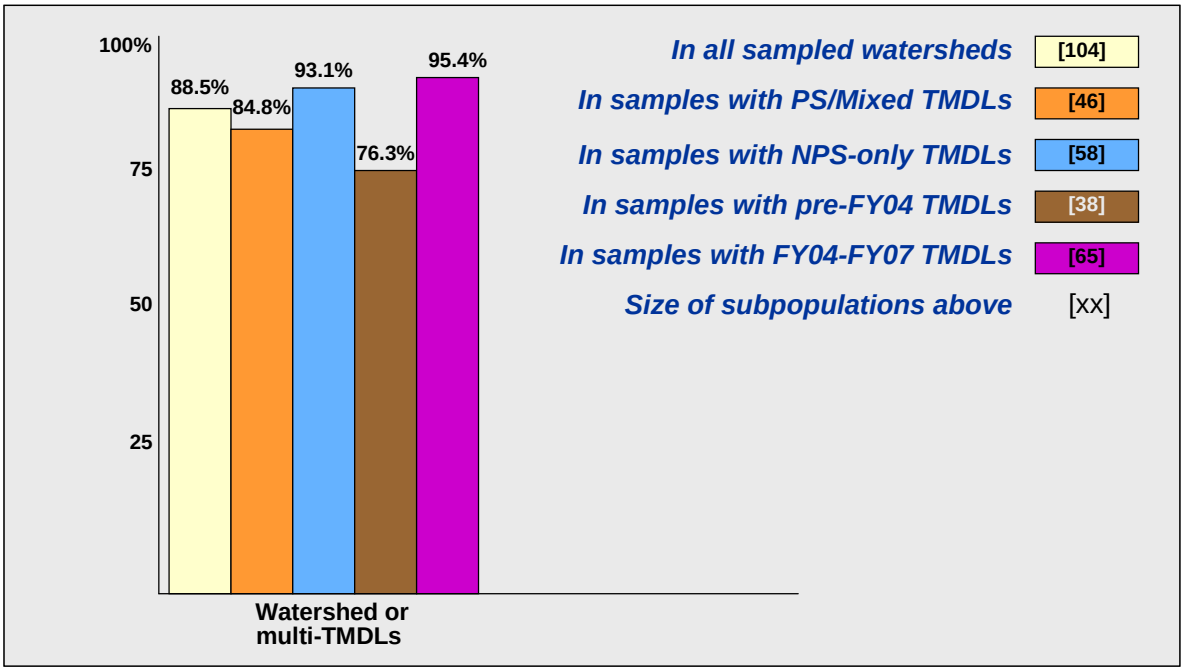
Figure 4.2. Estimated percent of TMDLs in sampled subpopulations that have an implementation plan. Note that 22.1% more implementation plans existed for older than newer TMDL samples, and 25% more for NPS-only than for mixed TMDLs.



Because of the growing popularity of developing large watershed TMDL studies that encompass up to hundreds of TMDLs per study in the Region 5 states, the study also analyzed the frequency of multi-TMDL or 'watershed TMDL' efforts and the proportion of partially to fully implemented samples that came from multi-TMDLs. The results of the analysis to quantify statement 7 demonstrated that multi-TMDL approaches are well established regionally and appear to be increasing in recent years. Among subpopulations, all far exceeded three-quarters from multi-TMDL efforts. NPS-only TMDL samples (97.7%) did exceed mixed (93.4%), but not within the margin of error. Newer TMDL samples (97.5%) significantly exceeded older ones (84.3%) by a margin of 13.2%. Specifically as shown in Figure 4.3, the high and increasing frequency of a multi-TMDL approach across all subpopulations existed also for that subset of the sample that had been at least partially implemented (104 of the 138 sample TMDLs).

The project team also explored possible associations between the TMDL implementation rates observed and potential explanatory variables, based on land use/land cover patterns in the watersheds of each sample TMDL. Land cover data were derived from the 2001 National Land Cover Dataset (NLCD) and the watersheds for each sample TMDL were custom-delineated. Aggregation of land cover statistics by TMDL sample watershed enabled the calculation of land cover proportions of interest, and reaggregation

Figure 4.3. Frequency of partially to fully implemented TMDL samples associated with watershed or multi-TMDLs, as separate from those developed as single TMDLs on single water bodies or segments. Note the percentage rise in this characteristic from older to more recent TMDLs is 19.1%. Figures not weighted.

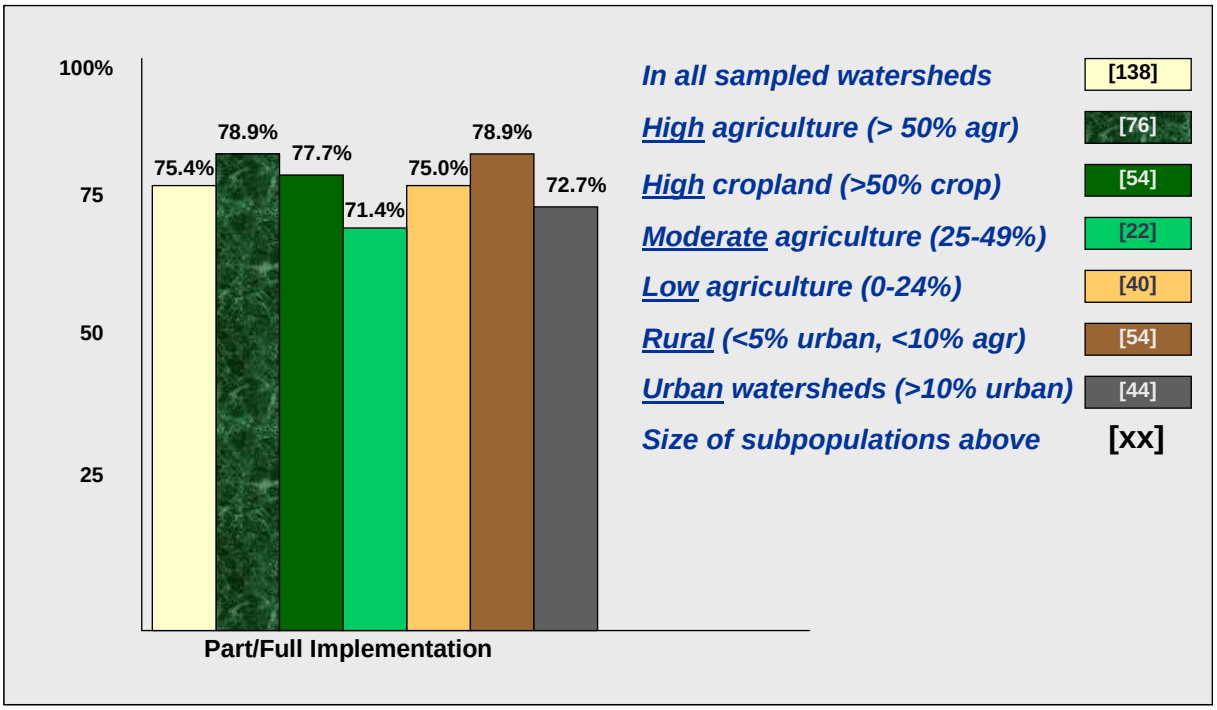


of samples into strata characterized by the predominance of specific land cover patterns. This analysis was conducted to gain insight on whether implementation rates might vary with widely different land use settings, e.g., urban vs. agricultural vs. less-developed rural watersheds (Figure 4.4). Consequently, this analysis departed from the subpopulations (older, newer, NPS-only, and mixed TMDLs) that were addressed in the original design and identified experimentally aggregated new subpopulations. The results obtained vary in the size (n) of the land use-related sample subpopulations, and some results therefore are not within the same margin of error targeted for the primary results. Sample weighting factors were not calculated for this portion of the analysis, thus percentages represent actual proportion of sample TMDLs rather than estimated proportion of these subpopulations.

Generally, all the subpopulations examined closely paralleled the overall region-wide implementation rate. The analysis examined several levels of agriculture-dominated (including cropland and pasture) and cropland-dominated watersheds and found no evidence that these land cover types were associated with implementation rates significantly different than those observed overall. Similarly, urban-dominated watersheds did not depart from the overall pattern in regional implementation rate. A lower-intensity agriculture category, and a 'rural' category where neither agriculture nor urban uses dominated, also displayed no significant differences in rates.

This sampling study and analysis of TMDL implementation rates provided insights into implementation across a six-state region, representing a scale at which no quantitative information on implementation previously existed. The primary seven statements around which the study was designed were able to be addressed and quantified. The findings estimate rates, quantify some associated factors, and fail to reveal other associations we tested. It is also probable that the limited resources and thus sample size available also limited the study findings we could verify within the targeted margin of error. The most prominent finding of this study is the evidence that, once approved, most of this region's TMDLs are at least

Figure 4.4. Percent of TMDL samples partly/fully implemented, reaggregated by predominant land cover in watershed. Some subpopulation sample sizes are too small to meet the +/- 10% margin of error, and sample weighting was not calculated. Note implementation rates across these subpopulations are similar to the region overall, suggesting that these land cover patterns do not explain implementation rates observed in this sample.



partially implemented. Moreover, a developed implementation plan very frequently follows the TMDL itself in the six Region 5 states.

The findings do suggest some factors exist that may influence the rates that were observed but unable to be tested statistically. For example, the 16.1% difference between the NPS-only and the higher, mixed TMDLs rates may be due to the voluntary nature of NPS controls as compared to the enforceable, PS-permitting process affecting the implementation of the mixed TMDLs. The slightly increased implementation rate among newer vs. older TMDLs, despite the pre-2003 subpopulation's longer time for implementation, may be related to possible improvements such as greater program capacity, funding, and commitment to action, or to developing more implementable TMDLs. The NPS-only TMDLs high percentage with implementation plans, in contrast to their somewhat lower implementation rates, may be strongly correlated with 319 watershed plans. On the other hand, the finding that mixed TMDL samples had fewer implementation plans but a greater frequency of partial implementation may be related to the high rate of permits mandatorily implemented whether or not a plan exists. The higher percentage of older TMDLs with completed plans than newer TMDLs may be explainable by the fact that TMDL development, implementation, and ultimate recovery is a many-year process that is in earlier stages among the newer sample TMDLs. Together these findings send a mixed message about the relationship of implementation plan completion and actual implementation. Overall, greater statistical power would have been particularly valuable to enable a more detailed examination and sub-categorization of the very broad 'partially implemented' category.

The exploratory analysis of watershed land cover was intriguing in part because it did not reveal any statistically significant differences among the widely different land cover settings examined. The project team did not, however, consider this limited analysis conclusive that land cover does not contribute to

explaining implementation rate differences in ways that were not tested. Based on NPS-only vs. mixed TMDL rate differences found, one might suspect that TMDLs in highly agricultural or rural watersheds would be significantly less implemented than urban TMDLs. The similar rates across these different watershed settings may in fact be linked to the existence of independent and very different drivers of implementation. Agricultural watersheds may have high rates due to the extensive reach of USDA funding for best management practices, whereas urban watersheds are likely much more influenced by stronger regulations and point source permitting situations. Exploratory analyses with more refined watershed land cover data, or using the data only within a corridor of much closer proximity to the impaired water, may generate different results. Also, socio-economic factors and other geo-spatial data may be explored as possible explanatory factors.

4.3 OBSERVATIONS

This section of the report offers a variety of observations made by the project team in conducting this study, including analysis of the results and several aspects of the study design and available data.

4.3.1 Study Results

The estimated overall rate of partial to full TMDL implementation was higher than expected at the onset of the study. This is likely due to a combination of the following factors:

- Very few of the TMDLs were found to be fully implemented. However, many TMDLs were found to be partially implemented. These included TMDLs where a significant number of practices have been installed as a result of the TMDL, but also TMDLs where there has been some but limited implementation. For example, several segments of the Wabash River in Indiana were included in this study with approved phosphorus TMDLs. The Wabash River drains more than 30,000 square miles and, although some practices were found to have been implemented for the segments of interest, the practices cover only a minimal portion of the area that eventually will need to be addressed to fully implement the TMDL. It is therefore unlikely that the high rate of partial implementation found in this study would presently be capable of producing a correspondingly high rate of water quality standards attainment.

- Thirty-six percent of the TMDLs in the study included WLAs and, for the most part, these WLAs were found to have been implemented because the TMDL either confirmed existing permit limits or the new permit limits were found to be implemented (82 percent). The estimated rate of partial to full TMDL implementation for TMDLs including only nonpoint sources (approximately 66 percent) was closer to what was initially expected when the study started.

- It appeared that a variety of implementation efforts are indeed occurring within the TMDL watersheds that will address the pollutant of concern. These include efforts by agricultural landowners to adopt nutrient management plans, plant filter strips, and implement reduced tillage practices as well as efforts by communities and state and local government agencies to address failing septic systems, CSOs, abandoned mine drainage, and other problems. However, in some cases it was not clear if these efforts were a result of or coincident to the TMDL. The project team used whatever data were available and its best judgment to try and make this determination but it is certainly possible that some implementation has been attributed to the TMDL that actually would have occurred regardless. However, as TMDLs by nature usually identify a variety of implementation actions beyond those driven by the TMDL program or EPA resources, actions by other stakeholders that are not directly connected to but consistent with the TMDL can be expected.

- The TMDL and Section 319 Programs in EPA Region 5 have placed an emphasis on implementation efforts for at least the past ten years, as have the states within the region. The unexpectedly high rate of implementation found in this study might, in part, reflect this emphasis and might not reflect typical implementation rates occurring in other regions or states.

The high rate of TMDLs with Implementation Plans is consistent with Tetra Tech's experience in Region 5 and is attributed to the following factors:

- Illinois EPA develops a majority of its TMDLs using contractor support and the development of a separate Implementation Plan is a required contract deliverable.

- Minnesota's Clean Water Legacy Act, through policy direction and funding incentives, has been a driving force behind the preparation of implementation plans for all Minnesota TMDLs.

- Ohio EPA typically includes detailed descriptions of implementation activities in its TMDL documents. Many of these were considered to constitute Implementation Plans according to the definition provided in the project SOW. Furthermore, detailed Watershed Action Plans had been developed for four of the Ohio TMDLs.

- Wisconsin implementation plans often come in the form of "Nonpoint Source Control Plans" that are developed for Priority Watershed Projects. Typically they are for larger watersheds and addressed the TMDL segments within this study.

The high rate of partially to fully implemented TMDLs in Region 5 that were developed through multi-TMDL or watershed-TMDL analysis is also consistent with Tetra Tech's experience in Region 5. Illinois, Indiana, Michigan, Minnesota, and Ohio almost exclusively develop TMDLs on a watershed basis.

4.3.2 Study Design

Having to categorize TMDL implementation into one of only four categories (not implemented, partially implemented, fully implemented, or unknown) proved to be challenging. The majority of the TMDLs fell into the category of partially implemented but the range of partial implementation is considered to be fairly large. Similar future projects may want to consider additional subcategories of partial implementation, even though a re-analysis of the 'partial' category in this study showed that subcategories would be difficult to identify and document consistently.

Including Minnesota's State-wide mercury TMDL in this study also posed some challenges. First, the majority of mercury in water is related to atmospheric sources, both within and outside of Minnesota. Accordingly, emphasis in the TMDL and implementation plan is focused on mercury minimization programs. These efforts are outside the scope of traditional water-related implementation programs, such as Section 319. Second, because of the large number of segments included in the state-wide mercury TMDL, the sample set was unintentionally drawn away from capturing implementation occurring for more traditional TMDL settings. This was noted by the state TMDL Coordinator, particularly in light of the high level of support for TMDL implementation in Minnesota that has resulted from the state's Clean Water Legacy Act (more than $70 million in funding from FY2006 – FY2009).

To a lesser extent, the inclusion of eight segments from the Wabash River TMDL also posed some challenges to this study. The Wabash River watershed is very large (more than 30,000 square miles) and therefore the subwatersheds draining to each of the segments included in this study were also very large. This size meant that there were a large number of potential point source and nonpoint source projects that had to be evaluated. Tetra Tech was fortunate to have many of the geographic information system (GIS) files needed to conduct this analysis because of supporting the development of the TMDL, but the

discrepancy in the size of the Wabash River segment watersheds compared to others in the study could potentially skew the results.

4.3.3 Gaps in Appropriate Information

An important observation made during the collection of data for this report was that in no state was all of the required information already compiled (let alone compiled in a central database or tracking system). Although a great deal of the background information on the TMDL, the permits, and the nonpoint source projects was available in central databases such as NTTS, PCS/ICIS, and GRTS, most of the detailed information regarding implementation status had to be retrieved through personal contact with state personnel or local stakeholders. This was true for the TMDLs where most of the implementation information had to be obtained by the project team, but also true for the TMDLs where state personnel took much of the lead in obtaining the information.

Additionally, in reviewing nonpoint source implementation projects, one issue surfaced that warrants discussion relative to tracking progress. Implementation actions can involve targeted areas, targeted programs, targeted activities, and targeted participants. Targeted areas include actions on specific parcels of land or work involving construction of identifiable facilities. Examples include fencing, riparian buffers, manure waste handing facilities, or off-site watering. These actions can be connected with quantifiable measures that relate to points on a waterbody. On the other hand, targeted programs, targeted activities, and targeted participants, while clearly instrumental to achieving environmental results, pose some challenges in relating actions to traditional “on the ground” measures.

With this in mind, many of the implementation actions identified for some of the TMDLs involve targeting broad programs, activities, and participants across the watershed. Work is clearly occurring. However, tracking specific locations is difficult. Examples include the Lower Otter Tail TMDL Sediment Reduction Section 319 project in Minnesota. The focus of this project is education work with land owners in the watershed to promote an array of erosion control projects designed to collectively reduce sediment loads to the Lower Otter Tail River. The project also includes efforts intended to lead to a county-wide erosion control ordinance, as well as work to retire erosion prone land from crop production.

Similarly, Section 319 project efforts to implement the Long Prairie River TMDL in Minnesota and reduce oxygen demanding wastes involve education and technical assistance to local landowners. This is also the case with implementation of the southeast Minnesota bacteria TMDL. Implementation projects include education and technical assistance to small feedlot owners, homeowners served by on-site septic systems, and landowners targeted for improved pasture management practices. Minnesota’s CWLA is also funding wide-spread implementation efforts in each of the TMDL watersheds reviewed for this project. Again, many of the projects are education and technical assistance efforts aimed at targeted participants, targeted programs, and targeted activities. The philosophy is that pollutant sources are often spread across the watershed and that solutions will require efforts that go beyond site-specific approaches. Tracking the net result of these education activities was beyond the scope of this study; nevertheless, the focus of the analysis was on carrying out actions called for in the TMDLs, not measuring environmental changes subsequent to those actions.

Determining whether a nonpoint source contributor had implemented actions consistent with a TMDL would have also been much more straightforward if such information was specifically recorded in GRTS or a project report. Since it wasn’t, the project team had to rely on trying to determine the specific location of the practice and then compare that location to the location of the impaired waterbody. A comparison also had to be made between the practice installed and the TMDL pollutant (e.g., a nutrient management plan was not considered implementation of an E. coli TMDL).

Just knowing that a practice occurred in the watershed was insufficient to assess implementation of the specific TMDLs included within this study because almost all of the TMDLs were developed on a watershed basis and there were therefore other TMDL segments in the same watershed that were not a part of the study. GIS files for practices were only available in a few cases and even detailed descriptions of the practice locations were difficult to obtain. Information in GRTS typically lacked spatial detail and the Section 319 annual reports were often only marginally better (e.g., "section 319 grant funding is awarded to restore approximately 1,400 linear feet of an unnamed tributary to the Chagrin River"). The project team therefore had to try to contact local officials familiar with the grant (which was time consuming) or use best professional judgment to assess whether a known practice occurred upstream of the TMDL segment. In several cases, the team was unable to find anyone knowledgeable of the location of the referenced projects. For example, the Duck Creek (Ohio) watershed coordinator had changed positions and his replacement did not have the necessary information on the project location.

4.4 Additional Analysis of Partially Implemented TMDLs

The TMDLs determined to be partially implemented were further explored through additional analysis. EPA requested this additional analysis because the original study design requested categorization of TMDL implementation into one of only four categories: Not Implemented, Partially Implemented, Fully Implemented, or Unknown. The majority (100 out of 138) of the TMDLs fell into the Partially Implemented category, but the range of partial implementation was considered to be fairly large (i.e., some TMDLs could be minimally implemented and others extensively implemented). Although consistent subcategories of partial implementation would clearly be difficult to assign consistently due to substantial variation among TMDLs and their data limitations, any additional insights on degree of implementation were seen as highly desirable.

A number of potential methods for assessing the degree of partial implementation were identified, including determining the proportion of the total number of practices identified in the TMDL implementation plan that have been implemented, determining whether any action has occurred yet for TMDLs that necessitated NPDES permit changes, estimating the load reduction achieved by the implemented practices, and "scoring" each TMDL found to be partially implemented based upon factors such as the number of 319 projects implemented, or the number of WLAs incorporated into permits.

In general, there were challenges with implementing each of the approaches, mostly due to data limitations but also in some cases due to resource constraints. For example, although some TMDLs or implementation plans do include a "menu" of practices, information as to whether each practice has yet been implemented was usually lacking. Similarly, considerable effort was involved in going back to the original TMDL documents just to create the "checklist" of implementation practices because the information had not previously been organized in that way.

Despite the challenges some significant findings were still obtained. Nine case studies were chosen for the implementation "menu" approach and, in eight of the nine TMDLs, at least 40 percent of the identified practices had been implemented. For the partially implemented TMDLs that included revised WLAs for WWTPs, 100 percent of the WLAs were found to have been established in new permit limits.

Additionally, "scoring" of the partially implemented TMDLs resulted in 76 percent of the TMDLs receiving at least 3 points on a 6-point scale.

Several TMDLs were also researched in greater detail to estimate the load reductions likely to be achieved by the documented implementation measures. Unfortunately, only 3 of the 100 partially implemented TMDLs had sufficient information on the extent and location of controls to be able to conduct such an analysis. For these 3 TMDLs, the already implemented controls were found to have controlled 4 percent, 52 percent, and 86 percent of the needed load reductions (see Appendix 2 for details).

APPENDIX 1:
DEFINITIONS OF KEY TERMS

TMDL: A TMDL or Total Maximum Daily Load is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. TMDLs are calculated as the total Waste Load Allocation (WLA, allocated to point sources) plus the total Load Allocation (LA, allocated to nonpoint sources) plus a margin of safety. For counting purposes, a single TMDL addresses one water body segment (state-defined) and one pollutant. One water body may have multiple pollutants and therefore multiple TMDLs.

TMDL Document: A report submitted to an EPA Region by a state that provides the detailed calculations and plans for one or more final, approved or established TMDLs. One TMDL document does not equal one TMDL; rather one document may address many TMDLs, e.g., in the case of a large watershed plan affecting multiple impaired waters and/or multiple pollutants.

Implementation: a sequence of actions including new or altered pollution control practices that are carried out to reduce pollutant loading consistent with the terms of a TMDL. Implementation actions can include onsite installation, operation, maintenance, and adjustment of nonpoint source control practices (Best Management Practices, BMPs) as well as issuance, reissuance or modification of PS control permits and practices. Implementation as used in this study does not encompass planning, funding, or completion of an implementation plan (i.e., implementation planning activities), nor changes in water body condition (i.e., post-implementation effects).

Implementation Planning: post-TMDL activities that encompass planning or funding control practices and/or completion of an implementation plan.

Post-Implementation Effects: changes in water body condition that are plausibly related to implementation actions taken.

Partially Implemented: having any combination of actions listed under the implementation definition above that are verified as having occurred or currently active.

Fully Implemented: available information indicates a TMDL that is fully implemented has had all point or nonpoint control actions completely put into practice onsite; note: in this meaning, full implementation of practices does not connote “fully implementing Water Quality Standards” and is completely independent from changes in condition caused by those practices.

Not Implemented: available information indicates a TMDL that is not implemented has had none of the TMDL’s point or nonpoint control actions carried out fully or partially.

Implementation Unknown: available information does not prove or disprove the implementation status of any of the control practices relative to a TMDL, all or in part.

Implementation Plan: documentation of planned specific actions and schedules for those actions to be taken in order to reduce pollutant loading consistent with a TMDL; an implementation plan may take any of the following forms:

- exists as stand-alone document

- exists within TMDL document
- exists as permit-related document(s)
- exists as 319-related document or watershed plan

APPENDIX 2:

ADDITIONAL ANALYSIS OF PARTIALLY IMPLEMENTED TMDLS

The TMDLs determined to be partially implemented were further explored through additional analysis. EPA requested this additional analysis because the original study design categorized TMDL implementation into one of only four categories: Not Implemented, Partially Implemented, Fully Implemented, or Unknown. The majority (100 out of 138) of the TMDLs fell into the Partially Implemented category, but the range of partial implementation was considered to be fairly large (i.e., some TMDLs could be minimally implemented and others extensively implemented). General characteristics of the partially implemented TMDLs are presented in Table A-1 and Table A-2.

Table A-1. Overall Partial TMDLs Summary Table.

Overall Partial TMDL Summary	
Total Number Impaired by Point Sources Only	1
Total Number Impaired by Nonpoint Sources Only	57
Total Number Impaired by both Point and Nonpoint Sources	42
Total Number of "Partial" TMDLs	100

Table A-2. Partial TMDLs by State.

Number of Partial TMDLs by State	
Illinois Partial TMDLs	12
Indiana Partial TMDLs	13
Michigan Partial TMDLs	9
Minnesota Partial TMDLs	27
Ohio Partial TMDLs	24
Wisconsin Partial TMDLs	15
Total Number of "Partial" TMDLs	100

A number of potential methods of assessing the degree of partial implementation were identified, including determining the proportion of the total number of practices identified in the TMDL implementation plan that have been implemented, determining whether any action has occurred yet for TMDLs that necessitated NPDES permit changes, estimating the load reduction achieved by the implemented practices, and "scoring" each TMDL found to be partially implemented based upon factors such as the number of 319 projects implemented, the number of WLAs incorporated into permits, etc. The results of each analysis method are presented in the following sections.

DETERMINING THE PROPORTION OF PRACTICES IMPLEMENTED

One approach to evaluating the extent of partial implementation is to determine the proportion of the practices identified in the TMDL or the implementation plan that have been implemented. This approach involves listing the identified practices mentioned in the TMDL report or implementation plan and then confirming whether or not they have been implemented. Although this approach provides a general assessment of the extent of implementation activity, it should be noted that skewed results are possible

due to the variable importance of the practices. For example, one practice might address 90 percent of the required load reduction whereas another nine practices only address the last 10 percent.

Establishing the "menu" of the implementation practices for each TMDL was a fairly intensive effort as most of the reports did not have the information organized that way. In addition, comprehensive information as to whether each practice has or has not yet been implemented was usually lacking. Because of this, there were inadequate resources to apply this approach for all 100 partially implemented TMDLs. Instead, the nine partially implemented TMDLs for Michigan were used to test this approach. The results are shown in Table A-3 and indicate that in eight of the nine TMDLs, at least 40 percent of the identified practices had been implemented

Table A-3. Determining the proportion of practices implemented in the nine partially implemented Michigan TMDLs.

TMDL ID	Number of Practices:				Percentage Known to Have Been Implemented	Notes
	Recommended in TMDL or IP	Implemented	Unknown	Not Implemented		
12239	8	1	7	0	13%	Detailed list of implementation practices available but information only exists to confirm that implementation is occurring, not as to which specific practices.
3847	1	1	0	0	100%	The one practice listed has been partially implemented.
3838	1	1	0	0	100%	The implementation recommended in the TMDL was only a very general statement; contact confirmed some implementation has occurred, which could apply to one practice or a whole suite of practices; we do not have the detailed information.
12277	1	1	0	0	100%	The one practice listed has been partially implemented.
3658	5	2	3	0	40%	Easements and point source implementation known to have occurred; unclear if other mentioned practices have occurred.
32213	1	1	0	0	100%	The one practice listed has been partially implemented.
4270	1	1	0	0	100%	The one practice listed has been partially implemented.
9499	7	3	3	1	43%	Certain educational practices are known to have been implemented.
3840	11	5	5	1	45%	A variety of practices related to one another have been implemented; status of some others unknown and status of one known to have not been implemented.

DETERMINING ACTION ON NPDES PERMIT CHANGES

Another approach to determining the extent of partial implementation is to assess whether any action has occurred yet for TMDLs that necessitated NPDES permit changes. Tetra Tech had this information readily available from our initial efforts and therefore simply categorized each TMDL WLA into one of the following three categories:

- Category 1: WLA in TMDL consistent with existing permit limits and therefore no permit revisions needed
- Category 2: WLA requires permit revisions; permit revisions have been made

- Category 3: WLA requires permit revisions; permit revisions not yet made

There were a total of 399 WLAs included in the 100 partially implemented TMDLs and 272 of these fell into Category 1. Of the remaining 127 WLAs, 45 fell into Category 2 and 82 fell into Category 3. However, all of the 82 WLAs in Category 3 were for stormwater or combined sewer overflow sources for which permit revisions are not straightforward. For example, EPA is currently in the process of finalizing the *TMDLs To Stormwater Permits Handbook* which is intended to provide better information on how TMDL WLAs should be implemented in stormwater permits. All of the WLAs for more traditional point sources were found to have been implemented through permit changes. Most of these were for wastewater treatment plants in Ohio that received new nutrient permit limits as a result of the TMDLs.

ESTIMATING THE PERFORMANCE OF CONTROLS

Several TMDLs were researched in greater detail to estimate the load reductions likely to be achieved by the documented implementation measures. This was done to compare the expected load reductions to the levels identified as needed in the TMDL reports. Comprehensive information on the extent of implemented controls was found to be frequently lacking. As a result, only 3 of the 100 TMDLs had sufficient information on the extent and location of controls to easily be able to estimate their effectiveness.

Homer Lake

The Homer Lake phosphorus TMDL was developed by the Illinois EPA and approved by the U.S. EPA in 2006. The nonpoint sources contributing to phosphorus loading in the Homer Lake watershed include sheet and rill erosion, agricultural and residential fertilizer, illicit wastewater connections, and internal phosphorus recycling.

Implementation Efforts

Though not all of the implementation has been a direct result of the TMDL, extensive efforts have been underway in the Homer Lake watershed before, during, and after TMDL development. Most of the implementation work in this watershed is due to a Section 319 project awarded in 2004 and completed in 2007. This project led to the implementation of the following nonpoint source controls: 5 acres of grassed waterways, two ponds, 4,000 feet of field border strips, 3,000 acres of conservation cropping, 34 acres of filter strips, 120 acres using deep phosphorus placement, and 4,950 acres using nutrient management planning to calculate appropriate fertilizer application rates.

Anticipated Reductions

Information included in the Homer Lake TMDL implementation plan (Illinois EPA, 2007) was used to estimate pre-implementation and post-implementation loads of phosphorus in the watershed. These estimates are summarized in Table A-4 and indicate that the implementation has achieved approximately 52 percent of the needed reduction. In other words, the TMDL has been approximately half implemented.

Table A-4. Estimated total phosphorus load reductions resulting from Homer Lake implementation efforts (based on data from the *Homer Lake Implementation Plan* [Illinois EPA, 2007]).

Source of Phosphorus	Pre-Implementation Load[1]	Load Reduction Needed[1]	Implemented BMP	Reported Effectiveness	Estimated Load Reduction That Has Occurred
Row crop agriculture	0.50 lb/ac/yr to 1.6 lb/ac/yr on 9,890 row crop acres = 4,945 lb/yr to 14,835 lb/yr	3,462 lb/yr to 10,385 lb/yr	34 acres of Filter Strips	65%	11 to 33 lbs/yr
			3,000 acres of conservation tillage	76%	1,140 to 3,420 lbs/yr
			5 acres of grassed waterways	30%	1 to 2 lbs/yr
			5,070 acres under nutrient management plans	35%	887 to 2,662 lbs/yr
Failing septic systems	580 lb/yr to 2,310 lb/yr	406 lb/yr to 1,617 lb/yr	No known implementation has occurred		
Internal Loading	40 lb/yr	28 lb/yr	No known implementation has occurred		
Atmospheric deposition	15 lb/yr	11 lb/yr	No known implementation has occurred		
Totals	**5,580 lb/yr to 17,200 lb/yr**	**3,906 lb/yr to 12,040 lb/yr**			**2,039 lb/yr to 6,117 lbs/yr**

[1]The TMDL does not present the existing loads by individual source category. The individual source loads are presented in the Implementation Plan and were combined with the TMDL's recommendation for a 70 percent reduction to create this table.

Argyle Lake

The Argyle Lake phosphorus TMDL was developed by the Illinois EPA and approved by the U.S. EPA in 2007. The nonpoint sources contributing to phosphorus loading in the Argyle Lake watershed are listed as agriculture, recreation, and forest.

Implementation Efforts

One Section 319 project has been completed in this watershed. A grade stabilization project was completed in a gully draining to Argyle Lake. This implementation project was primarily focused on stabilizing erosion in a gully and aimed to reduce sediment delivery to the lake. However, phosphorus is typically associated with sediment runoff and this project was therefore anticipated to result in both sediment and phosphorus load reductions.

Anticipated Reductions

Illinois EPA estimated that 153 lbs/yr of phosphorus would be reduced from stabilizing the gully draining to Argyle Lake. Little is known about this project so it is difficult to determine whether this is a reasonable estimate. The TMDL identified that 178 lbs/yr of phosphorus needed to be reduced and therefore this TMDL appears to be 86 percent implemented.

Otter Tail River – Breckenridge Lake to Bois de Sioux River

The Otter Tail River sediment TMDL was developed by the Minnesota Pollution Control Agency and approved by the U.S. EPA in 2007. Nonpoint sources of sediment loading to the Otter Tail River include stormwater runoff, illicit connections, and agricultural inputs.

Implementation Efforts

One Section 319 project has been partially implemented in this segment. The objective of this project was to reduce sedimentation in the Otter Tail River through education and cultural/structural BMPs. Four sediment sources are targeted including wind erosion, water erosion, streambank erosion, and in-stream erosion.

Another implementation project for the Otter Tail River has been funded with Minnesota Clean Water Legacy Funds. Clean Water Legacy Act funds are being used in conjunction with existing state and federal conservation programs to install conservation practices that reduce erosion, sediment, and turbidity. Targeted activities include conservation tillage, windbreaks, buffer strips, bio-fiber rolls, jetties, and stream barbs.

Both projects fall within the Otter Tail River watershed and are specific to this TMDL segment. BMP areas are not provided in the details of either project.

Anticipated Reductions

The Wilkin County Local Water Management Plan (Wilkin County, 2008) estimates the Clean Water Legacy Act projects will result in a load reduction of 2,645 tons of sediment per year. It is unclear how these anticipated reductions were calculated.

The Otter Tail River TMDL is summarized in Table A-5. The TMDL separates the allocations into five flow categories (low, dry, mid-range, moist, and high). Allowable loads for each flow zone were estimated using a load duration approach, and the existing loads were estimated using the S-LOADEST model. Load reductions are only needed during moist and high flow conditions. Based on the existing loads and TMDL for the moist and high flow zones, the total load to be reduced is 63,254 tons/year. This TMDL appears to therefore be approximately 4 percent implemented (2,634 tons/year divided by 63,254 tons/year).

Insufficient information is available to estimate the load reductions occurring as a result of the Section 319 projects.

Table A-5. Otter Tail River TMDL Summary.

Flow Zone	Existing Load (tons/year)	TMDL (tons/year)	Stormwater WLA (tons/year)	MOS (tons/year)	LA (tons/year)
Low Flows	No Reductions Needed	20,477	365	6,205	13,870
Dry Conditions	No Reductions Needed	26,134	365	4,380	21,535
Mid-Range Flows	No Reductions Needed	33,069	365	2,555	30,295
Moist Conditions	56,940	41,647	730	5,475	35,405
High Flows	100,740	52,779	730	5,110	47,085

"SCORING" OF PARTIALLY IMPLEMENTED TMDLS

Based on the results of surveying the 138 TMDLs included in this study, Tetra Tech has determined that comprehensive information on the extent of implemented controls is frequently lacking. Although information about the general nature of implementation is usually available (e.g., fencing was installed)

the specifics are usually not (e.g., 1500 linear feet of fencing were installed between river mile 3 and 4 of Duck Creek). The lack of such information makes it difficult or impossible to quantitatively estimate the likely effectiveness of the controls as was done for the three TMDLs described previously. Instead, only qualitative evaluations can be performed.

To test one qualitative approach we developed a methodology to apply to the partially implemented TMDLs included in this study (only the 79 non-mercury TMDLs were included). To try and ensure consistency in the qualitative evaluations, a "scoring system" was developed. Each TMDL found to be partially implemented was "scored" based upon the criteria listed in Table A-6. The scoring approach varied depending on whether the TMDL included only nonpoint sources or both point and nonpoint sources1. Points were variably assigned to each type of TMDL to ensure the same maximum potential score for each type. Each TMDL was scored based upon the information already existing in the study database; no additional contacts were made to obtain new information for the scoring.

Table A-6. Number of points assigned to evaluate degree of partial implementation.

Criteria	NPS TMDLs	PS Only and NPS/PS TMDLs
Is there an active Section 319 project?	1.5	1
Is there an active Section 319 project that is directly tied to the TMDL?	1.5	1
Is there an active non-Section 319 project addressing nonpoint sources?	1.5	1
Is there an active non-Section 319 project addressing nonpoint sources that is directly tied to the TMDL?	1.5	1
Have some of the WLAs been incorporated into permit revisions?	NA	1
Have all of the WLAs been incorporated into permit revisions?	NA	1
Maximum Score	**6**	**6**

The results of the scoring are summarized in Table A-7 and indicate that 24.1 percent of the TMDLs had relatively little implementation (2 points or less), 54.5 percent had a moderate level of implementation (3 or 4 points), and 21.6 percent had an extensive level of implementation. Thus, it appears that the general finding of the original study holds true – a large subset of the total population does indeed appear to have experienced a meaningful level of implementation. Only a relatively small number of the TMDLs appear to have been categorized as partially implemented due to having some, but not much, implementation.

1 Only one of the 100 partial TMDLs was listed as only having point source impairments – the bacteria TMDL for the Saline River in Michigan (Sample #17). There are three point sources upstream of this TMDL segment, all of which are wastewater treatment facilities. The WLAs have been incorporated into NPDES permits for each of the three facilities and all are meeting the permitted limits. However, other sources of bacteria include illicit sewer connections and stormwater inputs. Because these sources have not yet been addressed, this TMDL was categorized as being partially implemented.

Table A-7. Summary of partial TMDLs by score.

Points	# of TMDLs	Percent	Cumulative Percent
1	2	2.5%	2.5%
1.5	13	16.5%	19.0%
2	4	5.1%	24.1%
3	33	41.8%	65.8%
4	10	12.7%	78.5%
4.5	4	5.1%	83.5%
5	4	5.1%	88.6%
6	9	11.4%	100.0%