

Developing an Effectiveness Tracking and Reporting Framework for Implementing the Clean Water Legacy Act

Final Report



Photo by Stephanie Grayzeck

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Executive Summary

The following report summarizes a framework developed for tracking effectiveness and progress related to the Clean Water Legacy Act (CWLA), which passed into law in June 2006. Beginning in December 2007, the Water Resources Center at the University of Minnesota facilitated a series of meetings with representatives of the four state agencies with CWLA funding allocation, Board of Water and Soil Resources (BWSR), Minnesota Department of Agriculture (MDA), Department of Natural Resources (DNR), and Minnesota Pollution Control Agency (MPCA), as well as additional parties, including the U.S. Environmental Protection Agency (EPA), United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), University of Minnesota faculty, and a local government representative. This process built on the partnerships among the agencies responsible for the CWLA implementation, and resulted in the development of a shared vision to track and report on the Clean Water Legacy Act and funds. The ultimate goal of this framework is to allow agencies and the Clean Water Council to track progress and effectiveness of state programs in meeting goals for improving water quality in the state.

The Clean Water Legacy Effectiveness Tracking Framework is essentially a matrix, or table, that reports on measures within four major categories, *Partnerships/Leveraging*, *Environmental Indicators*, *Social Indicators*, and *Organizational Performance*, at various natural and political scales, including statewide, regions or basins, major watersheds (8-digit hydrologic unit codes), sub-watersheds, and local units of government including counties and cities. The development of this framework is only the first in a step wise process that will result in a data management system or portal that will allow users to draw on information from multiple state agency programs on water quality improvement efforts. Continued development and implementation of this framework relies on commitment from state agencies, the Clean Water Council, and additional partners.

The final report and supporting materials are available online at <http://wrc.umn.edu/outreach/cwlatracking>.

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Introduction

In June 2006, the Minnesota State Legislature passed and Governor Tim Pawlenty signed into law the Clean Water Legacy Act (CWLA), a progressive effort to address the state's impaired waters. The purpose of this law "is to protect, restore, and preserve the quality of Minnesota's surface waters by providing authority, direction, and resources to achieve and maintain water quality standards for surface waters as required by section 303(d) of the federal Clean Water Act, United States Code, title 33, section 1313(d), and applicable federal regulations"(CWLA 2006). The Legislature directed funding in Fiscal Year (FY) 2007, and FY 2008 and 2009 for expansion of the state's water quality monitoring efforts, developing additional Total Maximum Daily Load (TMDL) studies, installation of practices to restore and protect watersheds, and to monitor the effectiveness of practices in meeting Minnesota's water quality goals. Funding for these activities was distributed among four state agencies: Board of Water and Soil Resources (BWSR), Minnesota Department of Agriculture (MDA), Department of Natural Resources (DNR), and Minnesota Pollution Control Agency (MPCA).

Traditionally, resource agencies have measured *investments* and *activities*, but there is an increasing demand to establish and measure *results* (DNR 2007). Among the implementation policies of the Clean Water Legacy Act, state agencies must "establish and report outcome-based performance measures that monitor the progress and effectiveness of protection and restoration measures" (CWLA 2006). Additionally, the Clean Water Council, established by law to advise on the administration and implementation of the CWLA, "must recommend methods of ensuring that awards of grants, loans, or other funds from the Clean Water Legacy account specify the outcomes to be achieved as a result of the funding and specify standards to hold the recipient accountable for achieving the desired outcomes" (CWLA 2006). State agencies with CWLA responsibilities currently report program results to the Legislature annually or biennially, on an agency by agency basis. The Clean Water Legacy Effectiveness Tracking Project grew out of the need for a shared tracking and reporting strategy that will convey the overall effectiveness of CWLA activities across multiple state agencies and multiple programs.

In 2007, the MPCA selected the Water Resources Center (WRC) at the University of Minnesota and provided funding to the WRC to lead and facilitate the development of such a reporting framework. Over the course of three meetings in February, April, and May 2008, the WRC facilitated convened a group of representatives of the four state agencies with CWLA funding allocation (BWSR, MDA, DNR, and MPCA), as well as additional partners including the U.S. Environmental Protection Agency (EPA), United States Department of Agriculture (USDA) Natural Resources Conservation Service, University of Minnesota faculty, a local government representative, and a private TMDL contractor (See Appendix A for project work plan). In addition to facilitating meetings and writing up results, the WRC staff researched other environmental reporting frameworks, interviewed state agency staff and stakeholder groups, and more fully developed the draft frameworks and measures between meetings (for additional details, see the Framework Development Process, page 13).

The goal of this project was to create a *shared vision* for a framework that will provide the foundation for reporting results of Clean Water Legacy funded activities, but also water quality programs that have been in place for many years. Key audiences for these results include the Minnesota State Legislature, the Clean Water Council, the state agencies themselves, local and federal government partners, the general public, and interest groups. In the long run, the framework may serve as the basis for a data management system that will pull information from multiple agencies and programs, similar to the Environmental Data Access portal available of the MPCA's website for obtaining water quality information (<http://www.pca.state.mn.us/data/eda/index.cfm>).

The following report includes a complete description of the proposed Clean Water Legacy Effectiveness Tracking Framework and associated measures, Communication Tools developed during the process, and Recommendations and Next Steps agreed to by WRC staff and meeting participants. A more detailed description of the framework development process, as well as a brief literature review that aided participants in the framework creation, is included after the Recommendations section. The Appendices contain additional information including the initial frameworks developed during the second meeting (Appendix B), a complete list of proposed measures developed by the group (Appendix C), a list of individuals contacted for interviews (Appendix D), a review of existing data and databases at various state agencies (Appendix E), and finally a 'literature findings' matrix including brief descriptions of some the reviewed literature (Appendix F).

This report, meeting minutes, presentations, and other supporting materials are available electronically at <http://wrc.umn.edu/outreach/cwlatracking>.

The Clean Water Legacy Effectiveness Tracking Framework

The Clean Water Legacy Effectiveness Tracking Framework is essentially a matrix, or table, that reports on measures within four major categories, at a variety of spatial scales. The four main categories for grouping performance measures according to their function are: *Partnerships/Leveraging*, *Environmental Indicators*, *Social Indicators*, and *Organizational Performance*. This framework resulted from several discussions and evolved from two initial frameworks developed at the April meeting (See Appendix B for a description of these frameworks) that were based on time and spatial scale. Ultimately, a list of performance measures developed by the state agencies will populate the framework, providing results in each of the four categories, at multiple geographic scales. The group also developed a set of “metadata” for each measure, which will include information such as timeframe, collecting entity, audience, and other data.

Proposed framework

	Measure Category			
Geographic scale	Partnerships/ Leveraging	Environmental Indicators	Social Indicators	Organizational Performance
State				
Region/Basin				
Major Watershed (8 digit HUC)				
Project Sub-watershed Political Boundaries AUID Other <i>(project level must be defined)</i>				

Measure categories: Along the top row of this framework are four categories for measures. These four categories are defined as the following:

- Partnerships/Leveraging:** The Clean Water Legacy Act specifically calls for increasing agency cooperation and coordination, improving capacity of local governments, and leveraging other resources to improve water quality in Minnesota. Measures in the Partnerships/Leveraging category answer the question of *how well are agencies coordinating with other state agencies, with local units of government, with citizens, and with organizations like the University of Minnesota.*
- Environmental Indicators:** *What are the physical results of the “effort”?* Measures that fall into this category tend to be the overall environmental goals or “outcomes” agencies and other organizations are trying to reach. (Example: Has water quality improved? Are these Best Management Practices (BMPs) effectively reducing X pollutant?)
- Social Indicators:** Measures in the social indicators category refer *primarily to changes in attitudes and behaviors that impact water quality.* Social indicators tend to be medium term, predictive measures that can give agencies a heads up and allow for course correction if a program or target is not working.
- Organizational Performance:** Organizational performance refers to *How well is the organization (state agency, local unit of government, etc.) doing at managing a program or project?* Some of the measures reported in this category will be of high value to the agencies/organizations themselves in assessing and improving performance

Geographic scale: The first column of the framework indicates different geographic scales for reporting results. The highest scale of reporting is statewide. Region or basin-wide reporting is de-emphasized in this framework because while state agencies can and do report results at this scale, it is not necessarily a primary level for reporting. The next scale, for which a large majority of the measures will be collected and/or reported, is the Major Watershed, or 8-digit Hydrologic Unit Code (HUC), of which there are 81 in Minnesota. As the MPCA moves towards a watershed approach for water quality monitoring, TMDL planning, and TMDL implementation, the 8 digit HUC scale will become increasingly important and useful for reporting results. The lowest scale for reporting is the Project level. Project level refers to any project area smaller than a major watershed, which may have natural boundaries (e.g., sub-watershed or 12-digit HUC) or political boundaries (e.g., cities, counties). The project area *must* be defined for any measure reported at the Project level.

Metadata

For each measure that will eventually populate this framework, it is important to track certain related information, or “metadata.”. The seven metadata questions below are designed to help gather this information.

1. **Timeframe...***How long will it take to collect and report data for this measure?* Short term refers to 1-4 years, medium term refers to 5-10 years, and long term refers to 10+ years. These timeframe specifications may be altered to fit agency reporting if necessary. Example: *number of lakes with citizen volunteers* is a short term measure, while *water quality trends* is long term measure

2. **Who collects the data?...** Many of the data collected will come from multiple sources (e.g. state agencies, local units of government, federal government). This will be particularly important when the agencies begin thinking about a data management system. Example: the MPCA collects information on the number of TMDLs completed each year, but multiple agencies collect water quality monitoring data.

3. **Is the measure an output or outcome?...** Each measure may be described as an output/activity/effort or an outcome/final goal/ effect.. An output answers “*what did we do and what products or services were produced?*” while an outcome answers “*what did we achieve?*” (Hockings et al. 2000). Example: TMDL study completion is an **output**, while actual improvement in water quality is an **outcome**. It is possible for some measures to be both an output and an outcome.

4. **Who is the audience?** Different measures may be reported to different audiences. Example audiences: the Legislature, the Clean Water Council, agency management, general public

5. **What part of the Impaired Waters process does the measure fall under?** Funding for the CWLA and water quality improvement efforts still falls into traditional impaired waters process categories.

a. Monitoring and Assessment

b. TMDL/watershed Planning

c. Implementation: non-regulated (non point source) or regulated (point source)

Example: *Percent adoption of key urban runoff BMPs for a given area* falls under the implementation piece of the impaired waters process.

6. **Is the measure related to Protection or Restoration activities?** The Clean Water Legacy Act calls for both protection *and* restoration activities, so if applicable, it is important to indicate which type of activity the measure falls under. Example: A pollutant load reduction for a TMDL implementation plan is a restoration measure, while miles of shoreline stabilization on an unimpaired lake is a protection measure.

7. **What is the target/benchmark for the measure?**...The success of Clean Water Legacy efforts must be measured relative to targets or benchmarks. Setting these targets benchmarks will provide information for agency management, decision makers and policy makers and future decisions. Example: X percent of TMDLs will be locally led.

Measures

A complete list of 26 measures with metadata—compiled and edited by WRC staff from an initial list of over 58 measures—is included in Appendix C. Some example measures are included below, representing each of the four categories. In addition to placing each measure in a category, the WRC staff indicated the reporting scale, and answered metadata questions 1-6. Question 7, related to targets and benchmarks, has been left To Be Determined (TBD), as the final set of measures must be established before state agencies can answer this question state agencies.

Number and percent of 8-digit HUC watersheds monitored and assessed

a. Number of sites/years with trend data

Category: Organizational Performance

Reporting Scale: State

Metadata (see Metadata Questions 1-7 above)

1. Short-term to long-term
2. State (MPCA)
3. Output
4. Legislature, Clean Water Council, agency management, LGUs
5. Monitoring and Assessment
6. Both (protection and restoration)
7. TBD

Water Quality (WQ) trends statewide, for major regions

b. Actual versus expected water quality by region/eco-region

c. WQ at the watershed level

d. Number/percent of recreational impairments restored, number/percent of drinking water impairments restored.

e. Flow volume/rate trends over longer periods of time

f. Percent of waters trending up or down

Category: Environmental outcome

Reporting Scale: All levels

Metadata (see Metadata Questions 1-7 above)

1. Long-term
2. Local Government Units (LGUs), state (MPCA, DNR, MDA)
3. Outcome
4. Legislature, Clean Water Council, agency management, LGUs, general public
5. Monitoring and assessment
6. Both (protection and restoration)
7. TBD

Percent of locally led TMDLs

Category: Partnerships/Leveraging

Reporting Scale: State

Metadata (see Metadata Questions 1-7 above)

1. Short-term
2. State (MPCA)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. TMDL/watershed planning
6. Restoration
7. TBD

Behavioral tracking for non-regulated measures

Category: Social Indicators

Reporting Scale: state, Watershed

Metadata (see Metadata Questions 1-7 above)

1. Medium-term
2. State (MDA, MPCA, BWSR), some LGUs
3. Outcome
4. Agency management
5. Implementation (non-regulated)
6. Both (protection and restoration)
7. TBD

Populated framework

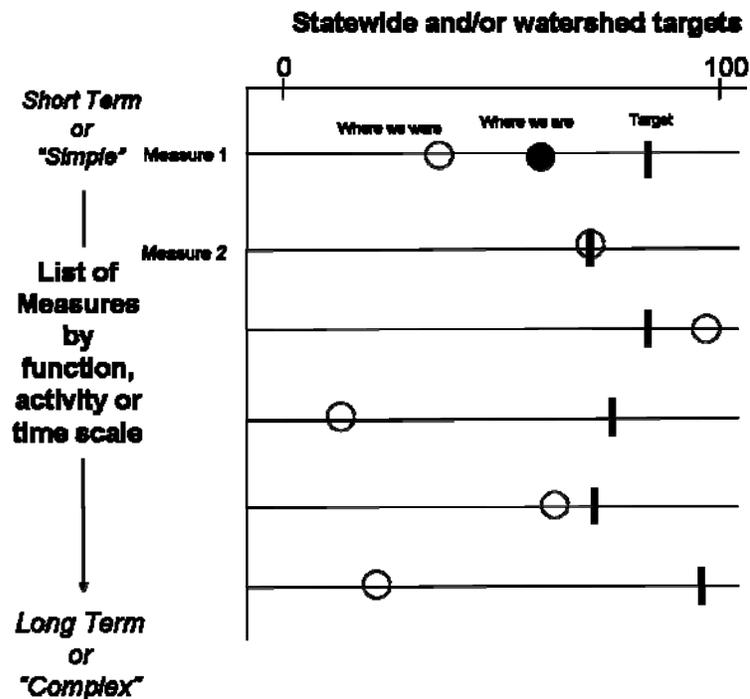
WRC staff placed several of the measures included in Appendix C in the proposed framework to give an idea of how state agencies may populate the framework when measures are fully developed.

	Measure Category			
Geographic scale	Partnerships/ Leveraging	Environmental Indicators	Social Indicators	Organizational Performance
State	⇒ Monitoring stations ⇒ Local TMDLs ⇒ Ratio of non-regulated funds ⇒ Ratio of regulated funds	⇒ WQ trends ⇒ Land conditions ⇒ Regulated source discharge ⇒ Non-regulated BMP poll. reduction	⇒ Non-regulated BMP adoption rates ⇒ Behavioral tracking ⇒ Social attitudes	⇒ Watersheds assessed and monitored ⇒ Data access ⇒ Watersheds/listings with completed TMDLs ⇒ Implementation Plan non-regulated targets met ⇒ Implementation Plan regulated targets met
Region/Basin				
Major Watershed (8 digit HUC)	⇒ Monitoring stations ⇒ Ratio of non-regulated funds ⇒ Ratio of regulated funds	⇒ WQ trends ⇒ Land conditions ⇒ Regulated source discharge ⇒ Non-regulated BMP poll. reduction	⇒ Non-regulated BMP adoption rates ⇒ Behavioral tracking	⇒ Data access ⇒ Implementation Plan non-regulated targets met ⇒ Implementation Plan regulated targets met
Project Sub Watershed Political Boundaries AUID Other <i>(project level must be defined)</i>	⇒ Ratio of non-regulated funds ⇒ Ratio of regulated funds	⇒ WQ trends ⇒ Land conditions ⇒ Regulated source discharge ⇒ Non-regulated BMP poll. reduction	⇒ Behavioral Tracking ⇒ Non-regulated BMP adoption rates	⇒ Implementation Plan non-regulated targets met ⇒ Implementation Plan regulated targets met

Communication Tools

While the main goal of this process was to develop a framework for reporting effectiveness, meeting participants were mindful of how to present the CWLA Effectiveness Tracking Framework and results to different audiences. As a result, during the second framework meeting, some participants developed communication tools for conveying results to the Legislature and the general public. It is important to keep in mind that these communication tools will only be useful once the framework and measures have been fully developed and agreed to by responsible state agencies. The underlying assumption for both of these tools is the ability to measure progress over time, and convey these results to diverse and less familiar audiences. The two communication tools put forward in this report are really iterations of the same idea, with the second tool correcting some of the weaknesses of the first. The use of these or other communication tools will only be as valuable as the measures developed for use in the CWLA framework. It is important to remember that the Legislature has new members at every session, so there needs to be a consistent message that ties back to commitments made by previous legislators.

Communication Tool 1:

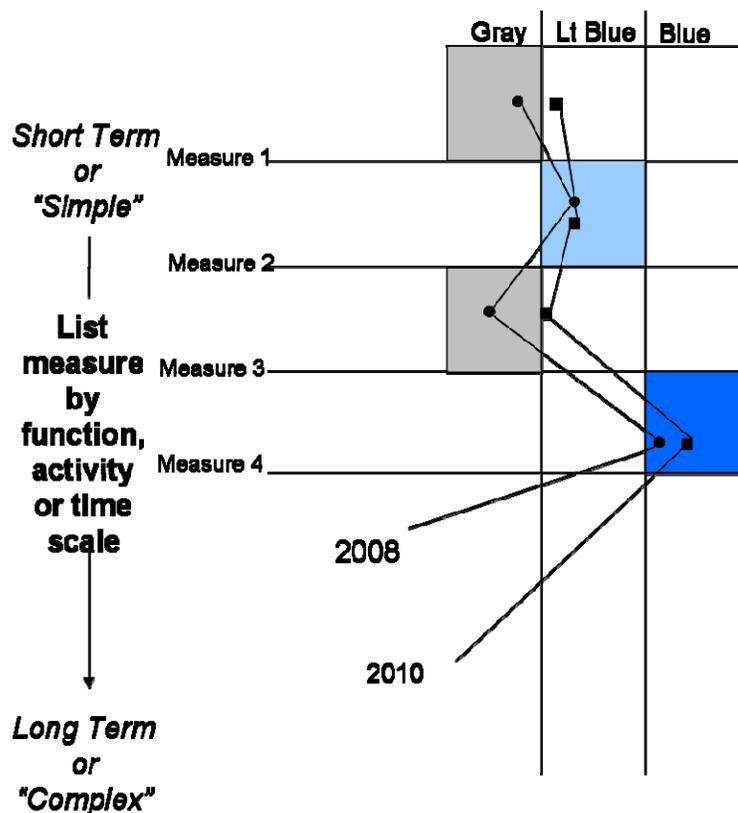


The idea behind Communication Tool 1 is to have a list of measures that can be organized in any number of ways down the Y axis, and along the X axis to show a measurement of progress on a scale of 1-100%. It is possible to show the state's progress on a particular measure or goal, for example impaired waters with a completed TMDL, both in the past, present, and then how those compare with the ultimate target. The downfall of this communication tool is that for some measures you may never reach the target of 100%, and it makes comparison across measures, and across watersheds, rather difficult because targets may change.

Communication Tool 2:

The shortfalls of the first communication tool led to the development of a second tool, which normalizes all the targets against each other by asking the question “How well are you doing at reaching your target?” Instead of a set target on display, “zones” indicate proximity to reaching targeted measures. The zones correspond to different levels of achievement. “Blue” indicates for example, that 90% of the target has been met, “light blue” indicates a moderate level of achievement has been made, and “grey” means that less than 60% of the goal or target has been met. This communication tool allows for comparison across different watersheds where the targets themselves may vary. Additionally, progress, or lack of progress, is visible over time.

Minnesota's Clean Water Report Card



Neither of these tools was tested during this project. The group felt that the guiding principles behind the development of these tools should be provided to those developing the final communication tools for various audiences:

1. Capturing progress over time.
2. Conveying results to multiple audiences.
3. The ability to look at a number of measures at the same time and see where progress has been made.
4. Setting normalized targets to make comparisons across watersheds and across the state.

Recommendations and Next Steps

The WRC staff, along with meeting participants, agreed on a series of recommendations and next steps regarding the implementation of the Clean Water Legacy Effectiveness Tracking Framework. Keys to the successful implementation of this framework will require the continued partnership of state agencies involved in the development process.

Agency development of measures and gaps analysis

- The WRC recommends that the state agencies involved throughout this process (BWSR, MDA, DNR, and MPCA) take the proposed framework and measures back to their staff for review. Agency staff familiar with the data and programs will discuss, modify, eliminate and/or add performance measures for the CWLA framework. As agency staffs develop these measures further, they must remember not to be limited by data and information that are currently collected. In addition, the metadata questions for each new measure must be answered.
- After state agencies have developed additional measures, the WRC recommends reconvening the framework group for one final meeting in the Fall of 2008. The purpose of this meeting will be to share responses from their respective agencies, refine the selected measures down to a manageable and reasonable number for use in the framework, and conduct a gaps analysis to determine the data that are not currently being collected for any of the measures. Gaps analysis was originally included in the project work plan, but the WRC staff and meeting participants realized that a full gaps analysis could not be conducted until a complete list of measures was developed for the framework.

Communication tools

- A full-fledged communication plan for reporting Clean Water Legacy results and using the CWLA Effectiveness Tracking Framework can be developed once the measures are finalized and populated in the framework. State agencies and the Clean Water Council may consider the communication tools developed during this process.

Common reporting requirements for implementation plans

- Over the course of this project, the WRC staff reviewed several MPCA-approved TMDL Implementation Plans. The WRC recommends that in adopting the CWLA Effectiveness Tracking Framework, the MPCA and other state agencies incorporate framework elements and some basic comparable measures into TMDL Implementation Plans. As the MPCA moves towards a watershed-based approach for both monitoring and TMDL development, these measures can be adapted for Watershed Implementation Plans as well. A more systematic reporting formula will allow for comparison across watersheds in the state, and provide a complete picture of implementation activities statewide.

- After the full list of measures is developed, WRC staff and meeting participants recommend that a ‘menu of measures’ be developed by state agencies for use by LGUs and others in the preparation of TMDL and Watershed Implementation plans.

Data management needs

- A full evaluation of data management needs cannot be performed until a final list of measures is vetted and agreed to by state agencies. The framework itself and the developed measures can serve as a basis for a data management system or portal, which can pull information collected by multiple agencies. A data management consultant who participated in the second and third meetings indicated that it would be possible for such a system to be established.

Research effectiveness measure

- A measure for research funding and results still needs to be developed and incorporated into the CWLA Effectiveness Tracking Framework. Many of the state agencies received CWLA funds for research projects, and it is important to track both the results as well as the effectiveness of these projects to address the research questions and provide useful information to managers and local implementers. Both meeting participants and members of the Clean Water Council Research and Outcomes workgroup expressed a desire to have such a measure in the framework.

Clean Water Council biennial reporting

- Once the CWLA Effectiveness Tracking Framework is tested and finalized by state agencies, the WRC recommends that it be incorporated into the Clean Water Council’s required biennial report to the Legislature on Clean Water Legacy activities and progress. This framework and report, along with example measures and metadata, were shared with the both the full Clean Water Council and the *Research and Outcomes* workgroup at the June 16th and July 21st Council meetings.
- Once the final report is available, the various workgroups of the Clean Water Council (*Research and Outcomes, Prevention and Monitoring, Civic Engagement and Local Partnerships, and TMDL Development and Implementation*) discuss the framework and additional measures, and feed any suggestions back to the state agencies.

Implementation and maintenance

- The implementation and maintenance of the CWLA Effectiveness Tracking Framework will require resources and/or staff time from state agencies.
- Implementation of the framework will likely be handled by the agencies themselves, but the primary responsibility may have to fall to one entity. A coordinating entity must be identified to ensure the implementation and collection of data for this framework.
- State agencies will need to reevaluate the framework and reporting system after it has been in place for at least 2 years.

Framework Development Process

To guide the development process and meeting agendas a project steering team was established, consisting of WRC staff and one person from each of five state agencies: BWSR, DNR, MDA, MPCA, and the Public Facilities Authority (PFA). The steering team met in December 2007 to recommend representatives from their respective agencies, as well as other participants, and established a rough timeline for implementing the project work plan and meetings. The steering team also established the following goal statement:

The overall goal of this project is to develop a framework to track and report Clean Water Legacy Act effectiveness. The framework will provide context for results of CWLA funding at a variety of levels (small scale and short term to large scale and long term) to respond to requests from key stakeholders such as the Legislature and Clean Water Council. This tracking and reporting strategy incorporates physical measurements of water quality, quantitative project measures (number and funding of point source/non point source projects, non point source Best Management Practices, administrative accomplishments), and human activity measures (e.g. community efforts, education, delivery of services to local governments, etc.) The ultimate goal of the proposed framework will be to assist the Clean Water Council in making recommendations about funding allocation and setting priorities to address impaired waters. State agencies will agree on framework that will be incorporated into criteria for selection of projects and used for reporting progress on a biennial basis.

Participants

One of the keys to success for developing this framework was active participation of the state agencies responsible for implementing the Clean Water Legacy Act. In addition to representatives from BWSR, MDA, DNR, and MPCA, it was important to include meeting participants with varying perspectives and ideas. Participants in the framework meetings were as follows:

<i>Agency/Organization</i>	<i>Number of Participants</i>
BWSR	1
MDA	2
DNR	2
MPCA	5
University of Minnesota faculty	2
Clean Water Council	1
Rice Creek Watershed District (Local Government)	1
U. S. Environmental Protection Agency, Region 5	1
Barr Engineering, TMDL Contractor	1
USDA Natural Resources Conservation Service	1
CGI Inc, Business Object Model contractor for MPCA	1
Total	19

Three WRC staff members participated on this project:

Faye Sleeper, *Co-Director*, directed all aspects of the project, facilitated all steering team meetings, the three framework meetings, and provided final review and approval of all written documents.

Stephanie Grayzeck, *Research Assistant*, worked in partnership with the Co-Director on all steering team and project meetings, composed the majority of written documents and presentations, and conducted much of the research and individual interviews between meetings.

Shannon Wing, *Graduate Research Assistant*, assisted the Co-Director and Research Assistant in benchmarking, interviewing, other information gathering, planning for all meetings and work between meetings and in the meetings.

Meeting structure

The project work plan, available in Appendix A, called for a series of three meetings to review existing data and databases, develop measures and frameworks, and synthesize the group's effort into one or more framework(s). Before each framework meeting, WRC staff met with the project steering team to review the agenda and goals. Full minutes, as well as presentations from these three meetings are available online at <http://wrc.umn.edu/outreach/cwlatracking>.

Framework Meeting 1, February 22, 2008 - Identification of Existing Data

The first framework meeting laid the foundation for the framework discussions that followed. Before participants could begin developing a framework, it was important that they understand the types of data and databases currently used by various state agencies to collect, track, and report results. To gather this information, the WRC staff interviewed 24 state agency staff at five agencies in January and February of 2008. A list of interviewed staff is included in Appendix D. For their respective program data, agency staff were asked about the purpose of collection, type of data (e.g. environmental monitoring results, types and numbers of best management practices installed, social data, fiscal information), scale (e.g. field, individual project, program, basin), and timeframe. The resulting information on data and databases was broken down into 4 general categories: *monitoring and assessment*, *TMDL studies and implementation plans*, *grant and loan reporting*, and *administration and compliance*. A detailed spreadsheet of all of data and databases is included in Appendix E.

Framework Meeting 2 – April 3, 2008 – Framework and Measure Development

Prior to the second framework meeting, WRC staff spoke with various stakeholder groups and outside observers to gather insight on performance measures and framework ideas (interview list available in Appendix D), and presented these results to meeting participants. WRC staff provided participants with some example frameworks and performance measures pulled from literature, interviews and discussions. Participants were divided into 3 small breakout groups to identify key measures, and develop initial frameworks. Two initial frameworks (the “yellow” and “blue” frameworks) emerged from these discussions, both were based on elements of time and scale. Details about these early frameworks are included

in Appendix B. The communication tools presented in this report were also developed during this meeting (See Communication Tools, page 9).

Framework Meeting 3 – May 22, 2008 - Synthesis

For the third framework meeting, participants revisited the developed frameworks, list of measures, and communication tools developed at the second meeting, with the goal of integrating these three components. The two initial frameworks were both based on elements of time and scale, and discussion during the 3rd meeting ultimately led to the development of the final framework presented in this report, as well as the associated measures and communication tools. Recommendations and next steps for state agencies were also discussed and incorporated into this report (see WRC Recommendations, page 11).

Literature Review and Example Frameworks

As stated previously, resource agencies in Minnesota and elsewhere have historically measured investments and activities, but there is now a greater focus on establishing and measuring *results* (DNR 2007, BWSR 2006). This movement towards greater accountability – reporting the *effectiveness* of organizations – is occurring at local, state, and federal levels of government. However, measuring agency and program performance effectively remains one of the big challenges in public management (Poister 2004). Many government agencies have systems in place for measuring and reporting results that do not satisfy the large information needs for measuring how effectively they achieve their objectives, and these reporting systems do not provide the feedback needed by decision makers to make choices about budget and resource allocation (Gawande and Wheeler 1999). For environmental programs and water quality improvement in particular, measuring and reporting effectiveness is difficult, especially in short time frames, when reporting on changes that may take years or even decades to see on the landscape. Over the course of this project, WRC staff utilized both the internet and library searches to identify efforts to measure and report effectiveness of environmental programs within Minnesota, in other states, and at the national and even international levels. Many of the sources WRC staff utilized along with a brief description (some of which are not discussed in this report) are located in the Literature Findings matrix in Appendix F. Several of the following frameworks, ideas, and theories were provided to meeting participants to elicit reaction, spark discussion, and provide ideas for the development of the Clean Water Legacy Act Effectiveness Tracking Framework. Elements and ideas from many of these frameworks were incorporated into both the initial frameworks that were developed, and the final reporting framework presented in the next section.

Current efforts in Minnesota

Every state agency is required to report annually and/or biennially to the Legislature on various programs they implement and manage, as well as overall agency achievements. The MPCA currently reports annually on wastewater facility infrastructure needs, tracking for new wastewater treatment facilities, and air and water fees, among many other programs. The MPCA also provides an *Annual Pollution Report to the Legislature* on all media (air, water, land). The most recent biennial report for the MPCA, *Driving Environmental and Economic Excellence in Minnesota* (MPCA 2006), contains information on multiple programs at the MPCA, including Clean Water Partnership grants. In addition to reporting to the Legislature, the MPCA also completes an annual *Watershed Achievements Report* for the EPA on Clean Water Partnership and Clean Water Act Section 319 projects completed in the state (MPCA 2007). The Watershed Achievements Report includes a description of each project, financial information, and results of the project. Additionally, the PFA, which manages the Clean Water Revolving Fund in cooperation with the MPCA, prepares an annual Intended Use Plan. This report details the point source projects expected to receive funding based on the Project Priority List prepared by the MPCA (PFA 2008). The MPCA also completed Minnesota's Water Quality Monitoring Strategy in 2004, which includes a section on effectiveness monitoring (MPCA 2004).

BWSR produces both annual and biennial reports on their performance and progress, including a check off "to do list" in the 2007 annual report which detailed several benchmarks achieved that year (BWSR 2007). MPCA and BWSR also require Local Government Units (LGUs) to use the *eLINK* system ("electronic link between state and local government") to track BMPs projects that utilize Section 319, Clean Water Partnership, and Clean Water Legacy Act funds. Results from *eLINK* are incorporated into biennial and annual reporting for both agencies, and include estimated pollutant load reductions, soil savings, and sediment reduction.

MDA is responsible for reporting biennially on the Agricultural Best Management Practices (AgBMP) Loan program (MDA 2008), which is tracked separately from projects reported in *eLINK*, as well as their monitoring efforts and pesticide enforcement (MDA 2007a). Additionally, MDA has produced reports on the effectiveness of the Minnesota Phosphorus Lawn Fertilizer Law (MDA 2007b).

The DNR, which along with other state agencies produces annual and biennial reports to the Legislature, has also developed *A Strategic Conservation Agenda*, first completed in 2003 and updated in 2007. The Conservation Agenda highlights the need for establishing and measuring results, and includes priority indicators and targets in six key performance areas of DNR management (DNR 2007).

In addition to biennial reporting to the State Legislature, state agencies are also required to identify priority goals with related performance measures and results for Governor Tim Pawlenty's Department Results performance accountability website, <http://www.departmentresults.state.mn.us/>. All of the cabinet level state agencies with water quality-related responsibilities (MPCA, DNR, and MDA) report through this website and

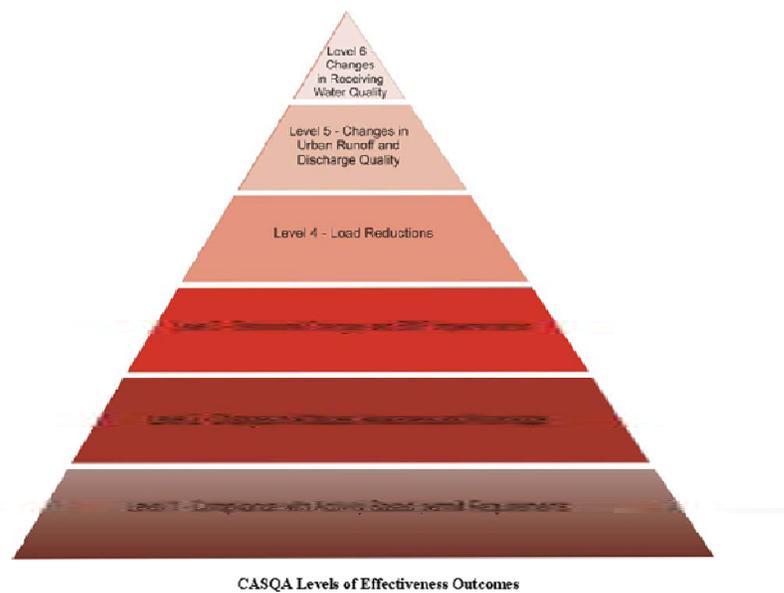
included the mission, along with several performance measures indicating progress towards that mission.

Frameworks considered during strategy meetings

The following frameworks, pulled from different sources, were provided to meeting participants in order to build on previous ideas and spark new ones.

CASQA Effectiveness Framework

The California Stormwater Quality Association (CASQA) defines effectiveness assessment as “the process that managers use to evaluate whether their programs are resulting in desired outcomes, and whether these outcomes are being achieved efficiently and cost-effectively” (CASQA 2005). CASQA developed an effectiveness assessment and monitoring framework based on various types of assessment outcomes, represented in a triangle from activity-based outcomes at the bottom to water-quality based outcomes at the top. The pyramid structure indicates a progression of each ‘outcome level’ towards the ultimate goal of water quality improvement at the top of the pyramid (CASQA 2005). This outcome is the most difficult to achieve.



Source: City of San Diego, Strategic Plan for Watershed Activity Implementation, 2005

The Logic Model

Another evaluation tool found in the literature is the logic model, which consists of the following components: *inputs* – resources that need to be invested in a program so that it will be able to perform its planned activities, *activities* – what the program does with the inputs, *outputs* – the direct products of program activities, and *outcomes* – the benefits of changes in the program’s target population (Savaya and Wasyman 2005). Variations of the logic model have been used for evaluation in many types of programs, ranging from social services to environmental programs. The International Union for the Conservation of Nature (IUCN)

used a modified logic model to propose a framework for evaluating effectiveness of World Protected Areas (Hockings et al. 2000). The following logic model example was provided to CWLA meeting participants:

Assumptions: *Optional*

Goal(s): *Optional*

INPUTS	ACTIVITIES	OUTPUTS*	SHORT TERM OUTCOMES*	MEDIUM TERM OUTCOMES*	LONG TERM OUTCOMES*
In order to accomplish our goals will need the following resources	Accomplishing the following activities will result in the following measurable deliverables	Accomplishing these activities will result in the following evidence of progress	We expect the following measurable changes within the life of the grant	We expect the following measurable changes within the next one to three years	We expect the following impacts/trends within the next three to seven years or more

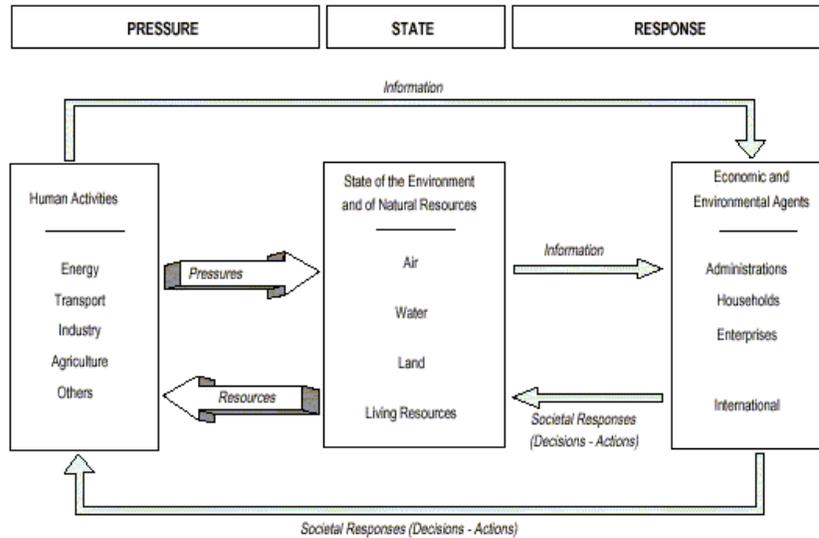
***Be sure to indicate how each of these will be measured.**

Source: EPA Region 10, Logic Model Template B, 2008

<http://yosemite.epa.gov/R10/ECOCOMM.NSF/webpage/measuring+environmental+results>

The Pressure-State-Response Model

The Pressure-State-Response model, developed by the Organisation for Economic and Co-Operation and Development (OECD), has also been utilized in the development of environmental indicators and effectiveness of programs. The OECD first developed the PSR model as a conceptual framework for developing environmental indicators to “strengthen countries’ capacity to monitor and assess environmental condition and trends so as to increase their accountability and to evaluate how well they are satisfying their domestic objectives and international commitments” (OECD 1991). The PSR model “represents the associations among the pressures exerted by human activities on the environment; the changes in the quality and quantity of natural resources; and the societal responses to these changes through environmental and other policies” (EPA 2008, OECD 1991). The Environmental Protection Agency’s National Estuary Program used the PSR framework for the recently published *Environmental Indicators for Estuaries* manual (EPA 2008).



Source: Organisation for Co-operation and Economic Development (1991)

Time and Scale

An additional framework was presented to meeting participants that did not come directly from literature or other state/national efforts. During the initial steering team meeting, a preliminary framework was developed by one of the team members, based on elements of time and scale. These spatial and temporal elements became the basis for the one of the initial frameworks developed during the second meeting. Additionally, the use of the terms *effort* and *effect* were brought into this framework to identify different types of measures (Friedman 2005). *Effort*, which is akin to the output term used in the logic model, includes measures and activities that answer the questions *How much did we do* and *How well did we do it?* (Friedman 2005). *Effect* answers the question *Is anyone really better off* and corresponds to the outcome piece of a logic model.

	<i>Time</i>		
<i>Scale</i>	Short-term	Medium-term	Long-term
Small	<i>Effort</i>	<i>Effort</i>	<i>Effort</i>
	<i>Effect</i>	<i>Effect</i>	<i>Effect</i>
Regional	<i>Effort</i>	<i>Effort</i>	<i>Effort</i>
	<i>Effect</i>	<i>Effect</i>	<i>Effect</i>
Statewide	<i>Effort</i>	<i>Effort</i>	<i>Effort</i>
	<i>Effect</i>	<i>Effect</i>	<i>Effect</i>

Other national and regional efforts

There have been several other national and regional efforts to measure effectiveness and develop frameworks and indicators for environmental programs. The United States Department of Agriculture (USDA) has been working on Conservation Effects Assessment Project (CEAP) since 2003. CEAP is a multi-agency effort to quantify the environmental effects of conservation practices the USDA oversees, and includes both a national assessment and several watershed assessments (USDA 2008). Questions posed by an external review panel of CEAP found that in order to inform strategic resource management, CEAP should be built to answer the question ‘what should we do next year?’ rather than ‘What did we do last year?’ (SWCS 2006). These same questions apply to the development of the Clean Water Legacy framework.

The EPA is currently assessing reporting needs and effectiveness measures for Total Maximum Daily Load (TMDL) implementation tracking. Once a TMDL is approved, there is no standardized process for states to track on-the-ground implementation efforts and progress (Cadmus Group et al. 2008). As a result, states are taking different approaches to TMDL implementation tracking, and there is little to no information on effectiveness of implementation efforts on a national scale. A report prepared for EPA Region 5 on TMDL implementation tracking status found that most of the nine states included in the study do not have data systems in place for tracking information on TMDL implementation and that most states would use a tracking system if one was developed by the EPA. Minnesota, which was included in this report, already has some data systems for tracking implementation activities (e.g. *eLINK*), but they are housed and operated by different agencies (Cadmus Group et al. 2008). This report was shared with meeting participants and several of the TMDL implementation indicators identified in the EPA report are incorporated into the list of proposed measures in Appendix C.

The Heinz Center has also been leading a national effort with federal government agencies and other collaborators to develop a set of environmental indicators to assess the nation’s ecosystems since 1999. In *The State of the Nation’s Ecosystems*, the Heinz Center lays out a reporting framework for these indicators that includes six major ecosystem types. The indicators fall into a number of categories: system dimensions, chemical and physical conditions, biological components, and human use (Heinz Center 2002). The goal of this project is to identify these key indicators and lay the groundwork for reporting on a national level. The indicators themselves provide an overall picture of the nation’s ecosystems, much like the Gross Domestic Product, stock numbers, and housing information provide key information on the health of the economy (O’Malley 2008).

On a regional, multi-state level, the Chesapeake Bay Program developed an indicator framework for an annual assessment of Chesapeake Bay health and restoration. The framework groups indicators by a functional role (*factors impacting Bay and watershed healthy, restoration and protection efforts, watershed health, and Bay health*) and places each indicator into a hierarchy of detail (Chesapeake Bay Program 2008).

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Appendices

- A. Project work plan
- B. Initial frameworks
- C. Interview lists
- D. Existing data and databases
- E. Literature findings matrix
- F. List of proposed measures

Appendix A
Project Work Plan

**Developing an Effectiveness Tracking and Reporting Framework
For Implementing the Clean Water Legacy Act**

Grant Work Plan

November 1, 2007 – October 31, 2008

Water Resources Center, University of Minnesota

Introduction

The Minnesota Legislature provided significant funding for the 2008/2009 biennium to the Board of Water and Soil Resources (BWSR), the Department of Agriculture (MDA), the Department of Natural Resources (DNR), and the Pollution Control Agency (MPCA) to implement the Clean Water Legacy Act. The legislature directed the funding for expansion of the state's water quality monitoring, developing additional Total Maximum Daily Load Studies (TMDL), installation of practices to restore and protect watersheds and to monitor the effectiveness of the practices in meeting the goals of the TMDL or watershed plan.

The Legislature, Clean Water Council and others will require that the agencies provide an accounting of the funds and how they are spent. This work builds on the partnership that has formed among the agencies responsible for the CWLA implementation and facilitates their developing a common vision and process to track and report on the Clean Water Legacy Act and funds.

Purpose

The purpose of this effort is to facilitate state agencies' collective effort in developing a framework to track and report CWLA implementation effectiveness, so that state agencies and the Clean Water Council are able to effectively communicate the progress made and goals achieved. This statewide, interagency framework would then be used to guide individual agency and organization efforts to monitor changes in water quality, track implementation efforts, and communicate results.

The keys to successful framework development will be active participation by the state agencies and partners involved in CWLA implementation in a discussion of the existing data/measures, data management system, and reporting needs. The framework would be developed by the agencies and facilitated by the University of Minnesota's Water Resources Center (WRC). The framework will be developed over the course of three meetings. The work of the WRC will involve gathering information prior to meetings, facilitating the meetings, and writing up the results in a fashion that is acceptable to the state agencies and the Clean Water Council.

Work Plan

Steering team

1. Identify a “steering team” consisting of U of M WRC staff and one person from each of five state agencies (BWSR, MDA, DNR, MPCA, Public Facilities Authority).
2. The steering team will meet initially to identify information that is available, who has the information, identify the participants for the three working meetings (see below list of proposed participants), and confirm the process outlined in this work plan.

Identification of Existing Data – Framework Meeting 1

1. Develop a draft of the agenda for review by the steering team
2. Work with steering team to identify their knowledge of where the data exist, to finalize the meeting agenda and expectations for the first meeting.
3. Meet with individuals who know the data. Gather information in the following categories:
 - Purpose of collection
 - Type of data (e.g. Environmental monitoring results, types and numbers of best management practices installed, social data, fiscal information)
 - Scale (e.g. field, individual project, program, basin)
 - Timeframe
4. Facilitate first meeting, during which information is shared on the data that have been identified, identify other data that have not been collected, and share possible frameworks (WRC will bring forward a few options to start the discussion). Record meeting discussions. Organize notes and meeting outcomes and distribute to all participants.

Identification of Results to be Tracked and Identified – Framework Meeting 2

1. Develop a draft of the agenda for review by the steering team
2. Work with steering team to identify key stakeholders, agenda and results desired from framework meeting 2.
3. Interview/gather information from key stakeholders not attending framework meetings
4. Benchmark with other states and organizations on water program measurement and reporting
5. Research and identify several options for presenting and communicating results to start the discussion.
6. Discussion will include the data/measures that need to be tracked to show results and how best to present and communicate those results.
7. The goal of the 2nd framework meeting is agreement on the results to be tracked and reported. Share results of interviews and research conducted by the WRC. Record meeting discussions. Organize notes and meeting outcomes and distribute to all participants.

Gaps Analysis – Framework Meeting 3

1. Develop a draft of the agenda for review by the steering team.
2. Identify gaps that are obvious and meet with appropriate parties to identify other potential gaps.

3. Facilitate third framework meeting with identification of gaps that must be filled, what data needs will fill those gaps and who will be responsible for filling gaps. Record meeting discussions.

Final products

1. Written report that includes:
 - Summary of meeting results
 - Description of report needs
 - Recommendations for a framework that meets the reporting needs, including data/measures, data management needs, communication tools, timeline for implementing the plan, and responsible agencies.
2. Verbal report
 - Report to agencies at their monthly CWLA coordination meeting
 - Other verbal reports as requested (e.g. Clean Water Council)

Logistics

1. WRC will be responsible for securing meeting rooms, providing necessary refreshments, and providing equipment for facilitating the meetings (including the written recording of the meetings).
2. WRC will submit final report in hard copy and electronically to the steering team and in hard copy to all other parties needing/desiring a copy.

WRC Resources

1. Staffing:

Co-Director will direct all aspects of the project, participate in all steering team meetings, the three framework meetings, and provide final review and approval of all written documents.

Research assistant will work in partnership with the Co-Director on all steering team meetings, project meetings, all written documents and will conduct much of the research and individual interviews between meetings.

Civil Service staff will assist with management of the grant, logistics and edit of the final report.

Graduate student will assist the Co-Director and Research Assistant in benchmarking, interviewing and other information gathering and in the meetings.

2. Travel: Travel to all meetings will be primarily in the metropolitan area.

Deliverables

1. Periodic progress reports if required by MPCA;
2. Meeting minutes and agendas
3. Three project meetings and a minimum of three steering team meetings
4. Final report as identified above.

Proposed Participants Framework Meetings*

Participants: The meeting participants would be based on the agencies and partners involved in CWLA implementation, with the number of participants from each agency reflective on the level of involvement in and responsibility for CWLA implementation.

<i>Agency/Organization</i>	<i>Number of Participants</i>
Department of Agriculture	1
Department of Natural Resources	1
Board of Water & Soil Resources	2
Pollution Control Agency	4
Public Facilities Authority	1
University of Minnesota	3 (non facilitators)
Clean Water Council	2
Local Government Representatives	2
EPA	1
TMDL Contractor (from PCA master contract list)	1
Total	18

Note: this list is subject to changes by the steering team. For framework meeting #2, 4 members of the G-16 representing the range of CWLA stakeholders will also be invited to participate in the discussion.

* Participants were adjusted after initial steering team meeting to include USDA NRCS.

Appendix B
Initial frameworks

The two initial frameworks developed during the second framework meeting on April 3, 2008 are described below. Complete minutes for all three meetings, as well as PowerPoint presentations given at these meetings, are available at <http://wrc.umn.edu/outreach/cwlatracking>

“yellow” framework:

	Short Term	Medium Term	Long Term
Small Scale (sub-watershed)			
Regional Scale (watershed)			
Statewide			

One of the breakout groups developed this framework, which is based on the time and scale framework developed by a steering team member and presented to all of the meeting participants. It is essentially a matrix that included timeframe for reporting measures (short, medium, and long term) and the spatial scale of the measures (statewide, regional/watershed, and small/sub-watershed scale). Group members walked through an exercise of placing developed measures in each square of the matrix and designating each measure as an *effort* or *effect*.

“blue”/Group 3 Framework:

		List	Plan	Implementation			
		Conditions Assessment	TMDL Plans	Restoration		Protection	
				Point	Non-point	Point	Non-Point
Federal	long term	▲	▲	▲	▲	▲	▲
	medium term	▲	▲	▲	▲	▲	▲
	short term	▲	▲	▲	▲	▲	▲
State	long term	▲	▲	▲	▲	▲	▲
	medium term	▲	▲	▲	▲	▲	▲
	short term	▲	▲	▲	▲	▲	▲
Region/Basin	long term	▲	▲	▲	▲	▲	▲
	medium term	▲	▲	▲	▲	▲	▲
	short term	▲	▲	▲	▲	▲	▲
Water-shed	long term	▲	▲	▲	▲	▲	▲
	medium term	▲	▲	▲	▲	▲	▲
	short term	▲	▲	▲	▲	▲	▲
TMDL	long term	▲	▲	▲	▲	▲	▲
	medium term	▲	▲	▲	▲	▲	▲
	short term	▲	▲	▲	▲	▲	▲
LGU	long term	▲	▲	▲	▲	▲	▲
	medium term	▲	▲	▲	▲	▲	▲
	short term	▲	▲	▲	▲	▲	▲

Short term = < 5 years (Outputs)
 Medium term = 10 years ▲
 Long term = Multi-decades (Outcomes - Conditions)

Another framework developed during the second meeting is also based on time and scale, but includes categories for the different parts of the Impaired Waters process: Conditions assessment, TMDL planning, Implementation broken down by point and non-point source, and protection and restoration). This group incorporated the pyramid concept used by the California Stormwater Quality Association (CASQA), indicating that in shorter time frames and at lower spatial scales, you are collecting multiple data points, while as you move up in scale and longer in time, there are less details to report and eventually your reporting narrows down to a few key indicators.

Appendix C

Proposed Measures for the CWLA Effectiveness Tracking Framework

The CWLA framework group developed the following list of measures over the course of the 2nd and 3rd meetings. WRC staff grouped different measures together to reach these 26. Each measure is identified by a unique letter (A-Z) but the letters do not imply any priority order. State agency staff will modify and/or add to this list in order to develop final measures for the CWLA Effectiveness Tracking Framework (see Recommendations section). Question 7 has not been answered, as this will be determined by agencies.

For each measure, the following information was identified:

Category

Reporting Scale

Metadata:

1. **Timeframe (short or long term)**
2. **Who collects the data?**
3. **Is the measure an output or outcome?**
4. **Is this a reporting measure or a management measure?**
5. **What part of the Impaired Waters process is this a part of?**
 - a. **Monitoring and Assessment**
 - b. **TMDL/watershed planning**
 - c. **Implementation**
 - i. **non-regulated (non point source)**
 - ii. **regulated (point source)**
6. **Is the measure related to protection or restoration activities?**
7. **What is the target or benchmark for this measure?**

- A. Percent of certified monitoring stations that are state, local, non-governmental**
- a. **Number of lakes with citizen volunteers/Number of stream sites or miles with citizen volunteers**

Category: Partnerships/Leveraging

Reporting scale: State, watershed, project

Metadata:

1. Short-term
2. State (MPCA, DNR, MDA), LGUs (WS Districts, SWCDs, Met Council, Counties, Cities, etc)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Monitoring and Assessment
6. n/a
7. TBD

B. Number and Percent of 8-digit HUC watersheds monitored and assessed

a. Number of sites/years with trend data

Category: Organizational Performance *Reporting Scale:* State

Metadata:

1. Short-term to long-term
2. State (MPCA)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Monitoring and Assessment
6. Both (protection and restoration)
7. TBD

C. Data accessibility

a. Quantity and quality of WQ data

b. Local climate data availability

c. Land cover data availability – collected every 5 years

Category: Organizational Performance *Reporting Scale:* State, WS

Metadata:

1. Short-term to medium-term
2. State (MPCA, DNR, BWSR, MDA), LGUs
3. Output AND outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Monitoring and Assessment, Implementation (reg and non-reg)
6. n/a
7. TBD

D. Water Quality (WQ) trends statewide, for major regions

a. Actual versus expected water quality by region/eco-region

b. WQ at the watershed level

c. Number/Percent of recreational impairments restored, Number/Percent of drinking water impairments restored.

d. Flow volume/rate trends over longer periods of time

e. Percent of waters with upward trends/downward trends

Category: Environmental outcome *Reporting Scale:* All levels

Metadata:

1. Long- term
2. LGUs, state (MPCA, DNR, MDA)
3. Outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Monitoring and assessment
6. Both (protection and restoration)
7. TBD

E. Land condition

a. Land cover/land use

b. Percent of stream miles eroding, Percent of stream miles buffered

c. Watershed vulnerability

Category: Environmental Outcome *Reporting Scale:* State, WS

Metadata:

1. Medium-term
2. State (DNR, MPCA), maybe some LGUs
3. Output in terms of collection, outcome in terms of actual land condition
4. Agency Management
5. Monitoring and assessment, implementation
6. Both (protection and restoration)
7. TBD

F. Percent of current listings incorporated into TMDLs...transitioning into Number of 8-digit HUC watersheds fully addressed by completed TMDLs (EPA approved)

Category: Organizational Performance *Reporting Scale:* State

Metadata:

1. Short-term
2. State (MPCA)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. TMDL/Watershed planning
6. Restoration
7. TBD

G. Percent of locally led TMDLs

Category: Partnerships/Leveraging *Reporting Scale:* State

Metadata:

1. Short-term
2. State (MPCA)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. TMDL/watershed planning
6. Restoration
7. TBD

H. Number of 8-digit HUC watersheds with completed (MPCA approved) implementation plans

Category: Organizational Performance *Reporting Scale:* State

Metadata:

1. Medium-term, long-term
2. State (MPCA)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. TMDL/Watershed planning

6. Restoration
7. TBD

I. Percent of TMDL study effort/outputs in sequence with overall watershed management plan/approach

Category: Organizational Performance *Reporting Scale:* State

Metadata:

1. Medium-term, long-term
2. State (MPCA)
3. Output
4. Agency management
5. TMDL/Watershed planning
6. n/a
7. TBD

J. Ratio of non-regulated (non point source) \$ from: state, federal, LGU, landowner

Category: Partnerships/Leveraging *Reporting Scale:* State, WS

Metadata:

1. Short-term to long-term
2. LGUs, state (BWSR, MPCA, MDA, DNR)
3. Output in the short term, outcome in the long term
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (non-reg)
6. both – could distinguish between the two for reporting
7. TBD

K. Percent adoption of key non-regulated BMPs for a given land use

Category: Social Indicators *Reporting Scale:* State, WS

Metadata:

1. Medium term to long term
2. LGUs, state (BWSR –rural and ag, MDA-ag, MPCA-urban, rural, ag, DNR-forestry, urban, lakes)
3. Outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (non-reg)
6. Both (protection and restoration)
7. TBD

L. Percent of land covered by a non-regulated BMP

Category: Environmental Indicator (maybe also organizational)
state, WS, LGU

Reporting Scale:

Metadata:

1. Short term
2. LGUs, state (BWSR, MDA, MPCA)
3. Outcome (TBD)
4. Legislature, Clean Water Council, Agency Management, LGUs

5. Implementation (non-reg)
6. Both (protection and restoration)
7. TBD

M. Targets/benchmarks for non regulated activities in TMDL/watershed implementation plans ADOPTED

a. Critical source areas reported against implementation of practices in those critical areas

Category: Organizational Performance *Reporting Scale:* State, WS

Metadata:

1. Short-term
2. LGUs, TMDL/watershed plan preparers (includes LGUs), state (MPCATBD)
3. Output
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (non-reg)
6. Restoration for TMDL, both for WS plans
7. TBD

N. BMP effectiveness and pollution reduction totals

a. Paired watershed studies

b. Estimated reduction measurements

c. Actual reduction measurements

Category: Environmental Indicators *Reporting Scale:* State, WS, project

Metadata:

1. Long-term
2. LGUs, state (MPCA, MDA, BWSR), Universities (TBD)
3. Outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (non-reg)
6. Both (protection and restoration)
7. TBD

O. Targets/benchmarks for non-regulated activities in TMDL/watershed implementation plans MET

Category: Organizational Performance *Reporting Scale:* State, WS

Metadata:

1. Long-term
2. State (MPCA, BWSR), TMDL/WS plan preparers (includes LGUs)
3. Outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (non-reg)
6. Both (protection and restoration)
7. TBD

P. Behavioral tracking for non-regulated measures

Category: Social Indicators *Reporting Scale:* State, WS

Metadata:

1. Medium-term
2. State (MDA, MPCA), some LGUs
3. Outcome
4. Agency management
5. Implementation (non-reg)
6. Both (protection and restoration)
7. TBD

Q. Ratio of regulated (point source) \$ from: state, federal, LGU, landowner

Category: Partnerships/Leveraging *Reporting Scale:* State, WS

Metadata:

1. Short-term to long-term
2. LGUs, state (PFA and MPCA)
3. Output in the short term, outcome in the long term
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (regulated)
6. Both (protection and restoration)
7. TBD

R. LGU compliance with permits and stormwater pollution prevention program (SWPPPs) in MS4s

Category: Organizational Performance *Reporting Scale:* State, WS

Metadata:

1. Short-term
2. State (MPCA), LGUs
3. Outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (regulated)
6. Both (protection and restoration)
7. TBD

S. Percent adoption of key urban runoff stormwater BMPs for a given area

Category: Social Indicators *Reporting Scale:* State, WS

Metadata:

1. Medium-term to long-term
2. LGUs, state (MPCA, DNR)
3. Outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. Implementation (regulated)
6. Both (protection and restoration)
7. TBD

T. Report permitted discharged summation by 8 digit HUC

- a. Percent compliance with NPDES permits**
- b. Tons of pollutant per capita**
- c. Feedlot measure placeholder**
- d. Industrial measure placeholder**

Category: Environmental Outcome *Reporting Scale:* State, WS

Metadata:

- 1. medium-term
- 2. State (MPCA), with data from LGUs
- 3. Outcome
- 4. Legislature, Clean Water Council, Agency Management, LGUs
- 5. Implementation (regulated)
- 6. Both (protection and restoration)
- 7. TBD

U. Targets/benchmarks for regulated activities in TMDL/watershed implementation plans ADOPTED

Category: Organizational Performance *Reporting Scale:* State, WS

Metadata:

- 1. Short-term
- 2. LGUs, TMDL/watershed plan preparers (includes LGUs), state
- 3. Output
- 4. Legislature, Clean Water Council, Agency Management, LGUs
- 5. Implementation (regulated)
- 6. restoration for TMDL, both for WS plans
- 7. TBD

V. Targets/benchmarks for regulated activities in TMDL/watershed implementation plans MET

Category: Organizational Performance *Reporting Scale:* State, WS

Metadata:

- 1. Long-term
- 2. LGUs, TMDL/watershed plan preparers (includes LGUs), state
- 3. Outcome
- 4. Legislature, Clean Water Council, Agency Management, LGUs
- 5. Implementation (reg)
- 6. Restoration for TMDL, both for WS plans
- 7. TBD

W. Creation of GIS and/or web interactive tools for sharing and coordinating information between agencies

Category: Partnerships/Leveraging *Reporting Scale:* State

Metadata:

1. Short-term
2. State
3. Output and outcome
4. Legislature, Clean Water Council, Agency Management, LGUs
5. n/a
6. n/a
7. TBD

X. Social attitudes

Category: Social Indicators *Reporting Scale:* state, WS

Metadata:

1. medium term
2. state (5 yr annual report card)
3. output and outcome
4. Agency management
5. n/a
6. n/a
7. TBD

Y. Number of participants at various public meetings, tracking complaints

Z. Research Projects

e. measures to be developed for projects

Category: Partnerships/Leveraging, Environmental Indicators *Reporting scale:* project level

Appendix D

The following individuals were interviewed by WRC staff in January and February of 2008 to obtain information on currently collected data and existing data bases at various state agencies:

State Agency	Name
BWSR	Eric Mohring
BWSR	Tim Ogg
BWSR	Connor Donnelly
BWSR	Don Buckhout
DNR	Dave Wright
DNR	Greg Kruse
DNR	Jim Solstad
DNR	Peder Otterson
DNR	Mark Briggs
DNR	Ray Valley
DNR	John Hiebert
DNR	Al Stevens
MDA	Dwight Wilcox
MDA	Adam Birr
MDA	Barb Weisman
MDA	Dan Stoddard
MPCA	Glenn Skuta
MPCA	Tom Pearson
MPCA	Bob Murzyn
MPCA	Louise Hotka
MPCA	Miranda Nichols
MPCA	Kim Nuckles
MPCA	Joan Demeurisse
PFA	Jeff Freeman

The following individuals were interviewed by WRC staff in March 2008 to gain insight and ideas for possible frameworks and measures. Interviewees were asked about critical elements to report to key audiences, the appropriate level of detail, and how to report to each audience.

Affiliation/Organization	Name
Former reporter	Patrick Sweeney
MCEA	Kris Sigford
Legislator	Dennis Ozment
Former house research	John Helland
PCA	Cathy Moeger
U of M	Dennis Becker
U of M	Steve Taff
U of M	Bill Easter
U of M	Dave Mulla
U of M	Ken Brooks
MPCA	Jennifer Groebner
DNR	Andy Holdsworth
BWSR	Jon Fure
Stearns SWCD	Dennis Fuchs
Dakota SWCD	Brian Watson
Mower SWCD	Bev Nordby
South Washington WD	Matt Moore
Minnehaha WD	Mike Wyatt
Sauk River WD	Lynn Nelson
Cottonwood SWCD	Kay Clark and Dave Bucklin
MEP (former G-16)	Steve Morse

Appendix E
Existing data and databases

Monitoring and Assessment Data

Data/ DataBase	Who manages/ reports?	Purpose	Type of Data	Who collects?	Scale	Timeframe	Issues?	Additional Info
STORET	EPA manages; PCA reports. PCA also maintains a MN-specific STORET database	WQ condition and problem investigation monitoring; data is used for CWA 303d assessment	Water chemistry data: temperature, DO, turbidity, nutrients, metals, pH	PCA staff, citizen monitoring, LGUs (WD, SWCD), Lake Associations, other state agencies	field site level, (lakes and stream reaches)	all data from a field season is entered by the following field season. In assessment years, data gets into STORET faster	EPA is going to discontinue their maintenance of STORET; does not include biological monitoring data	PCA is implementing a 10 year monitoring strategy where they will focus on 8 watersheds per year for baseline condition monitoring. More intensive monitoring will then be done for problem areas within those watersheds, at the same time, next 8 watersheds are monitored.
EDA	Data portal managed by the PCA, draws from STORET, Biological Monitoring info. Available online, map and text-based searches.	Provide WQ data to the public and any interested party	water chemistry, biological monitoring data	data comes from STORET and BioMon	field site, lakes, stream reaches			online data portal that pulls from multiple sources, STORET IBI database, etc.
Assessment Database (ADB)	EPA reporting tool for assessments and impairments.	summarizes electronic information submitted by the states to EPA	waterbody name, impaired yes/no, type of impairment. EPA will be introducing a 3 digit ID code for impairments	data used to assess waters comes from STORET	lake or river reach	PCA reports impairments to the EPA every 2 years		
DNR IBI database	DNR Ecological Resources	IBI information for lakes;	fish and macroinvertebrate numbers that are converted to IBI, both raw and index #s are in the DB. community assessments also	DNR	lakes			fairly new program, not much data yet

Data/ DataBase	Who manages/ reports?	Purpose	Type of Data	Who collects?	Scale	Timeframe	Issues?	Additional Info
MPCA Biological monitoring database	MPCA created database for all biological monitoring done on streams in MN. Data is accessible on the EDA.	biological indicators to determine water health	Access-based DB, fish and macroinvertebrate numbers that are converted to an Index of Biotic Integrity, both raw and index #s are in the DB.	PCA	field site level, streams only		cannot be put into STORET	
DNR Water Chemistry	DNR Ecological Resources	Environment information collected when DNR fisheries does a lake survey; also shallow data from Wildlife	Access-based DB, Water chemistry	DNR Fisheries, when they go out and do lake surveys, DNR Wildlife for shallow lakes	lakes, shallow lakes, field site level			files are extractable and can be put into STORET
HYDSTRA	DNR and PCA both manage the database, both report into it	established stage levels for floods, seasonal flow patterns	continuous flow data from gauges around the state.	gauges are DNR, MPCA, USGS, and NWS	gauge site level, pour points of each watershed	many sites report continuous data directly into HYDSTRA	large amount of information	There is a joint website between the DNR and MPCA that compiles flow and WQ data for the gauge sites, can offer live feed info for some sites
LIMS	MDA lab manages data	MDA has statutory authority to monitor pesticides and fertilizers	WQ data, specifically pesticide and fertilizer monitoring info. There is a also a flow component for this data, which is not stored in LIMS.	MDA Pesticide and Fertilizer Management Division	3-tiered monitoring system	all data from a field season is entered by the following field season.	Not a good database for monitoring, difficult to interpret data on its own, need additional information. Flow data cannot be put into LIMS	All WQ data is extractable and STORET compatible; some of this data has been used for Acetachloride listings and will be used for those TMDLs
Fish Tissue (Hg)	DNR Ecological Resources	establish mercury impairment, provide MPCA and MDH with information to make fish consumption advisories	Access-based, analytical data from examining fish, location, species, level of Hg	DNR fisheries collects samples for Hg when they do their lake surveys	lake or stream reach	there is lag time from when samples are collected to when they are analyzed		all of the raw data is provided to the MPCA and the MDH for fish consumption advisories. This info makes it into the DNR lakefinder application

TMDL Study Data

Data/ DataBase	Who manages/ reports?	Purpose	Type of Data	Who collects?	Scale	Timeframe	Issues?	Additional Info
Assessment Database (ADB)	EPA reporting tool for assessments and impairments.	summarizes electronic information submitted by the states to EPA	waterbody name, impaired yes/no, type of impairment. EPA will be introducing a 3 digit ID code for impairments	data used to assess waters comes from STORET	lake or river reach	assessment process is every 2 years		may be connected to a TMDL project database that will track all TMDL projects and associated listings
TMDL Database	MPCA watershed section	to coordinate TMDL study data with listing data, and relate TMDL study information to other MPCA databases	TMDL project name, basin, manager, staff, any contracts, all listings associated with the project; each project will have a unique identifier	MPCA watershed section	project level data;	DB will include all projected start/end dates, as well as actual start/end dates	Need TMDL study area GIS layers; update info; not fully up and running yet	Hope is that this database will use the unique TMDL project identifier to relate to several other DBs that have TMDL information: ADB, NCT contracts, eLINK, GIS data.
IWIMS	MPCA	lose system to connect all TMDL/Impaired Waters efforts	financial info, project info, WQ info	MPCA divisions	beyond the project level		has been on hold for the last year	The IWIMS or BOM may act as a portal that draws from other databases.

Grant/Loan Reporting Data

Who manages/ reports?	Purpose	Type of Data	Who collects?	Scale	Timeframe	Issues?	Additional Info
BWSR manages; Local Government Units report all projects funded by EPA 319, CWP and CWL	tracks non point source projects implemented by LGUs	LGU, project name, date started, location, total project cost, funding source, estimated sediment reduction, phosphorus reduction and soil savings	LGUs report all of this information into eLINK themselves	LGUs are typically counties, SWCDs, WDs. Project level reporting	All eLINK information from previous year must be in by Feb 1st. LGUs are encouraged to update once a month.	LGU reporting can be unreliable, there is not a lot of accountability in the system; pollution reduction #s are ESTIMATES, LGUs do not always fill this section in	All CWL funding comes from 7 pots of money, each project that has CWL money has a "CWL marker fund" that can be used to track these projects
MPCA	track all contracts for non point source projects funded by 319, CWP, CWL, TMDL; both grants and master contracts	Access-based DB, project name, contractor name, project manager info, financial info (total \$\$, date released/allotted)	Project managers report into this DB system	project level, although there may be several contracts attached to one project		Not a good system to query reports on specific funding source; CWL surface water assessment projects are not tracked in this system	will be switching to an oracle- database tied to the DELTA system; hope is to combine some admin efforts, tie directly into GRTS which is for EPA reporting
PCA	EAO tracks all surface water assessment projects awarded CWL \$\$	project name, STORET ID, contact, station IDs, study area, purpose	MPCA EAO division	project level, actual WQ data is collected for each station ID, reported into STORET	all data from a field season is entered by the following field season.	not connected to the NCT contracts DB.; tracked in a spreadsheet	serving as the pilot for the new Oracle based contracts reporting

Who manages/ reports?	Purpose	Type of Data	Who collects?	Scale	Timeframe	Issues?	Additional Info
MDA	track all loan and project information for the AgBMP program	LGU, landowner, lender, project cost, location, description of purchase, category of purchase, Animal Units, primary crop, conservation tillage acres	All applications are faxed to MDA, inputted by Dwight W. ; LGUs typically fill out forms with the landowner	each loan app is entered into the system; data is often reported by county or other LGU	applications are entered into the system as received, updated when \$\$ is released; Feb 1st is annual report deadline for counties	Data has to be given to eLINK; TMDL study area info is not accessible, has to export data to ARCGIS to see if project is within area; sometimes location info is not accurate	program looks for who is ready now(because it is a revolving fund); counties do not have a set standard for selecting BMPs, some counties have better standards than others
PFA	track all wastewater projects funded by MPCA and PFA, using CWSRF, wastewater infrastructure fund, phosphorus reduction, small communities and TMDL grants	series of linked spreadsheets that track grant and loan financial info for point source and wastewater projects	PFA collects info, and MPCA also collects info that they report to the PFA	municipality level	PFA produces annual reports on each of the loan/grant programs; CWSRF projects are put into the EPA's CWSRF reporting system	there is not a good way to track what point source projects have been completed in a TMDL study area; have to go into the data to find out	
EPA; MPCA reports to it	track all EPA 319 funds spent in the state	project and financial info	MPCA; some info come from BWSR via eLINK	project level	annual reporting	eLINK provides a list of CWP/319 projects that must be manually added to GRTS, eLINK is not connected for automatic dumping of information	PCA is moving towards an oracle contract system that will report this information
EPA	track the clean water state revolving fund \$\$ spent in MN	projects (both PS and NPS) funded by the state revolving fund loan program	PFA reports wastewater and PS projects, and MDA reports AgBMP loan program info	project level	annual reporting	MDA cannot upload the AgBMP data to CWSRF as there are too many projects for EPA to handle (6000 in MN v. only 220 in NY in the last 10 years)	

Administration and Compliance Data

Who manages/ reports?	Purpose	Type of Data	Who collects?	Scale	Timeframe	Issues?	Additional Info
MPCA	track compliance and permitting information for the municipal and stormwater divisions	permitting compliance for municipalities (MS4s) and industry. Multi-media system (air, water)	MPCA Municipal and Industrial divisions				Oracle based system; MPCA may move to add contracts info to this database as another component
MPCA	track all contracts for non point source projects funded by 319, CWP, CWL, TMDL; both grants and master contracts	Access-based DB, project name, contractor name, project manager info, financial info (total \$\$, date released/allotted)	Project managers report into this DB system	project level, although there may be several contracts attached to one project		Not a good system to query reports on specific funding source; CWL surface water assessment projects are not tracked in this system	will be switching to an oracle- database tied to the DELTA system; hope is to combine some admin efforts, tie directly into GRTS which is for EPA reporting
MPCA	used for queries and reports, shows all executive contracts by division	early stages of contract, contract amendments, somewhat redundant to NCT	MPCA fiscal services	contract level			
MPCA, DNR, MDA, BWSR		staff hired with CWL funds	HR/fiscal services (?)	n/a	n/a		Different job functions: monitoring and collection, analysis of data, TMDL implementation, coordination/cooperation type positions

Appendix F
Literature Findings Matrix

Title	Agency/Author	Date	Description/Important Points
Assessing the WQ Benefits of BMPs	AAFC, Ducks Unlimited, others	2006	Very little watershed testing of BMP effects, most estimates based on model extrapolation. Nothing about reporting. Objectives are to begin the process of BMP performance evaluation, use WQ as primary indicator, and to correlate with other agencies.
CA Stormwater Effectiveness Assessment and Monitoring Framework	CA		BMP effectiveness framework and pyramid with levels of Outcomes
California Stormwater Effectiveness Assessment	CA		Reiterates implementation effectiveness assessment : feedback on effectiveness of programs in achieving objectives on multiple scales. WQ-evaluates water bodies if using WQ assessment to draw conclusion about program effectiveness - results are usually very general and require extensive periods of analysis. Integrated Assessment: evaluates whether program implementation results in WQ improvements. Implementation assessment is simpler and less costly but requires cause and effect relationships. Has outcomes pyramid (compliance>BMPs>WQ
San Diego Framework for assessing effectiveness of Water Programs	CA	2003	point of effectiveness assessment is its iterative nature: program planning>Implementation>effectiveness monitoring>program planning, etc. Important to integrate the assessment of both WQ and the projects. Goal of establishing cause and effect relationships over time to improve efficiency.
TMDL Implementation Tracking Needs Assessment	Cadmus Group, prepared for the EPA	2008	Benefits of being able to track TMDL implementation, key features or capabilities desired in tracking tool, identification of implementation indicators, summary of current state tracking tools - all derived from interviews with 9 states.
Framework for annual assessment of Bay Health and Restoration	Chesapeake Bay Program	current	The framework groups indicators by a functional role (factors impacting Bay and watershed healthy, restoration and protection efforts, watershed health, and Bay health) and places each indicator into a hierarchy of detail
2006-2011 EPA Strategic Plan	EPA	2006	Section on results and accountability that states that timely data is required to hold managers accountable for achieving results. Discusses a draft technical document companion to the State of the Environment report that will act as a baseline of current env. conditions that we can measure our accomplishments against.

Indicator Development for Estuaries	EPA	2008	Includes list and definitions of various indicators: Worldwide, Cultural/societal, Economic, Ecological, Environmental, Programmatic. Uses the Pressure-State-Response model first developed by the Organisation for Co-operation and Economic Development.
Trying hard is not good enough	Friedman, Mark	2005	Discusses the need for more focus on measuring and reporting on the <i>effect</i> of government programs, rather than just the <i>effort</i> or activities.
WATERSHED MANAGEMENT Better Coordination of Data Collection Efforts Needed to Support Key Decisions	GAO	2004	many agencies are collecting data, that improved data/collection leads to more informed decision making, that more funding is needed.
Evaluating Effectiveness: Framework for Assessing management of protected areas	IUCN, World Commission on Protected Areas	2005	Pros of effectiveness monitoring or evaluation: promotes adaptive mgmt, improves project planning, promotes accountability. Includes framework for evaluating mgmt effectiveness, design, appropriateness, delivery, planning, resource allocation, implementation, monitoring and evaluation, feedback, also framework for developing outcome based monitoring program (Hockings (98) and Jones (2000)
A Strategic Conservation Agenda	MN DNR	2007	Describes DNR's progress towards achieving conservation results, identifies and describes approximately 90 measurable indicators in six key performance areas.
Mn's WQ Monitoring Strategy	MPCA	2004- 2014	Contains an effectiveness monitoring matrix with geographic scale and also an effectiveness monitoring strategy.
CWLA: Restoring and Protecting Mn's Waters	MPCA, BWSR, DNR, MDA, PFA	2007	Report geared towards the public, includes case study examples of where CWLA money will go, for different parts of the impaired waters process.
Watershed Achievements Report	MPCA, prepared for the EPA	2006	Reports on CWA 319 and Clean Water Partnership projects in Minnesota for 2005-2006. Includes eLINK and LARS estimates for projects from 1997-2006. Projects are reported on individually, by watershed.

OECD Environmental Indicators	OECD	1991	there is no universal set of indicators; rather several sets exist, serving several purposes and audiences. OECD work led in particular to agreement on a common conceptual framework, based on a common understanding of concepts and definitions and on the pressure-state-response (PSR) model.
Conservation Effects Assessment Project (CEAP)	Soil Water and Conservation Society, prepared for the USDA NRCS	2006	Recommendations include monitoring versus simulation or extrapolation, solving problems versus estimating effects, and strategic resource management. The most important and troubling missing piece is the absence of plans for on-the-ground monitoring of change in the environmental indicators and outcomes conservation programs and activities are intended to improve.
The State of the Nation's Ecosystems	The Heinz Center	2002/ 2007	National effort to develop environmental indicators for measuring the condition of the lands, waters, and living resources of the US. Six major ecosystem types used as the basic reporting units (coasts and oceans, farmlands, forests, fresh waters, grasslands and shrublands, and urban/suburban areas. Important note: many of the indicators developed do not have currently collected data, this was important to keep in mind for the CWLA framework.
National Water-Quality Assessment Program - Modifications to the Status and Trends	USGS	2006	Major focus of NAQWA program is on regional and nat'l scale assessments of WQ status and trends. Analysis and reporting is focused on status, trends, and understanding at the large scale of 8 large regions (major river basin scale.) Characteristics of the assessment include: data collected from a given number of sites, correlating models with data to extend knowledge of unmonitored but comparable areas, long term ambient resource assessment, evaluation of ecological conditions specific to each river basin, and collaboration and integration with other agencies and organizations. Has an interesting box on the status of WQ monitoring in the US
UW Extension Sample WQ Program Logic Model	UW-Extension	2002	An example of the logic model with questions and indicators
Conceptual Framework for TMDL Effectiveness Monitoring in WA State	WA State Dept. of Ecology	2003	3 phases of effectiveness monitoring framework / nothing about reporting

CWA Monitoring Strategy for Washington State	WA State Dept. of Ecology	2005	Monitoring Framework consists of: Priorities, Objectives, Design (including how effective are CW projects and programs), WQ indicators, Quality assurance, and Data Management. WA has tiered monitoring strategy - Tier 1: Coarse Scale info on State wide waters - rotating schedule. Tier 2: Targeted to determine trends over time. Tier 3: Intensive Study to determine full extent of suspected WQ problems. tiers seems similar to Phase 1 and Phase 2 idea PCA is rolling out.
Effectiveness Measurement Study	WA State Dept. of Ecology	1996	Regulatory compliance assumed to indicate protection of environment thru (in their case) waste mgmt. Regulations divided into compliance categories. Conditions compared over time and management approach adapted for future assessment.
EIM Database Search	WA State Dept. of Ecology	2006	Entry portal for WA state's environmental information management system.
Outline of Statewide Monitoring Framework for Habitat and WQ trends	WA State Dept. of Ecology		Good For Developing sample network, assembling indicators, protocols, determining partner needs, developing monitoring plan including: procedures, data mgmt, evaluation procedures, partnerships, schedule, budget
Monitoring strategy	WI DNR		Describes a 3 tiered monitoring system for comprehensive coverage of the state's waters. Strategy is limited to monitoring and does not include implementation efforts.
Social Indicators for non point source management	Multiple Universities and the EPA	Ongoing, 2008	Several universities, including the U of M, are working with the EPA to develop social indicators for non point source management. Will serve as a good reference for the development of measures for the <i>social indicators</i> category of the framework. http://www.uwex.edu/ces/regionalwaterquality/Flagships/Indicators.htm

