



# Citizen Monitoring of Surface Water Quality

2007 Report to the Legislature



Minnesota Pollution Control Agency

## ACKNOWLEDGEMENTS

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## COVER PHOTOS:

Left: A Cannon River Watershed Partnership volunteer records the transparency of the river in the Cannon River Wilderness Area.

Right: Students in the St. Louis River-River Watch program collect chemical, physical and biological data twice per year at river sites located throughout northeastern Minnesota. The data are shared among all schools, as well as with state and local communities, to protect and manage the Western Lake Superior Basin ecosystem.

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<http://pca.state.mn.us/hot/legislature/reports/>.

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This report can be made available in other formats, including Braille, large type, or audiotope upon request. This report is printed on paper with at least 20 percent post-consumer recycled paper.

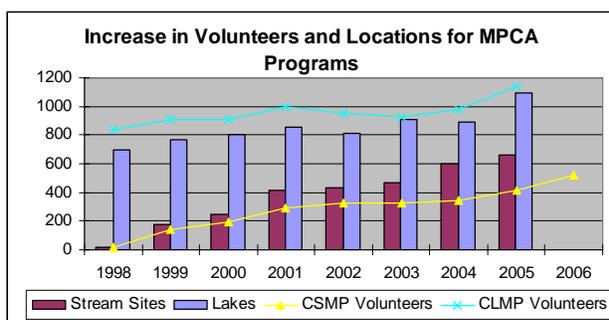
## INTRODUCTION

Minnesota is fortunate to have abundant water resources – 92,000 miles of rivers, 12,000 lakes and more than nine million acres of wetlands. Of the 48 contiguous states, Minnesota has the greatest amount of surface water, and Minnesota’s economy and recreational opportunities are dependent on the quantity, quality, and diversity of its water resources.

With these abundant resources, however, come challenges – how to monitor, protect and restore such a vast number of waters. Citizen monitoring is a critical component in responding to the challenge, and its role is increasing over time – both in numbers of citizens participating and in use of citizen data.

### The extent of citizen monitoring

Minnesota citizens have participated in monitoring Minnesota’s water resources since at least the 1970s. In 1973, the University of Minnesota started the Citizen Lake-Monitoring Program (CLMP). In its first year, volunteers monitored 74 lakes. In 1978, the program was transferred to the Minnesota Pollution Control Agency (MPCA). Today over 1,000 lakes are monitored each year.



In 1998, the MPCA added the Citizen Stream-Monitoring Program (CSMP). In its first year, 22 locations were monitored. Today, over 700 sites are monitored annually.

Currently, CLMP and CSMP have 1,136 and 521 active volunteers respectively. The number of lakes and stream sites monitored has also increased over time as shown in the chart at left.

### Purpose of this report

This report provides a 2005-2006 update on citizen monitoring activities, as required by Minn. Stat. § 115.06, subd. 4, highlighting the following areas:

- Improvements and expansions in MPCA’s overall water quality monitoring activities
- Use of citizen monitoring data in assessments and other agency programs
- Technical assistance and guidance
- Improve access to water quality data and information on partially and fully assessed waters
- Development and distribution of guidelines and improvement of data management

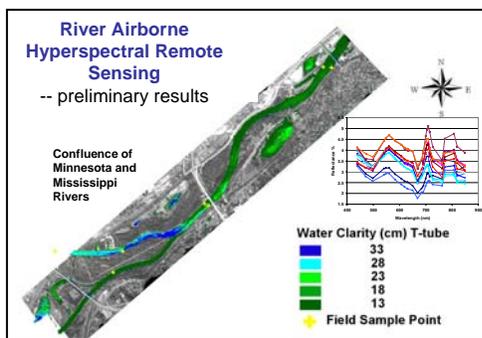
In addition, the report will discuss other regional or local citizen monitoring opportunities across the state. The report is intended to provide a brief summary of advances made in citizen monitoring in the last two years. A more complete description of state and local monitoring programs and purposes is contained in *Minnesota’s Monitoring Strategy 2004-2014*.

## IMPROVEMENTS IN MPCA'S OVERALL MONITORING ACTIVITIES

In 2005 and 2006, MPCA made changes to its surface water quality monitoring activities. The changes came about as a result of funding from the Legislative Commission on Minnesota Resources (LCMR), and a revision of the MPCA's strategic plan.

**Minnesota Water Quality Monitoring Strategy.** In 2004, MPCA developed a comprehensive strategy for water quality monitoring for the next ten years, covering both surface and ground water. The surface water assessment portion, developed in collaboration with the Impaired Waters Policy Work Group, includes a four-part approach: monitoring by the MPCA, monitoring by other organizations, remote sensing and citizen monitoring. The strategy will result in comprehensive assessment of Minnesota's lakes and streams from its current 2006 level of 10 percent and 16 percent of streams and lakes, respectively. Within the strategy, less-intensive citizen monitoring provides greater monitoring frequency and geographic coverage, supplementing the more rigorous monitoring of MPCA and other groups.

**Remote Sensing of Lakes and Streams.** With funding from the LCMR, the University of Minnesota completed a statewide remote sensing of lakes, as well as a historical evaluation using CLMP data and imagery from as early as 1985. Development of remote sensing of streams is currently underway. This will explore the feasibility of remote sensing technologies for large streams and rivers in Minnesota. Remote sensing provides the greatest level of geographic coverage at the least cost. In Minnesota, the MPCA plans to use remote sensing as a targeting tool, to identify lakes and streams that warrant more rigorous monitoring and assessment.



**Acceleration of Integrated Monitoring.** In 2006, with LCMR funding, MPCA accelerated its work on conducting integrated monitoring (biological, physical and chemical) on a rotating basin schedule giving a more comprehensive assessment of Minnesota stream conditions. This monitoring approach was piloted in the Snake River Watershed in 2006, with 60 sites being monitored for fish, macroinvertebrates, water chemistry, and physical habitat by MPCA staff.

## USE OF CITIZEN MONITORING DATA

MPCA, local governments and other organizations increased their use of citizen data over the last few years. Data can be used for a variety of purposes, from educational/awareness to assessment purposes. At the MPCA, citizen data is used as both an education/awareness tool and, if it meets the necessary criteria, for the assessment process.

Recent increases in the use of citizen monitoring data include:

**Data Use in State Assessments.** For many years, MPCA has used its CLMP Secchi disk transparency data in conjunction with nutrient data in assessing lakes for 305b and 303d reports. Since 2000, nutrient and Secchi data collected as part of the Citizen Lake-Monitoring Plus Program (CLMP+) has also been incorporated into the assessment process. Starting with the 2006 assessment cycle, MPCA is also using transparency tube data collected by citizens (primarily citizens enrolled in the MPCA's Citizen Stream-Monitoring Program) in determining stream turbidity impairments. This transparency tube data contributed to the assessment of 88 stream segments.

Data collected by external parties (local units of government, volunteer groups, etc.) are also incorporated into the MPCA's assessment process. Guidelines and data requirements are laid out in the Volunteer Surface Water Monitoring Guide, and data must be submitted for entry into STORET, the EPA's national water quality database, in order to be used for assessments. In 2006, 30 percent of the stream data used was collected by external parties and 28 percent collected jointly by external parties and MPCA. This has significantly increased since 1994, when the external parties collected only six percent and joint collection accounted for seven percent of the data used in assessments.

**Remote Sensing Model Calibration.** Secchi data has been used historically to calibrate remote sensing data for lake quality. Under the current LCMR appropriation, the University of Minnesota Remote Sensing Lab is now working on utilizing transparency tube data to calibrate similar imagery for large streams and rivers in Minnesota.

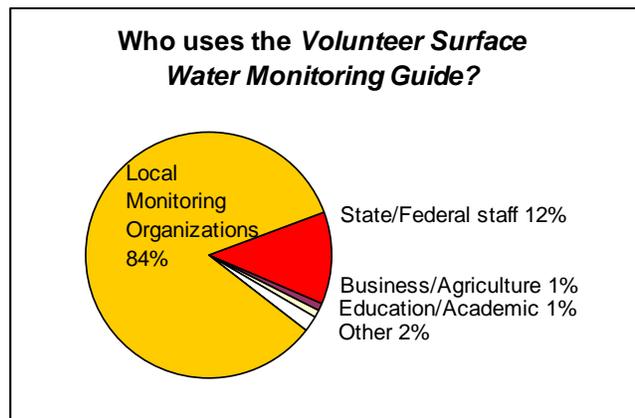
**Data Use for Lake Trends.** Citizen Secchi disk data is the principal source of information for studying trends in lakes and providing information to potential property owners on the quality of specific lakes. MPCA also develops trend fact sheets for counties with ten or more lakes and enough data to perform trend analysis (trend analysis identifies whether lake clarity is increasing or decreasing over time). The fact sheets are provided to volunteers, are available online, and available to local resource managers for local decision-making.

## TECHNICAL AND FINANCIAL ASSISTANCE FOR CITIZEN MONITORING

In the last few years, a number of advances in providing technical and financial assistance to citizen monitors have occurred, in part due to (LCMR) funding and passage of the Clean Water Legacy Act.

### Technical Assistance

**Guidance for Volunteers.** Since 2003, volunteer monitors have had clear guidance on the data quality needed to have their data used in state assessments under the Clean Water Act. The *Volunteer Surface Water Monitoring Guide*, provides the specific monitoring requirements that are required for MPCA's 305b and 303d assessments (305b and 303d are sections of the Clean Water Act, under which states identify the condition of waters and waters that are impaired). Volunteer monitors following these requirements and submitting their data to the MPCA can be assured that their data will be included in state assessments. To date, the guide has been distributed to over 900 Minnesotans.



**Basin Planning.** In Minnesota, ten drainage basins divide the state. In these basins, the MPCA has implemented a basin planning/management approach. This involves MPCA and other agency staff, local units of government, and citizens coming together to develop a document with information, goals, priorities, and action steps to further water resources protection. In the Rainy River Basin, priorities have been placed on development of a basin-wide monitoring plan (including citizen monitoring), and development and sustainability of a basin water resources center. For several of the watersheds in the basin, monitoring has been implemented. MPCA staff provides technical assistance to groups, equipment for loan, and in some cases funds for activities.

## Training Courses/Activities

In order for citizen volunteers to conduct monitoring activities, training is necessary. This can vary from a program manual, training guide or DVD, to a personal training session. The MPCA offers the following programs:

The MPCA offers volunteers a basic transparency monitoring program for both lakes and streams statewide. The **CLMP** involves monthly Secchi disk readings at an established location on a lake. Volunteers monitor transparency using a Secchi disk on their lake of choice. Data is used for both trend analysis and the assessment cycle. In addition to the regular CLMP program, in 2004 a plastic disk was developed by MPCA staff for use in the Boundary Waters. Since then, the disks have been available on loan to anyone interested in monitoring the transparency of the lakes on their route.

The **CSMP** involves weekly transparency measurements at an established stream site and daily rainfall observations. Volunteers use a transparency tube to measure the clarity of their stream. Starting with the 2006 assessment cycle, transparency tube data has been included in water quality assessments.

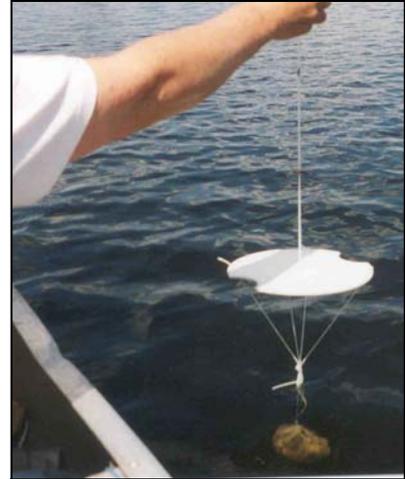
The CLMP also offers a 'Plus' program (**CLMP+**) to Greater Minnesota. This program works collectively with local water resource staff, lake volunteers, and MPCA staff to monitor a set of lakes for chemistry and temperature, in addition to transparency over the course of a summer. This program is driven by local interest, moving to a different county each monitoring season.

For the basic programs, a program handbook, detailing how to take the measurements, is sent to volunteers with their equipment. For the CLMP+ program, a local training event is held at the start of the season. Equipment is distributed with a detailed handbook and instructional video. Since 2004, the training video has been available to volunteers, for training on participating in the CSMP, CLMP, or CLMP+. To date, over 1,000 copies have been distributed to Minnesotans.

Trainings are also provided to citizens by a variety of other organizations across the state. More information on these groups is available in the section on other volunteer opportunities.

## Financial Assistance

In 2006, the Minnesota Legislature passed initial funding for the Clean Water Legacy Act. Within this act, funds are being made available to citizen monitoring groups across the state to assist in the enhancement or completion of a surface water assessment dataset. For the Surface Water Assessment Grants, over \$1,000,000 is available for the monitoring of streams, rivers, and lakes in Minnesota. MPCA put out the request for proposals in October 2006, and will distribute funds to qualified applicants in the early spring of 2007.



In 2006, the Boundary Waters sampling, as part of CLMP, expanded to include volunteers from the Northern Tier High Adventure Boy Scout Camp and the Outward Bound Wilderness Camp.

## DATA ACCESSIBILITY

Increasing monitoring and data collection, in itself, is not enough unless the data is accessible and available for use. The MPCA developed the **Environmental Data Access (EDA)** system to improve public access to environmental data (<http://www.pca.state.mn.us/data/eda/index.cfm>). The initial focus was to make statewide surface-water monitoring data more accessible to water resource planners and managers, and the public (air quality data is also available and ground water data will be added in the future). Users can access information about Minnesota's lakes and streams via the internet, through either map-based or text-based searches. All data in STORET, the state and federal water quality database, is accessible through the system. In addition to being available via the EDA, MPCA's citizen stream and lake monitoring data are available directly from the MPCA's CSMP and CLMP Web sites.

In 2003, MPCA created a staff position to work extensively with external organizations to assist in **ensuring that external data is entered into STORET**. This position provides a point of contact for external volunteer groups that wish to have their data included in STORET. A webpage has also been developed where citizens can find the steps necessary to have their data included in STORET (<http://www.pca.state.mn.us/water/storet.html>).

In addition, the CSMP and CLMP publish annual reports summarizing data collected over the past season. These reports are distributed to volunteers and posted on the internet for any interested parties. In 2006, the CSMP program introduced the CSMP Individual Site Report to participants (<http://www.pca.state.mn.us/water/csmp-reports.html#sitereports>). This 4-page report provides in-depth results for a specific site, including a detailed map with land use, data summary, and chart that plots transparency and rainfall across the entire monitoring season. The report also indicates any impairment found on that segment of the stream, and includes an interpretive guide to understanding transparency readings and the information they provide about stream health. Volunteers were given the opportunity to comment on the new report through an electronic survey. Results of the survey will be used to improve the content and format of future Individual Site Reports.

The CLMP+ program provides volunteers a detailed report summarizing the nutrient and Secchi data collected on their lake, in addition to a discussion on how the lake compares to others in the region. These reports are made available to participating volunteers, and other residents of the area are notified of the document, in addition to its placement on the MPCA webpage.

The DNR **Lake Finder internet database** ([www.dnr.state.mn.us/lakefind/index.html](http://www.dnr.state.mn.us/lakefind/index.html)) is now linked to MPCA's CLMP and Lake Assessment Program data, allowing users to view both lake quality and other hydrologic information through the same site. In addition, the database also links to the University of Minnesota's Remote Sensing Lab, showing satellite based transparency measurements based on data from 1990, 1995, 2000, and 2005.

For lakes and streams in Minnesota, the assessment cycle occurs every two years. Previous years lists [305(b) and 303(d)], maps, and supporting documentation are available online at <http://www.pca.state.mn.us/water/tmdl/index.html>. This provides information on waters that have been fully assessed [305(b)] and determined to be impaired [303(d)].

## PROMOTING CITIZEN MONITORING

Despite the increase in citizen monitoring over the last few years, Minnesota is far short of its Monitoring Strategy 2014 goal of citizen T-tube monitoring at 3600 sites and citizen Secchi disk monitoring at all lakes larger than 100 acres (about 4,000 lakes). In light of this, the MPCA has engaged in a variety of educational and promotional efforts to raise awareness about and promote citizen monitoring.

The MPCA's **CLMP and CSMP** programs focused their marketing and recruiting efforts on distributing posters (over 1,700 distributed in 2004 and 2006) and informational displays (over 250 distributed in 2006); targeted news releases recruiting volunteers; news media coverage; and through state and local fairs. In addition, CSMP partners with county and watershed project staff to recruit and maintain volunteer involvement. Educational opportunities are also used to promote the programs, with staff participating in a number of water festivals and/or training events across the state annually.

The MPCA's Basin Planning also provides an opportunity to promote citizen monitoring. In the Upper Mississippi River Basin, staff encourage lake associations to participate in the MPCA's CLMP. In addition, staff has worked with schools (primary, secondary, post-secondary) to educate students on monitoring and promote the opportunities available to citizens.

## **OTHER VOLUNTEER OPPORTUNITIES FOR MINNESOTANS**

In addition to the MPCA, a broad range of organizations work with citizen monitors – from local governments and watershed districts to non-profits and coalitions of water resource groups. The following includes several examples that provide a sense of the breadth of volunteer monitoring activity opportunities in Minnesota.

The Wetland Health Evaluation Program (WHEP), a cooperative partnership between the MPCA, local water resource managers, counties, and citizens, involved eight volunteer teams from Dakota County and seven teams from Hennepin County in 2005. With their efforts, 58 wetlands were monitored for aquatic vegetation and macroinvertebrates. Reports on wetland monitoring in Dakota and Hennepin counties are available on the **WHEP Web site** ([www.mnwhep.org](http://www.mnwhep.org)).

In 2005, the Friends of the Mississippi River received a 319 grant to pilot a volunteer monitoring program called Stream Health Evaluation Project (SHEP). This program was modeled after WHEP, involving adult volunteers and local units of government. The pilot focused on biological monitoring on sites in the Rice Creek Watershed District, and volunteer interest far exceeded expectations.

The Volunteer Stream Monitoring Partnership (VSMP) is a macroinvertebrate monitoring program for streams in the metropolitan area. This program works with local water resource managers, county staff and area schools to monitor the biological health of neighborhood streams. In addition, VSMP in conjunction with the University of Minnesota developed the *Guide to Aquatic Invertebrates of the Upper Midwest*. This guide is available to the public in print from the University of Minnesota Water Resources Center and designed for use by students, citizens, and professionals for identifying aquatic macroinvertebrates. In late 2006, the University of Minnesota developed an interactive webpage designed to work with the *Guide to Aquatic Invertebrates of the Upper Midwest*. This webpage, Volunteer Stream Monitoring Interactive Verification Program, allows volunteers to view photographs of the individual macroinvertebrates, as well as detailed photos of key identifying characteristics. VSMP sponsored the annual **River Summit** in 2005. This event brings together volunteer stream monitors with educators and water resource professionals from the metropolitan area to share information and receive recognition for their efforts. Attendance at the 2005 event exceeded 200 participants.

Training for **high school and college students** to monitor water quality is also occurring around the state through River Watch and other similar programs. The programs link teachers and students with monitoring experts to provide hands-on environmental education, promote river stewardship, and gather water quality data.

For metropolitan area lakes, the Metropolitan Council Environmental Services operates a program similar to MPCA's CLMP+ program, the Citizen Assisted Lake Monitoring Program (CAMP). Through the program, citizens collect chemistry data, Secchi transparency measurements and user perception

information about the lake's physical and recreational condition, on a bi-weekly basis, April through October. The data is used to provide water quality information to lake and watershed managers to help them properly manage the resources and also help document water quality impacts and trends. The CAMP data are presented in an annual report, with a "report card" grade for the water quality of each lake. The lakes are graded for total phosphorus, chlorophyll-a, and water clarity, along with an overall grade combining the three. ([www.metrocouncil.org/environment/RiversLakes/index.htm](http://www.metrocouncil.org/environment/RiversLakes/index.htm)). In addition, the data is provided to MPCA for storage in STORET and use in assessments. In 2005 and 2006, 130 volunteers monitored 206 different lakes.

Minnesota Waters (organization formed by the merger of the Rivers Council of Minnesota and the Minnesota Lakes Association) works statewide to enhance and expand citizen monitoring for lakes and streams. Using funding awarded by the Legislative Commission on Minnesota Resources, Minnesota Waters developed a **Monitoring Plan Training** program. This training takes lake and river groups through the steps of developing a plan for the "who, what, where, when, why, and how" they will monitor their waterbody. This training connects citizens with their local water resource managers to ensure that the data is used locally, regionally, or at the state level, depending on their goals and water issues. In addition, citizen monitors who go through the program also receive the *Volunteer Guide to Surface Water Monitoring* and are introduced to the steps necessary for their data to be used in state assessments by the MPCA. Since its development in 2003, 20 groups across Minnesota have completed detailed monitoring plans and implementing 153 stream sampling sites on 66 streams and sites on 56 lakes. Six additional groups are in the process of attending trainings and plan development. In 2006, the program was revised and materials were placed online and in the first three weeks, over 100 people registered on the site and downloaded the materials ([http://www.riversmn.org/resources\\_citmon.html](http://www.riversmn.org/resources_citmon.html)).

In addition to the Monitoring Plan Training, Minnesota Waters has been able to provide skills trainings using LCMR funds to provide topic specific training events. These trainings have covered topics from macroinvertebrate monitoring techniques (including training for the SHEP program), to lake and stream sampling protocols, to data analysis and interpretation. To date over 300 participants have attended the 15 skills trainings offered across Minnesota.

Minnesota Waters sponsored a **Lakes and Rivers Conference** in fall 2006, with over 500 participants, funded in part by the Legislative Commission on Minnesota Resources. The conference included 48 sessions and eight workshops on topics ranging from information on lake and river issues to training in water quality monitoring and provided information on resources and tools available to citizens. Workshops and sessions provided an opportunity for local monitoring groups to share information, improve their understanding of key water resource issues and enhance their monitoring skills.

Minnesota Waters also publishes a quarterly newsletter delivered to over 3,800 citizens. This publication contains information on monitoring, including tips, news, and success stories.

## SUMMARY

Citizen monitoring is an important part of Minnesota's water quality monitoring strategy, producing several beneficial outcomes and advances:

- More Minnesotans are participating in some form of citizen water quality monitoring;
- Volunteers are providing valuable water quality information on Minnesota's lakes, rivers and wetlands, that can be used for a variety of purposes at the local and state levels; and
- As part of collecting water quality samples, volunteers also develop an increased awareness of the condition of their lake, stream or wetland, fostering local stewardship efforts.

Technical and financial assistance from the Legislative Commission on Minnesota Resources, state agencies, local governments, non-profits and others helped to advance the citizen role.

A number of effective models for providing assistance to citizens have emerged. In all the models, an organizing entity providing communications, technical assistance and data management is essential. That organizing entity can be a county office, a non-profit organization, the state, an academic institution, a school program, etc.; however, it must have the resources and expertise to provide needed support to the volunteers.

In coming years, the role of volunteer monitoring can be expected to continue to expand in Minnesota, bringing much-needed volunteer efforts and stewardship to help protect Minnesota's waters. While many challenges remain, Minnesota has demonstrated a strong commitment to volunteer monitoring as an important component of the state's overall monitoring program.