Citizen Monitoring of Surface Water Quality

2011 Report to the Legislature

Minnesota Pollution Control Agency

December 2010

Legislative Charge

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Executive Summary

Minnesota is fortunate to have abundant water resources—105,000 miles of rivers, 12,200 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 these challenges, and its role is increasing over time, both in numbers of citizens participating and in use of citizen data.

Citizen monitoring produces 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.
- As part of collecting water quality samples, volunteers develop an increased awareness of the condition of their lake, stream or wetland, fostering local stewardship efforts.

Technical and financial assistance from the Clean Water Legacy Act, the Legislative-Citizen Commission on Minnesota Resources, state agencies, local governments, and non-profits have helped to advance opportunities for citizen monitoring.

A number of effective models for providing assistance and training 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 the state, a county office, a non-profit organization, 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. While many challenges remain, Minnesota has demonstrated a strong commitment to volunteer monitoring as an important component of the state's overall monitoring program.

Purpose of this report

This report provides a 2009–2010 update on the Minnesota Pollution Control Agency's (MPCA's) citizen monitoring activities, as required by Minn. Stat § 115.06, subd. 4. It highlights the following areas:

- Minnesota surface water monitoring strategy
- MPCA citizen monitoring programs
- use of citizen monitoring data
- financial and technical assistance for citizen monitoring
- data accessibility
- promoting citizen monitoring
- other volunteer opportunities for Minnesotans

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* which can be found at http://www.pca.state.mn.us/index.php/view-document.html?gid=10228.

Minnesota's Surface Water Monitoring Strategy

Minnesota water quality monitoring strategy includes volunteer efforts

In 2004, the MPCA, in conjunction with a broad-based stakeholder group, developed a comprehensive strategy to assess the condition of Minnesota's waters on a 10-year cycle. The key organizing approach used in this strategy is that of the "major" watershed. There are 81 major watersheds in Minnesota (Figure 1), which means that about eight watersheds must be monitored annually to meet the goal of monitoring the entire state every 10 years.

The MPCA has a four-tiered approach to accomplishing the goals set in the water monitoring strategy:

- stream and lake monitoring by MPCA staff
- stream and lake monitoring by other organizations (counties, lake associations, etc.)
- remote sensing of water quality
- stream and lake data collection by volunteers

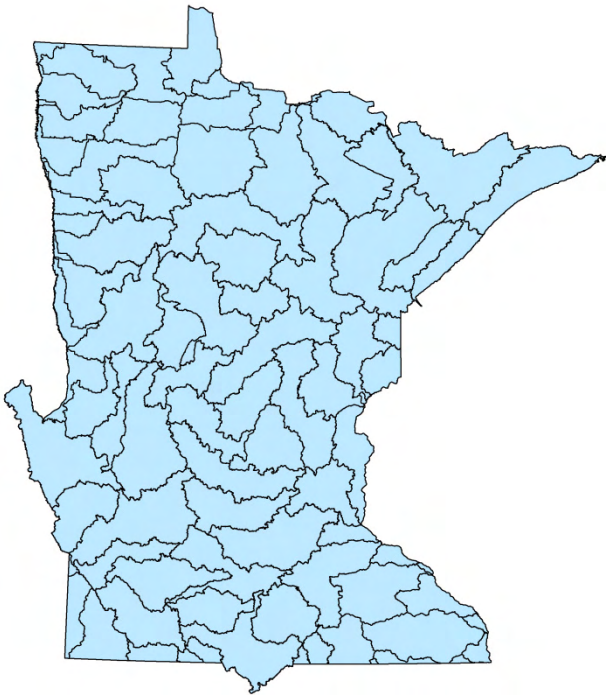

Figure 1: Minnesota's 81 major watersheds

Implementation of the Water Quality Monitoring Strategy depends on the concerted efforts of MPCA staff, other state and local agencies, and citizen volunteers, all of whom collect data to help determine the health of our water resources. With this monitoring data, the MPCA can identify impaired waters (waters that do not meet water quality standards), identify waters in need of additional protection efforts to prevent impairments, prioritize waters for follow-up monitoring, and track changes in water quality over time.

Clean Water Legacy Act and Clean Water, Land and Legacy Amendment support and fund citizen monitoring efforts

In 2006, the legislature passed the Clean Water Legacy Act which accelerated the process of addressing impaired waters by enabling the water quality assessment of more lakes, rivers and streams, and increasing the number of Total Maximum Daily Load studies initiated as required by the federal Clean Water Act. The citizens of Minnesota passed the Clean Water, Land and Legacy Amendment to the state constitution in 2008, which provides long-term funding for water monitoring and assessment, strategy development, and implementation efforts through the Clean Water Fund.

The Clean Water Fund monitoring allocation provided to the MPCA for fiscal years 2010–2011 supports MPCA efforts to:

- Monitor and assess a total of ~100 lakes for recreational use support each year, focusing on lakes 500 acres and larger.
- Monitor approximately 500 stream sites annually to assess recreational, aquatic life, and aquatic consumption use support.
- Partner with local units of government, non-profit organizations and local citizens through Surface Water Assessment Grants which support the monitoring of approximately 440 lakes and 560 stream sites.

- Cooperate with the Minnesota Department of Natural Resources, Metropolitan Council and others to establish permanent load monitoring stations at the outlet of each of the 81 major watersheds in Minnesota.
- Provide funding to the University of Minnesota to remotely sense the condition of lakes to provide information on lakes inaccessible for monitoring, identify monitoring priorities, and track trends in lake clarity.

MPCA Citizen Monitoring Programs

Minnesota has a long history of volunteer monitoring. Citizens have participated in monitoring Minnesota's water resources since at least the 1970s. The Citizen Lake Monitoring Program (CLMP) and Citizen Stream Monitoring Program (CSMP) are volunteer surface water quality monitoring programs administered by the MPCA. These programs were designed to provide the opportunity for citizens statewide to monitor the lakes and rivers they care about. All data collected by CLMP and CSMP volunteers are entered into the MPCA's water quality database and used in the water quality assessment process. Visit the CLMP and CSMP program webpages at http://www.pca.state.mn.us/cmp for more information.

Citizen Lake Monitoring Program

The CLMP was started by Dr. Joe Shapiro at the University of Minnesota in 1973. In its first year, CLMP volunteers monitored 74 lakes. In 1978, the program was transferred to the MPCA. In 2009, 1,263 volunteers monitored 1,237 lakes (Figure 3).

CLMP volunteers monitor transparency (clarity) using a Secchi disk (Figure 2) at an established site on their lake of choice. Additionally, since 2004, lightweight plastic disks have been available on loan to anyone interested in monitoring the transparency of the lakes in the Boundary Waters Canoe Area Wilderness (BWCAW). Figure 3 includes these BWCAW volunteers and lakes.

Figure 2: CLMP volunteers use Secchi disks to monitor lake transparency.

In addition to the CLMP, the MPCA also offers an advanced lake monitoring program (CLMP+). The CLMP+ enables a select number of CLMP volunteers to monitor their lakes for chemistry and temperature, in addition to transparency, over the course of two summers. Volunteers are eligible for participation in the CLMP+ if they have participated in the CLMP for at least two years and if their lake has insufficient chemistry data for assessment.

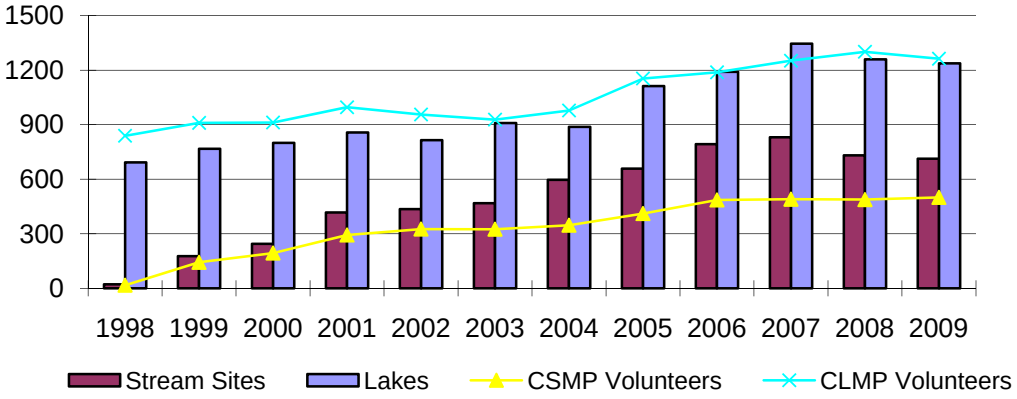

Figure 3: Change in volunteer numbers and sites for MPCA programs over time

Citizen Stream Monitoring Program

In 1998, the MPCA added the CSMP. CSMP volunteers take weekly stream transparency measurements at an established site and also record daily rainfall observations. Volunteers collect stream water in a bucket and use a transparency tube (Figure 4) to measure the water's clarity. In its first year, 22 locations were monitored. In 2009, 500 volunteers monitored 713 sites on streams and rivers (Figure 3).

Figure 4: CSMP volunteers measure stream transparency using a transparency tube.

Use of Citizen Monitoring Data

Over the past several years, the MPCA, local governments and other organizations have been increasing their use of data collected by citizens and local groups. At the MPCA, data collected by citizens are used as both an education and awareness tool and, if the data meets necessary criteria, for the water quality assessment process.

Recent increases in the use of local group and citizen monitoring data include the following.

Data use in State Waterbody Assessments

The MPCA uses CLMP Secchi disk transparency data in conjunction with nutrient data (phosphorus and chlorophyll) for its water quality assessments to determine the condition of waters and identify waters that are impaired. Since 2000, nutrient and Secchi data collected as part of the CLMP+ have also been incorporated into the assessment process. Starting with the 2006 assessment cycle, the MPCA also began using transparency tube data collected by citizens (primarily citizens enrolled in the MPCA's CSMP) to determine stream turbidity impairments. In 2010, transparency tube data contributed to the assessment of 486 stream segments.

Data collected by local groups through Surface Water Assessment Grants (SWAGs) are also incorporated into the MPCA's assessment process. Most SWAG recipients use citizen volunteers to collect water quality data (see page 8). In fact, SWAG applications that indicate citizen involvement are given priority in the application scoring process. These groups can find data requirements and guidelines in the Volunteer Surface Water Monitoring Guide (see page 8), and data are required to be submitted for entry into the MPCA's water quality database in order to be used for assessments. SWAG projects funded in 2009-2010 are expected to yield data to be used for waterbody assessment purposes on approximately 440 lakes and 560 stream reaches.

Remote sensing model calibration

Secchi disk data (primarily collected by CLMP volunteers) have been used to calibrate remote sensing tools used to determine lake transparency for lakes greater than 20 acres (Figure 5). Remotely sensed Secchi datasets have been calculated on five-year intervals from 1975 through 2005. The University of Minnesota Remote Sensing Lab has also used transparency tube data to calibrate similar tools for large streams and rivers in Minnesota.

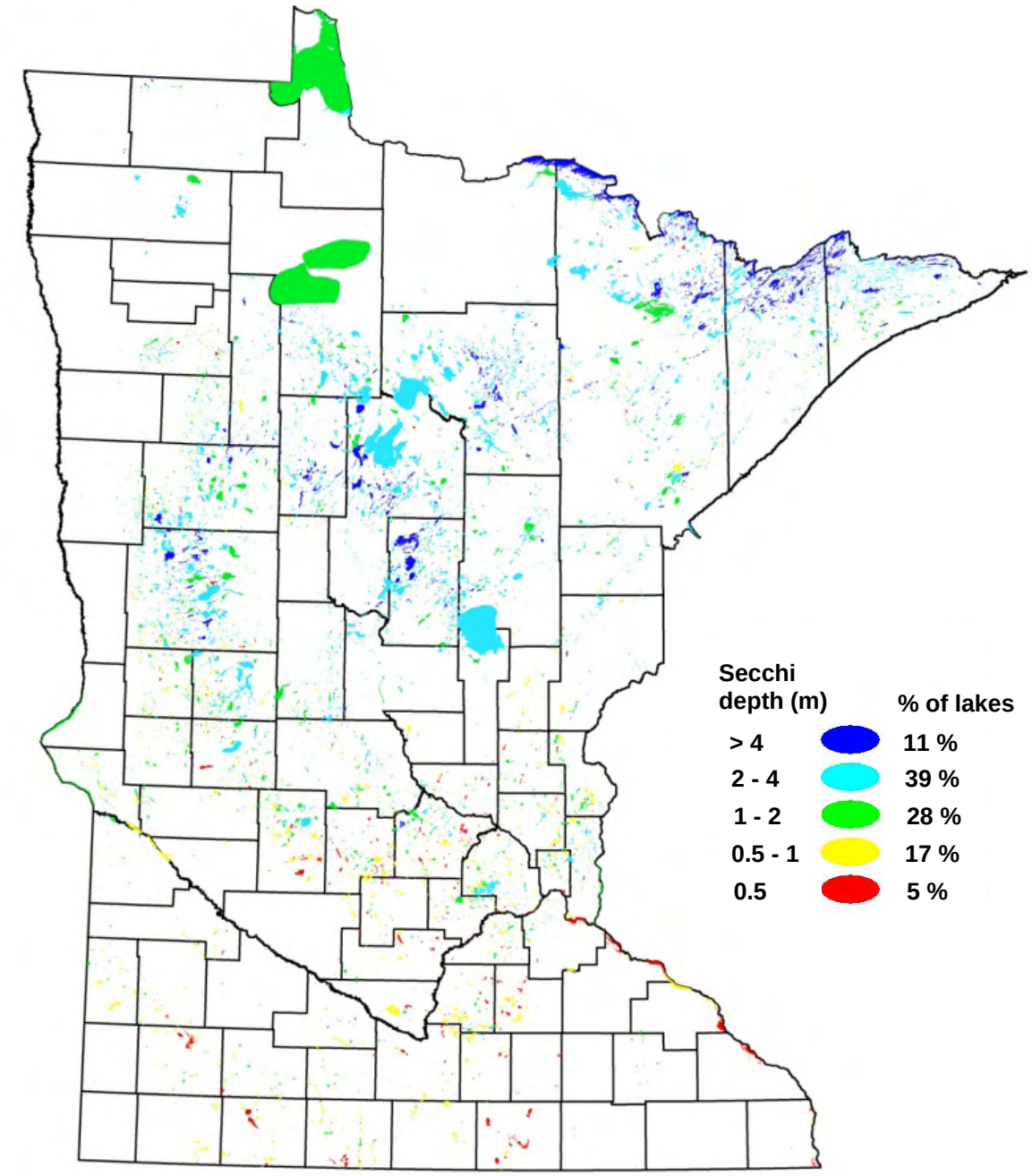

Figure 5: Citizen-collected Secchi disk data enables the calibration, and therefore more accurate production, of satellite remote sensing tools. This figure shows 2005 remotely sensed Secchi transparency data for lakes greater than 20 acres.

Determination of transparency trends

Citizen-collected Secchi disk and transparency tube data are the principal source of information for transparency trend analysis (i.e. whether clarity is increasing or decreasing over time) for lakes and rivers (see Figures 6 and 7). The MPCA includes transparency trend analysis in the Individual Site Reports sent annually to volunteers. Trend information is also included in the annual Statewide Summaries available for both programs on the MPCA website (http://www.pca.state.mn.us/cmp).

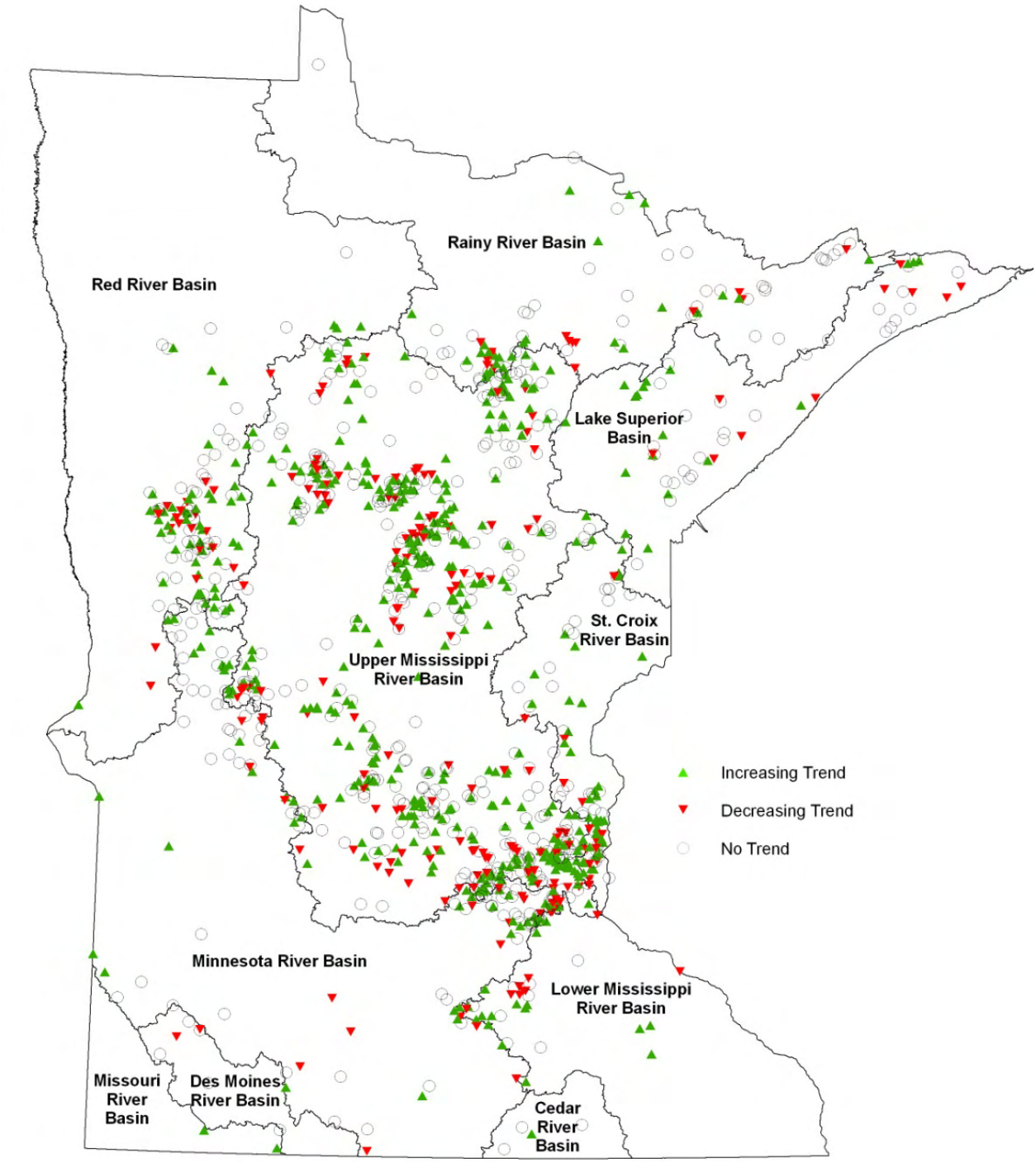

Figure 6: 2009 Statewide transparency trends for all lakes with sufficient data for trend analysis. Of these, 41 percent show improving trends, 17 percent show declining trends, and 42 percent show no detectable trend.

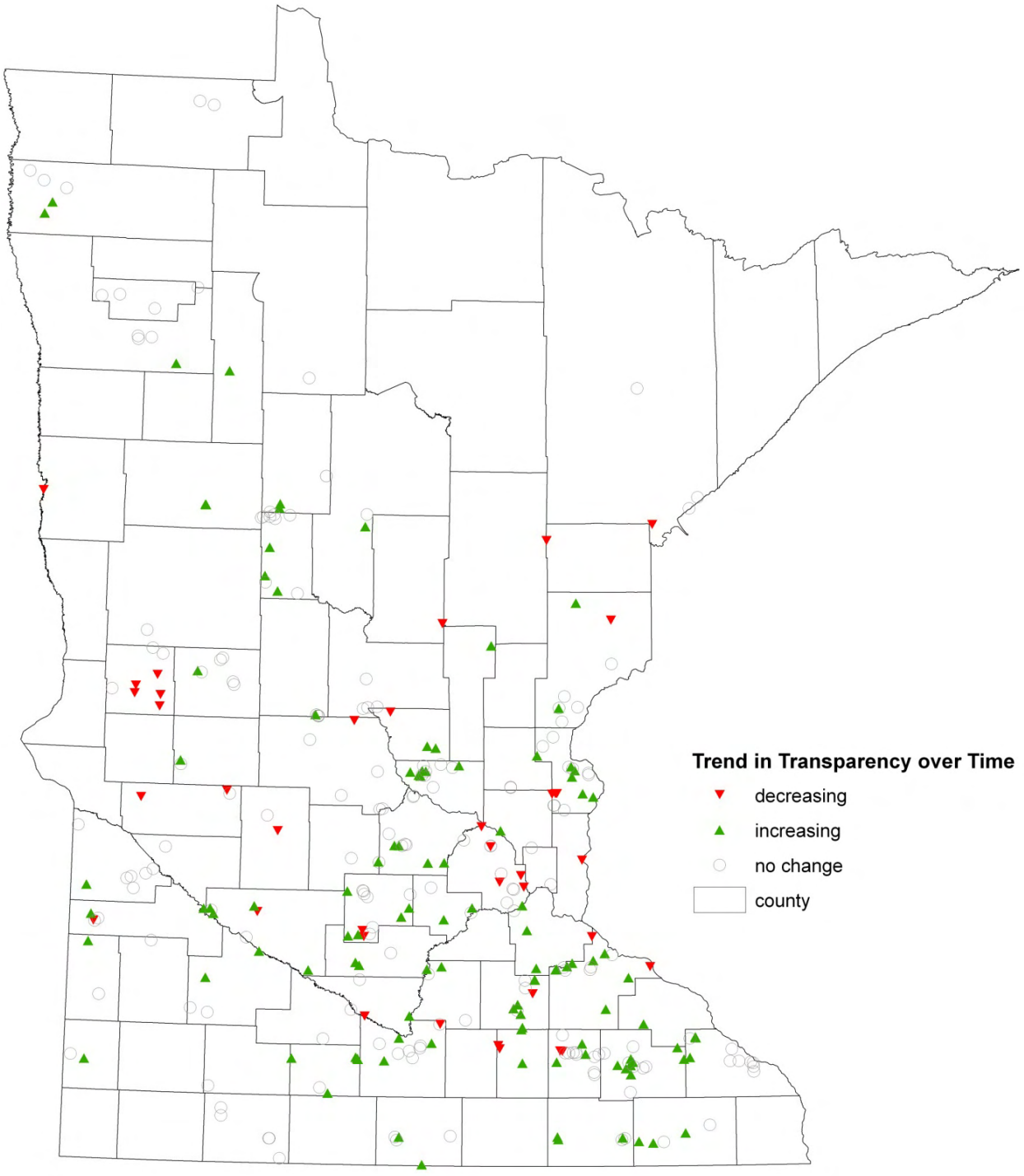

Figure 7: 2009 Statewide transparency trends for all stream/river monitoring sites with sufficient data for trend analysis. Of these, 34 percent show improving trends, 11 percent show declining trends, and 55 percent show no detectable trend.

Financial and Technical Assistance for Citizen Monitoring

A number of recent advances have been made in providing technical and financial assistance to citizen monitors outside of MPCA programs, in part due to passage of the Clean Water Legacy Act and funding from the Legislative-Citizen Commission on Minnesota Resources.

Surface Water Assessment Grants

Clean Water Legacy Act funding from the Minnesota State Legislature in fiscal year 2009 and again for the 2010–2011 biennium makes funding available to citizen monitoring groups across the state to assist in the collection of surface water data through Surface Water Assessment Grants. These grants are intended to provide local organizations funds to complete monitoring needed to meet assessment requirements on lakes and streams. Citizen involvement is one of the criteria by which grant applications are scored. In 2009, approximately $1.73 million was distributed in grants to 33 local groups. In 2010, 28 applicants were awarded grants totaling $1.1 million. Of the projects funded in 2009-10, 55 (90 percent) involve citizens. These grant projects are expected to yield data on approximately 440 lakes and 560 stream reaches, all of which will be used for waterbody assessment purposes. The MPCA has up to $1.5 million to award in Surface Water Assessment Grants in 2011. The Request for Proposals for this latest grant round closed on November 5, 2010. Staff will rank proposals received and notify potential grantees in January 2011.

Technical assistance

Since 2003, citizen monitors interested in submitting their data to the MPCA have had clear guidance on the data quality required for use in state water quality assessments. The *Volunteer Surface Water Monitoring Guide* (Figure 8) is a publication that outlines the MPCA's monitoring requirements. Citizen-collected data that meet these requirements and are submitted to the MPCA will be included in the assessment process. To date, the guide has been distributed to more than 900 citizens and groups. The Volunteer Surface Water Monitoring Guide is available online at http://www.pca.state.mn.us/water/monitoring-guide.html.

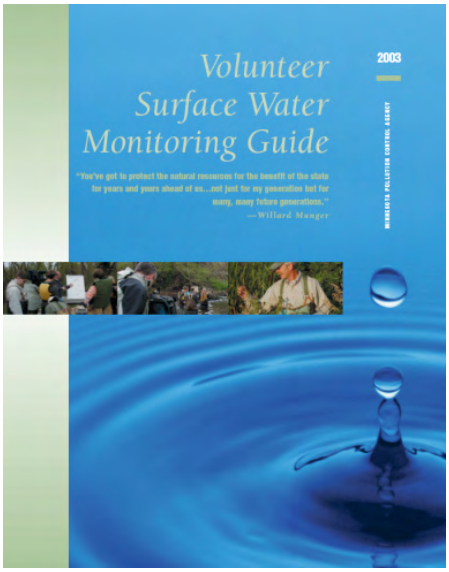

Figure 8: The Volunteer Surface Water Monitoring Guide provides citizens with data quality guidance.

Training courses and activities

Proper training is necessary in order for citizen volunteers to conduct lake and stream monitoring activities. "Training" can refer to anything from a program manual, training guide or DVD, to a face-to-face, hands-on training session.

The CLMP and CSMP provide their volunteers with a program handbook and training video demonstrating proper monitoring procedure. The CLMP+ program includes an on-site training with each volunteer at the start of the season.

Through the Surface Water Assessment Grants, the nonprofit organization Minnesota Waters received funds to provide a variety of trainings to grant recipients and other interested parties across Minnesota on subjects ranging from monitoring plan development to lake and stream monitoring techniques. Grantees may also use grant funds to support their own training activities or to hire an external organization to provide water quality monitoring training for their project participants.

Data Accessibility

Dedicated staff

In 2003, MPCA created a staff position to work extensively with external organizations to assist in ensuring that their water quality data are entered into STORET, the state and federal water quality database. This position provides a point of contact for external volunteer groups that wish to have their data included in STORET. In 2010, the MPCA is transitioning to a new water quality database called EQuIS. At this time, the process for data submittal to EQuIS is the same as it has been in the past for STORET. Citizens and groups can find the steps necessary for EQuIS data submittal at http://www.pca.state.mn.us/water/storet.html.

Environmental Data Access

In 2004, the MPCA developed the Environmental Data Access (EDA) system, a Web-based data search tool, to improve public access to environmental data (Figure 9). EDA is accessible via the MPCA website http://www.pca.state.mn.us/data/eda/index.cfm and includes surface water, ground water and air quality data. The EDA makes statewide environmental monitoring data accessible to the public and to water resource planners and managers. Users can access information about Minnesota's lakes and streams through either map-based or text-based searches. In addition to being available via the EDA, CLMP and CSMP data are available directly on their program websites (http://www.pca.state.mn.us/clmp or http://www.pca.state.mn.us/csmp).

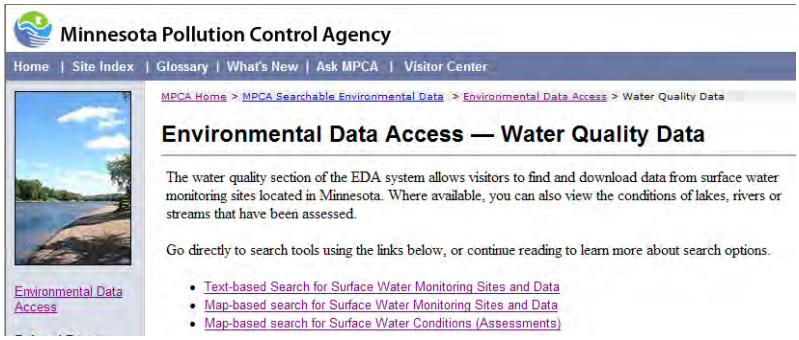

Figure 9: The public can access environmental data online through the Environmental Data Access system (EDA).

Program reports

Reports to volunteers

The CSMP and CLMP publish annual Statewide Summary reports that summarize the data collected by all program participants over the past monitoring season. These reports are made available to volunteers on the program websites (http://www.pca.state.mn.us/cmp) or in hard copy by request. In addition to the Statewide Summary reports, each program also produces an Individual Site Report for each participant. This four-page report provides in-depth results for a specific site, including a detailed watershed map with land use, seasonal data summary, and chart that plots transparency (and rainfall for CSMP) across the entire monitoring season. This report includes assessment information for the volunteer's lake or stream segment, as well as a trend analysis if sufficient data are available.

The CLMP+ program provides volunteers with 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 posted on the MPCA website.

These reports to volunteers are important because they summarize and interpret the data that volunteers collect during the monitoring season. Reports also provide information that helps volunteers compare the data they collect at their monitoring site with other sites in their area.

Reports to U.S. Environmental Protection Agency (EPA)

In the past, the MPCA assessed lakes and streams statewide every two years, and reported assessment results to the EPA biennially in the Integrated Report on Surface Water Quality. This report contains the 305 (b) assessments (attainment of standards of fishable and swimmable waters) and the 303(d) Impaired Waters List. Recent increased funding for water monitoring activities significantly increased the volume of new water quality data being generated, which necessitated the development of a new assessment process. In 2009, the MPCA began to assess lakes and streams in select watersheds annually, with the goal of assessing every major watershed in the state on a ten year cycle. Assessment results will continue to be reported to EPA biennially. Previous years' reports, maps and supporting documentation are available online at: http://www.pca.state.mn.us/water/tmdl/tmdl-303dlist.html.

Lake Finder

The Minnesota Department of Natural Resources (DNR) *Lake Finder* website (http://www.dnr.state.mn.us/lakefind/index.html) is linked to MPCA's lake monitoring data, allowing users to view both lake quality and other hydrologic information through the same site. *Lake Finder* also links to the University of Minnesota's Remote Sensing Lab, showing satellite based transparency measurements in five year intervals between 1975-2005.

Promoting Local Group and Citizen Monitoring

MPCA's goal for statewide monitoring coverage enhanced by citizen volunteer efforts makes volunteer recruitment and retention efforts essential program functions.

Coordinating with local groups to focus monitoring efforts where they will be most effective for assessment and trend monitoring helps local citizens and governments see how their efforts are being used to inform water quality management decisions and affect change. As noted previously, the MPCA is monitoring lakes and streams within the 81 major watersheds in Minnesota on a ten-year cycle. The prior identification of specific watersheds and lake and stream sites to be monitored by agency staff enables volunteers to be recruited for those same sites; making water quality data available for the years before and after the MPCA's monitoring.

MPCA staff promote the MPCA's citizen monitoring programs (CLMP and CSMP) and the availability of Surface Water Assessment Grants using a variety of marketing tools including:

- posters and displays distributed to bait shops and license centers throughout the state
- area-specific press releases with interviews of current volunteers
- stories about the monitoring programs aired on local television and radio
- program-specific maps to show which lakes and streams need volunteers
- notice in the State Register and in an e-mail to local governmental units statewide of an approaching grant round

CLMP and CSMP feature prominently in the MPCA's state fair exhibit, the Eco Experience. Fairgoers learn about each program through hands-on, interactive displays. New to the exhibit in 2008 was a transparency tube display where fairgoers could use a transparency tube to compare water clarity in samples from the Minnesota and Mississippi Rivers. Computers are located near each display so fairgoers can enroll in the CLMP and CSMP programs. More than 300,000 people visited the water display at the 2010 Eco Experience.

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, lake associations, and coalitions of water resource groups. These organizations provide a vast range of opportunities for Minnesotans to further engage with, learn about and protect their water resources. Volunteers participating in these organizations range from students to retirees, and the data that they collect are often submitted to the MPCA's water quality database for use in water quality assessments. Some of the organizations sponsoring these volunteer monitoring opportunities receive funding from the MPCA (recipients of Surface Water Assessment Grants, for example), but are entirely locally based and function entirely independently of the MPCA.

Volunteers Making a Difference

As noted throughout this report, citizen monitoring is an important part of the MPCA's water monitoring strategy. Volunteers are able to collect water quality data at a scale and frequency that isn't possible with professional staff alone. But useful data are only one of the positive results of citizen participation in water monitoring. Many volunteers in citizen monitoring programs also experience an increased understanding and awareness of their local water resources, a heightened feeling of "connection" to the lake or stream they monitor, and increased interest in water stewardship efforts. Some volunteers in the MPCA's citizen monitoring programs decide to take their experience with water monitoring further, by working to secure grant funding, presenting their results to community leaders, or recruiting and organizing additional volunteers. The following is just one of many stories of volunteers taking their involvement in citizen monitoring beyond data collection.

Figure 10: Nick Anderton presents information about the CLMP to Scout Troops in Martin County.

Nick Anderton is an eleventh grader from Fairmont, Minnesota. He has been a volunteer with the Citizen Lake Monitoring Program on Amber Lake in Martin County since 2007. Nick is a long-time Boy Scout, and when he decided to pursue the rank of Eagle Scout, it seemed only natural to him to include his interest in water quality and the CLMP in that effort. Working with his parents, scouting advisors and the CLMP coordinator, Nick developed a plan for his Eagle Scout project that would help raise awareness of the CLMP and lake monitoring among area Scout troops. Nick developed a presentation to introduce Scout troops to the concept of lake monitoring, as well as a survey to measure how likely Scouts would be to participate in the program. His results indicate that there is great interest in participation in the CLMP among the troops he spoke with, and that many troops had never heard of the CLMP. Results from Nick's project will help the MPCA increase CLMP participation among this demographic. In addition to his outreach and education efforts, Nick also helped train new volunteers on CLMP Secchi disk monitoring throughout the summer, and began monitoring an additional lake that had very little data. Nick's participation in the CLMP and his desire to do more will have far-reaching positive effects on him, his community, and the CLMP program.

There are many stories of volunteers like Nick, whose interest in citizen monitoring led to additional education, outreach, or advocacy. The existence of citizen monitoring programs helps to ensure the preservation of Minnesota's water resources, and provides an opportunity for Minnesotans who care about their water resources to get involved in learning about and protecting them. Read more about citizen monitoring efforts and other "Water Stories" at http://www.pca.state.mn.us/index.php/water/water-types-and-programs/surface-water/minnesota-water-stories.html.