



Citizen monitoring of surface water quality

2009 Report to the Legislature



Minnesota Pollution Control Agency

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Cover photos

Picture #1: Three students in the Red River Watch Program monitor a river in the Red River Basin
Picture #2: A volunteer takes Secchi disk readings as part of the Citizen Lake Monitoring Program.
Picture #3: Two Wetland Health Evaluation Program volunteers monitor a wetland in Mendota Heights.
Picture #4: Students measure transparency tube data as part of the Red River Watch Program

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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; and
- 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, non-profits and others 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 2007–2008 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:

- MPCA citizen monitoring programs
- improvements in MPCA's overall water quality monitoring activities
- use of citizen monitoring data
- technical and financial 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*.

The Role of Citizen Monitoring in Minnesota's Surface Water Monitoring Strategy

Minnesota water quality monitoring strategy

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," or eight-digit hydrologic unit code, watershed. There are 81 major watersheds in Minnesota (Figure 1), which means that six to eight watersheds must be monitored annually to meet the goal of monitoring around the 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 data collection by other organizations (counties, lake associations, etc.);
- remote sensing; and
- stream and lake data collection by citizens.

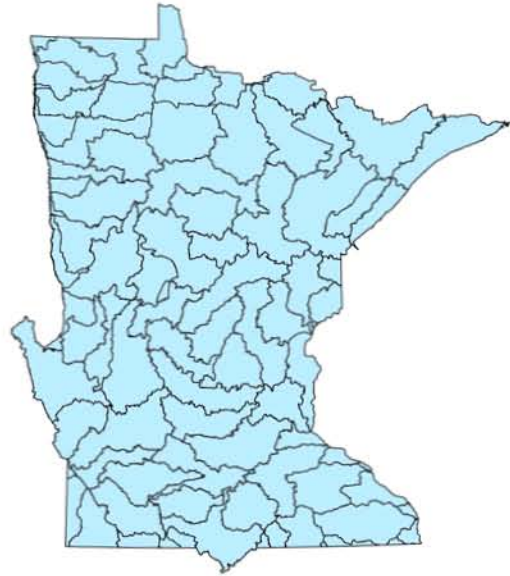


Figure 1: Minnesota's 81 major watersheds

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 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

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.

Clean Water Legacy Act funding provided to the MPCA for fiscal years 2008–2009 supports MPCA efforts to:

- Monitor and assess a total of 80–100 lakes for recreational use support each year, focusing on lakes 500 acres and larger.
- Monitor 500 stream sites to assess recreational, aquatic life, and aquatic consumption use support.
- Partner with local units of government, non-profit organizations and citizen volunteers to monitor more than 475 lakes and 170 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 Local Group and Citizen Monitoring Programs

Citizen Lake Monitoring Program

Minnesota has a long history of volunteer monitoring. 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, CLMP volunteers monitored 74 lakes. In 1978, the program was transferred to the MPCA. In 2007, 1,187 volunteers monitored 2,207 sites on 1,263 lakes (Figure 2).

CLMP volunteers monitor transparency (clarity) using a Secchi disk at an established site on their lake of choice. In 2004 a plastic disk was developed by 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.

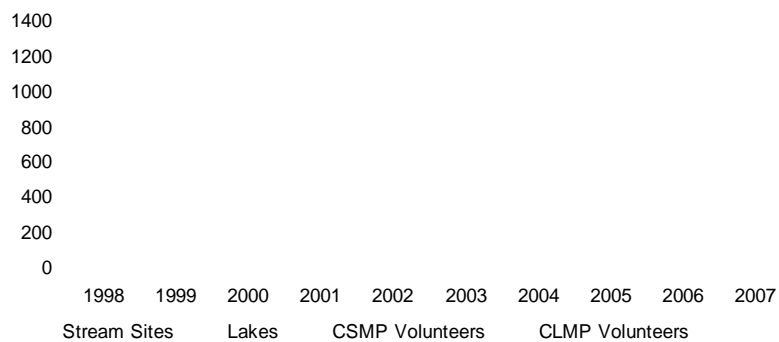


Figure 2: Increase in volunteer numbers and sites for MPCA programs

The MPCA also offers a 'Plus' program (CLMP+) to Greater Minnesota. This program works 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.

Citizen Stream Monitoring Program

In 1998, the MPCA added the Citizen Stream Monitoring Program (CSMP). 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. In its first year, 22 locations were monitored. In 2007, 490 volunteers monitored 831 sites on streams and rivers (Figure 2).

Surface Water Assessment Grants

Through the 2006 Clean Water Legacy Act, the Minnesota State Legislature funded the 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 ranked. In 2007, approximately \$1 million was distributed in grants to 13 local groups. In 2008, 41 applicants were awarded grants totaling just under \$2 million (Figure 3). Of these, 39 (95%) involve citizens. The MPCA has up to \$2.1 million to award in Surface Water Assessment Grants in 2009. The Request for Proposal for this latest grant round closed on November 4, 2008. Staff will rank the 43 proposals received and notify potential grantees by early January 2009.

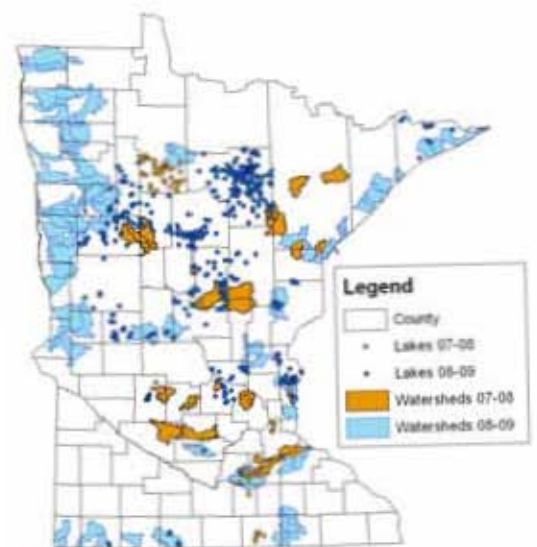


Figure 3: Location of monitoring sites funded through Surface Water Assessment Grants

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, this data is used as both an education and awareness tool and, if it meets necessary criteria, for the water quality assessment process.

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

Data Use in State 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+ Program has also been incorporated into the assessment process. Starting with the 2006 assessment cycle, MPCA also began using transparency tube data collected by citizens (primarily citizens enrolled in the MPCA's CSMP) in determining stream turbidity impairments. In 2008, transparency tube data contributed to the assessment of 188 stream segments.

Data collected by local groups through Surface Water Assessment Grants 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 U.S. Environmental Protection Agency's (EPA) national water quality database, in order to be used for assessments.

Remote Sensing Model Calibration. Secchi data has been used to calibrate remote sensing tools used to determine lake transparency. The University of Minnesota Remote Sensing Lab has also used transparency tube data to calibrate similar tools for large streams and rivers in Minnesota.

Data Use for Lake Trends. Citizen-collected Secchi disk data is the principal source of information for lake transparency trend analysis (i.e. whether lake clarity is increasing or decreasing over time). The MPCA develops lake trend fact sheets for counties with ten or more lakes and enough data to perform the analysis. The fact sheets are available online and are sent to volunteers and local resource managers.

Technical and Financial Assistance for Citizen Monitoring

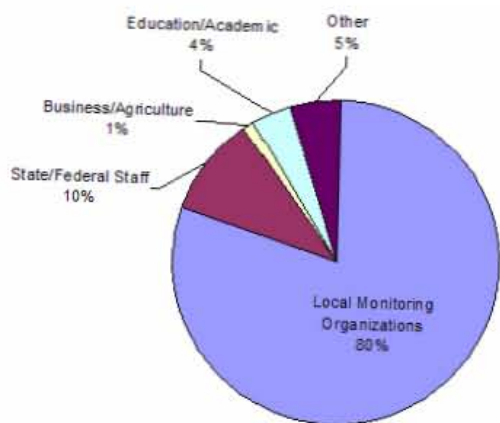


Figure 4: Distribution of the Volunteer Surface Water Monitoring Guide by category

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

Technical Assistance. Since 2003, citizen monitors have had clear guidance on the data quality required for use in state water quality assessments. The *Volunteer Surface Water Monitoring Guide* is a publication that outlines the MPCA's monitoring requirements. Citizen-collected data that meets 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 (Figure 4). In 2008, a revised Appendix was posted to the MPCA's Web site (www.pca.state.mn.us/water/monitoring-guide.html).

Financial Assistance. Clean Water Legacy Act funding from the Minnesota State Legislature in fiscal year 2007 and again for the 2008–2009 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.

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 a local training event at the start of the season. Through the Surface Water Assessment Grants, 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. Information on groups other than MPCA and Minnesota Waters providing monitoring training is available in the section titled “Other Volunteer Opportunities for Minnesotans” below.

Data Accessibility

Environmental Data Access

The MPCA developed the Environmental Data Access (EDA) system,

<http://www.pca.state.mn.us/data/eda/index.cfm> a Web-based data

search tool, to improve public access to environmental data (Figure 5). All data in STORET, the state and federal water quality

database, is accessible through the system. The goal for EDA was to make statewide environmental monitoring data more accessible to the public and to water resource planners and managers (surface-water and air quality data are currently available and ground water data will be added in the future). 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 Web sites (<http://www.pca.state.mn.us/water/volunteer-monitoring.html>).

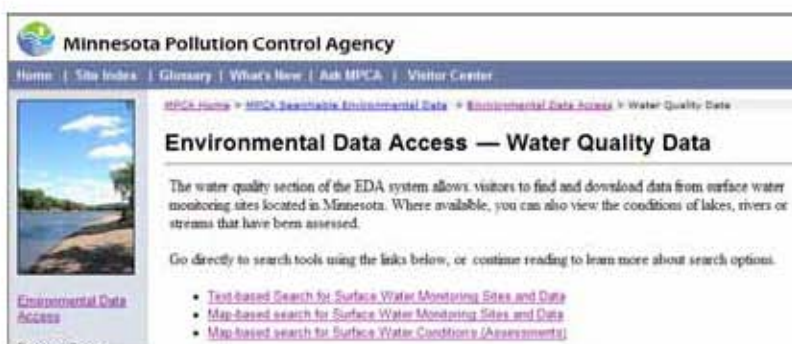


Figure 5: The public can access environmental data online through the Environmental Data Access system (EDA)

Dedicated staff

In 2003, MPCA created a staff position to work extensively with external organizations to assist in ensuring that external data is entered into STORET. MPCA is further accelerating that effort with Clean Water Legacy Act funding. This position provides a point of contact for external volunteer groups that wish to have their data included in STORET. A Web page has also been developed where citizens can find the steps necessary to have their data included in STORET (www.pca.state.mn.us/water/storet.html).

Program reports

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 (www.pca.state.mn.us/water/csmpr-reports.html#sitereports). 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 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. A similar Individual Site Report was made available to CLMP volunteers in 2007. The CLMP report summarizes the readings taken at a specific site over a season and also provides a chart illustrating historic data trends for the lake.

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 other residents of the area are notified of the document, in addition to its placement on the MPCA webpage.

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

Lake Finder

The Minnesota Department of Natural Resources (DNR) *Lake Finder* internet database (www.dnr.state.mn.us/lakefind/index.html) is linked to MPCA's CLMP and 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 from 1990, 1995, 2000, and 2005.

Promoting Local Group and Citizen Monitoring

One of the challenges in enhancing citizen and local group monitoring efforts is recruiting new partners. MPCA's goal for statewide monitoring coverage by citizen volunteers makes 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 lake and stream sites to be monitored by agency staff enables volunteers to be recruited for the same sites; making water quality data available for the years before and after the MPCA's monitoring effort.

MPCA staff promotes the citizen monitoring programs 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
- recruitment postcards mailed to current volunteers encouraging them to advocate for the program and to recruit additional volunteers
- 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
- informational meetings around the state as new grant rounds approach
- a Training and Promotion Grant to Minnesota Waters, a statewide non-profit organization that supports citizen monitoring, to promote Surface Water Assessment Grants

In 2007, CSMP program coordinators developed two specific recruitment areas and worked with local SWCD staff, local basin planners and other partners to promote the program. In one of the recruitment areas, staff coordinated a booth at Detroit Lakes' *Capitol for a Day* environmental fair and promoted the program through a segment on *Minnesota Bound*, an outdoors program on Kare 11.

Additionally, both CLMP and CSMP participated in the MPCA's state fair exhibit, the Eco Experience. Fairgoers learned 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 were located near each display so fairgoers could enroll in the CLMP and CSMP programs. More than 350,000 visitors visited the water display at the 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 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)** is a cooperative partnership between the MPCA, local water resource managers, counties, and citizens (Figure 6). In 2007, there were eight WHEP teams in Dakota County, and eight teams in Hennepin County, totaling 188 volunteers. Together, these volunteers monitored 63 wetlands for aquatic vegetation and macroinvertebrates (spineless organisms). Reports on wetland monitoring in Dakota and Hennepin counties are available on the WHEP Web site (www.mnwhep.org).

In 2006, the **Friends of the Mississippi River** partnered with Minnesota Waters to pilot an adult volunteer stream monitoring program called the **Stream Health Evaluation Project (SHEP)**. This program, funded in part by the Minnesota Community Foundation and the Rice Creek Watershed District, was modeled after WHEP. Now in its third year, the Rice Creek SHEP features multiple field and laboratory training sessions for over thirty volunteers in three teams. Volunteers monitor sites along the Rice Creek, Hardwood Creek and Clearwater Creek in the Rice Creek Watershed District, and assist program staff in reporting results to local units of government. In 2007, a **Hennepin County SHEP** was piloted through Hennepin County Environmental Services with 18 volunteers on six sites on Elm Creek.

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



Figure 6: A WHEP volunteer monitors a wetland in Dakota County.



Figure 7: A River Watch team from the Ulen-Hitterdal School District prepares to monitor in the Red River Basin.

Since inception in 1995, the **Red River Basin River Watch** program, with the support of the Red River Watershed Management Board and other partners, has grown to include nearly 30 school teams monitoring over 180 sites on over 60 waterways throughout northwest Minnesota (Figure 7). Program goals include collection of scientifically sound baseline data and raising awareness about the condition of waters in the Red River Basin. Teams of high school students and their teachers conduct monthly monitoring of five to fifteen sites from April through October. Students take a variety of field measurements and record general observations of vegetation and other conditions in the watershed that influence water quality. Data is managed through an online data base, <http://riverwatch.umn.edu/>, developed in coordination with the University of Minnesota-Crookston. Youth leadership and community engagement are priority areas being developed to compliment the solid monitoring foundation already established.

The **Hennepin County River Watch** program provides hands-on environmental education opportunities for high school and college students. Groups of students and teachers or adult volunteers collect benthic macroinvertebrates during the spring and/or fall. In 2007, roughly 500 students in 18 schools monitored 26 sites on Minnehaha, Elm, Shingle, Bassett, Rush, and Pioneer Creeks and the Crow River.

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. Since 2001 the VSMP has sponsored an annual metro-wide River Summit for high school students, teachers, and adult volunteers. Students present results of their stream monitoring activities and participate in small group activities that help them recognize potential solutions to the problems facing urbanized waters. The VSMP in conjunction with the University of Minnesota published the *Guide to Aquatic Invertebrates of the Upper Midwest* (<http://wrc.umn.edu/outreach/vsmp/edmaterials/index.html>) as well as an interactive webpage designed to work with the *Guide* (<http://www.entomology.umn.edu/midge/VSMIVP.htm>).

The **Citizens Monitoring Bacteria** project began in six great lakes state in 2003 and was funded by a USDA Cooperative State Research, Education, and Extension Service grant. In 2005 – 2007, 45 volunteers monitored 69 sites on 39 Minnesota lakes and streams for *E. coli* bacteria. The goal of the project, sponsored in Minnesota by the University of Minnesota Extension Service, is to assess the accuracy and reliability of *E. coli* test kits when used by volunteers monitoring surface water. Program participants take field measurements and collect water samples which are split into two sub-samples. One is sent to a certified laboratory and the other is analyzed by volunteers using test kits. Although the project was intended to evaluate the accuracy of the test kits, in Minnesota, additional funding from the LCCMR in 2005 – 2007 allowed volunteers to collect samples weekly to determine whether lakes and streams met state bacteria standards.

For metropolitan area lakes, the Metropolitan Council Environmental Services operates the **Citizen Assisted Monitoring Program (CAMP)**. Through the CAMP, citizens collect chemistry data, Secchi transparency measurements and user perception information on a bi-weekly basis, mid-April through mid-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 (www.metrocouncil.org/environment/RiversLakes/Lakes/index.htm). The CAMP submits data to MPCA for storage in STORET and use in assessments. In 2007, a total of 176 lakes were monitored through the CAMP. 137 citizen-volunteers monitored 106 different lakes, and another 70 lakes were monitored by staff of local units of government as part of the CAMP.

Minnesota Waters works statewide to empower active, engaged citizens to be at the forefront of locally-led stream and lake conservation. Part of the mission of Minnesota Waters is to enhance and expand citizen monitoring for lakes and streams. Under a Surface Water Assessment Grant awarded in 2007, Minnesota Waters, in partnership with local government units as well as other organizations, has been able to provide several types of skills training workshops.

Using the Minnesota Waters *Data to Information to Action Pathway*, which values the collection and use of data about the health of lakes, streams and watersheds, several workshops were provided to achieve sustainable collection of quality lake and river data along with the skills to understand and interpret the resulting information. The 2007–2008 Lake and River Monitoring Training Workshops resulted in over 317 volunteer monitors trained to collect water quality assessment data from 66 lakes and 51 streams. The SHEP that was piloted in 2006 continued to grow with 57 volunteers trained to collect macroinvertebrate data from 14 streams. A Data Analysis and Interpretation workshop was held in the Red River Basin that focused on training 25 participants on how to present and interpret their water quality data to their data users as well as the greater community. Additional Data Analysis and How to Design Your Monitoring Plan workshops are planned in the fall of 2008.

Minnesota Waters has been able to provide skills trainings using Legislative Commission on Minnesota’s Resources funds to provide topic specific training events. In 2008 Aquatic Plant Identification workshops were offered in the Brainerd and Spicer regions. These workshops trained volunteers on how to identify native as well as invasive aquatic plants. Over 26 participants representing 13 lake associations and local government staff attended these spring workshops. Minnesota Waters is sponsoring a Lakes and Rivers Conference in the spring of 2009 with an expected attendance of over 400 participants. The conference will include sessions and workshops on topics ranging from information on citizen water quality monitoring to aquatic invasive species, climate change, landuse and shoreland management. Workshops and sessions provide 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 4,000 citizens. This publication contains information on monitoring, including tips, news, and success stories. Minnesota Waters’ electronic newsletter, *The Confluence*, is emailed to over 3300 citizen and professional recipients a month. *The Confluence* provides timely information on training opportunities as well as water quality information from the state and nation.