Citizen Stream-Monitoring Program

Stream Reader

Newsletter of the Minnesota Pollution Control Agency

Minnesota Pollution Control Agency

Spring 2000

CSMP volunteers complete their first full monitoring season

Welcome to the first issue of the *Stream Reader* newsletter of the Minnesota Pollution Control Agency's (MPCA) Citizen Stream-Monitoring Program (CSMP). The *Stream Reader* will share river-related news and relay CSMP information as the program grows and develops. Please share your river stories with the CSMP network by submitting ideas and photos to *Stream Reader*, MPCA, 1230 S. Victory Dr., Mankato, MN 56001.

Volunteers completed their first full monitoring season in 1999. Approximately 130 volunteers submitted data from across the state's 10 major drainage basins. MPCA staff are currently compiling submitted data. A report on the 1999 CSMP monitoring season will be available by the end of the year. Thank you for all of your hard work and dedication to stream monitoring and protection. Congratulations on completing this inaugural monitoring season!

Sue Butler
So. Branch
Zumbro River,
Olmsted County

B-J Norman and
assistant Bugsy
Belle Creek
Goodhue County

Tammy Moren
Pine River
Cass County

Deborah Robinson
Watab River
Stearns County

What transparency tube measurements are telling us about stream-water quality in Minnesota

Stream-water transparency generally depends on the amount of material suspended in the water ("total suspended solids") and the ability of those materials to scatter light that passes through water ("turbidity"). A longer version of this article appeared in the first annual CSMP report. Here, we discuss types of materials suspended in stream water, their effects on transparency, and how transparency measurements taken by CSMP volunteers may be used to screen for stream water-quality problems.

What affects transparency in Minnesota streams and rivers?

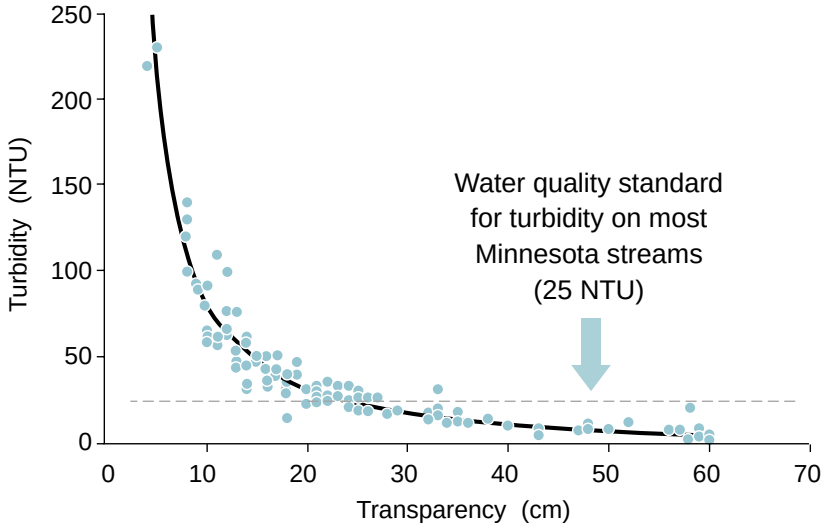
Materials that are either dissolved or suspended in water can influence water transparency. For most water bodies, the amount of suspended solids is the most important thing affecting transparency: the more suspended materials, the lower the transparency. In lakes, the majority of suspended solids are algae. Suspended sediments (soils) may also reduce transparency in some lakes, especially in shallow lakes receiving lots of runoff from their surrounding watersheds. This is common in southern Minnesota. In streams and rivers, soils affect transparency more than algae, as water flows downstream carrying and depositing sediment with it. A good example of dissolved material affecting transparency is bog stain (tea color) that comes from incompletely decomposed organic matter from wetlands. This is more common in lakes and streams that have extensive wetlands in their watersheds, as is the case in northeastern Minnesota.

Turbidity describes how particles suspended in water affect water clarity, or transparency. It is a measure of how particles scatter light that passes through the water. Turbidity does not actually measure the concentration of these materials, but measures their effect on water clarity. Some rivers are naturally more turbid than others. Rivers in the southern part of Minnesota, where soils are very erodible, are naturally turbid, whereas those in the northeastern part of the state are naturally clear. Within this range of natural turbidity, certain human activities can increase turbidity. These activities include disturbance of the riverbed or banks, and any action on surrounding land that disturbs the soil, carrying it by surface runoff into rivers.

Based on work done during 1997, MPCA staff found a significant relationship between transparency-tube measurements and turbidity (Figure 1). This relationship is reflected by the high correlation coefficient (R^2) between transparency-tube readings and turbidity ($R^2 = 0.86$). Correlation coefficients are a measure of the strength of a relationship between two factors — the higher the number, the stronger the relationship. As transparency falls below about 25-30 centimeters (cm), we see dramatic increases in turbidity. This occurs between turbidities of 20-25 units. Turbidity continues to increase dramatically as transparency declines to 10 cm. As tube readings fall below 10 cm, further increases in turbidity bring about minimal declines in transparency (Figure 1).

Understanding this relationship between transparency and turbidity provides a starting point for characterizing the health of a stream. The relationship described above suggests the possibility of predicting turbidity from transparency measurements. In Minnesota, we have a water-quality "standard," or limit, for turbidity of 25 units for most streams and rivers. If turbidity is consistently above this 25-unit standard, we consider the stream "impaired" because high turbidity can interfere with fish behavior and other stream processes. Suspended materials clog fish gills, smother fish eggs, and interfere with vision. Because suspended materials absorb heat, turbidity can increase water

Figure 1. Transparency tube and turbidity from several Minnesota streams in 1997



temperature. This, in turn, results in lower dissolved oxygen levels because warm water holds less oxygen than cold water.

> *"A water-quality standard defines water-quality goals of a water body by designating its uses and by setting criteria necessary to protect public health or welfare, enhance the quality of water, and serve the purposes on the Clean Water Act"*
>
> *Clean Water Act section 40CFR 131.2*

By figuring out the transparency-tube measurement in centimeters that corresponds to the 25-unit turbidity standard on a stream, we can use transparency as a simple "meter" of turbidity. Frequent exceedances of the turbidity standard could indicate a stream water-quality problem that requires attention. This, in turn, could serve to prioritize streams for more detailed chemical, physical or biological monitoring, and watershed investigations to determine sources of pollutants entering a river.

To date, these are the readily apparent links identified between transparency and routine chemical measures of water quality. It is likely that additional links to other water-quality measures will be identified in the future. These linkages will potentially broaden the use of the transparency tube and help establish it as a simple but highly useful tool for measuring stream health.

River Watch Program expands in Red River Valley high schools

The Red River Valley River Watch Program was awarded a Board of Water and Soil Resources challenge grant to expand the River Watch program throughout the Red River Basin. River Watch helps communities establish sound scientific practices to measure the health of local streams so that the community can take actions to protect desired river conditions and uses. River Watch water-quality monitoring procedures were developed in Minnesota by the Rivers Council of Minnesota and the Mississippi Headwaters Board, with technical assistance from River Watch Network of Montpelier, Vermont, and the Minnesota Pollution Control Agency.

The goal of the Red River Valley River Watch Program, which is headed by Wayne Goeken, is to develop a sustainable partnership between area high schools and resource managers to provide useful water-quality data for natural resource management based on scientific, standardized methods. Currently, 16 Red River Valley high schools participate in the program. Six more schools are scheduled to begin monitoring this spring. The program intends to bring in remaining high schools in the Red River Valley Basin over the next two to three years, for a total of 53 schools. For more information, call Wayne Goeken at (218) 574-2622 or e-mail him at **wrg@maplebay.means.net**.

CSMP goes to Bulgaria!

Minnesota's citizen lake- and stream-monitoring programs recently expanded their reach into Eastern Europe with the addition of two new partners in the cities of Rousse, Bulgaria, and Giurgiu, Romania. Brian Fredrickson, MPCA's Lake Superior Basin coordinator, presented a Secchi disk and transparency tube to Emil Bachijsky and Marcoci Gabriel at a workshop in Rousse on January 25. The workshop was part of an exchange program supported by the U. S. Agency for International Development. Rousse and Giurgiu are working with American partners such as the MPCA to develop an environmental management system that meets international standards. One of the key components of this system is to encourage citizen involvement and discourse in decisions that impact human health and the environment. This involvement can only be heightened when citizens are given the opportunity to participate in monitoring and stewardship programs like those available in Minnesota.

Tube Teasers: Answers to your stream-monitoring questions

Q. *It's hard to know when the Secchi symbol (black and white pattern) on the bottom of the transparency tube is "clearly visible."*

A. Look for the screw in the middle of the Secchi symbol, on the stopper at the bottom of your tube. When you can see the screw, that's a good indication that the symbol is "clearly visible."

Q. *It's difficult to know when to mark a "Y" in the rain event column on the CSMP datasheet. How do you know when a rainfall is significant enough to be called an "event"?*

A. There is no easy answer to this question. You need to become familiar with how your stream responds to rain to get a feel for what qualifies as an "event." There are a few things to take into account as you figure this out:

1. If soil in the surrounding watershed is saturated to the touch, a small amount of rain can produce a "significant" event. If it rained more than 1.0 inch during the previous week, and it rains another .30 inch, the level of your stream may go up and transparency may drop because the ground cannot absorb any more water. In this situation, a .30-inch rainfall qualifies as a rain event. If the soil is very dry, a larger amount of rain may have to fall to initiate runoff and potential changes in streams.
2. You also need to consider the intensity of the rainfall. Did the .30-inch of rain fall over a two-hour period, or over 24 hours? Rainfall that occurs over a shorter period is more likely to produce changes in your stream, qualifying it as an event.
3. As a *general* rule of thumb, a rainfall of approximately .50 inch over a relatively short period of time can result in a significant event.

You may also want to adjust the number of days that you take daily measurements (*e.g.*, every day for four to five days) in response to a rain event. The number of daily measurements will depend on how quickly rainwater travels off the land and past your sampling location. Once you have monitored a few rainfalls, use your best judgment to determine when stream conditions change in response to a rain event. Then take enough daily (or more frequent) measurements to capture that change.

If you have a question related to streams or CSMP monitoring that you would like answered in this column, send them to: Tube Teasers, c/o Stream Reader, 1230 S. Victory Dr., Mankato, MN 56001

Metro Area Coordinated Volunteer Stream-Monitoring Program

There is a "ripple" of excitement here in the Twin Cities metropolitan area. A new program is emerging that will benefit all volunteer stream-monitoring programs in metro area. The Coordinated Volunteer Stream-Monitoring Program will connect citizens and student volunteers with local and state agencies, enhance existing databases, and expand efforts to evaluate and improve stream-water quality. A strategic plan for this program was developed in 1999 by a strong partnership of public and private interests to provide program coordination, consistent training and protocols, safe monitoring equipment, and watershed-based communication and reporting. Thirty-eight groups were identified in 1999 as part of the first inventory of volunteer monitoring programs in the metro area. Implementation of the plan is being led by a steering committee of eight representatives from local and state agencies, non-profits, the private sector, and the University of Minnesota. Several proposals have been submitted to fund coordinator positions and support volunteer monitoring programs at the county level. CSMP monitoring protocols are incorporated into this effort as part of a menu of monitoring options. Implementation of this program will compliment the CSMP and make it easier for volunteers to get involved in assessing and improving the health of their favorite streams.

CSMP NEWS

1998 Pilot CSMP Report available.

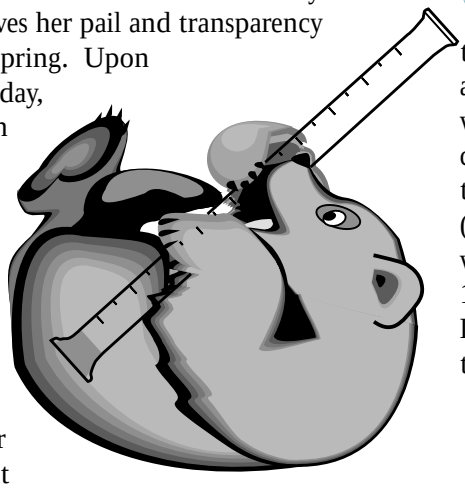
A summary report on the 1998 pilot season was mailed to the 17 pioneer CSMP volunteers in January. These volunteers, who turned in a 1998 data sheet, also received a CSMP T-shirt as a token of appreciation for their work. This first annual report provides background information, summarizes 1998 data collected by volunteers, and discusses future direction of the program, including how data can be used to promote stream protection in Minnesota.
The report is available on the MPCA web site at:
http://www.pca.state.mn.us/water/csmp-reports.html
or call Laurie Sovell, CSMP coordinator, at (507) 389-1925 or (800) 657-3864 (toll-free) or e-mail her at laurie.sovell@pca.state.mn.us.

Congratulations to CSMP volunteer Ed Stone.

Ed was featured in the Minneapolis *Star Tribune*'s December 12 special report on the Minnesota River. Ed monitors Sacred Heart Creek near where it flows into the Minnesota River. The article spoke of Ed's love for the river and his desire to clean it up. Way to go, Ed!

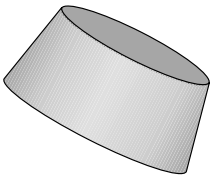
Bear this in mind while monitoring.

In July 1999, Barbara Nelson from Chisago County had an encounter with a bear that cut her monitoring season short. Barbara is a CSMP volunteer who monitors a spring on her property that flows into Goose Creek and eventually to the St. Croix River. She leaves her pail and transparency tube in a shed near the spring. Upon arriving at the shed one day, Barbara found the screen window ripped off, her pail punctured and the transparency tube chewed up! A bear had broken into the shed, apparently looking to appease its appetite. Barbara noted that it wasn't a good year for berries, and this must have just been one hungry bear. Watch out for unsuspecting transparency-tube predators out there!



Gear-maintenance Tips.

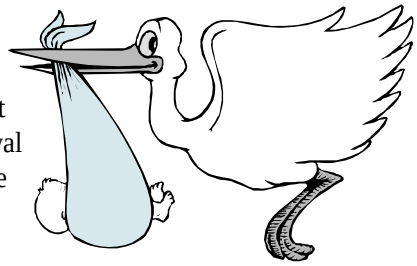
- Watch out for loose stoppers! We've had reports of stoppers being lost from transparency tubes. Each time you monitor, check to be sure that the stopper is firmly wedged into the bottom of your tube. If you lose your stopper, contact Laurie Sovell, CSMP coordinator (see above for contact information).



- Dirty transparency tube? If you monitor a stream that is on the murky side, chances are the walls of your t-tube have clouded up. Try cleaning the inside of your tube by filling it three-quarters full with tap water, add a couple drops of dish soap, and push a clean, soft rag or washcloth down the tube with the end of a broom handle, scrubbing the sides. If you take the stopper out of the bottom, be sure to fit it back into the tube securely.
- Crimped release valve tubing. Try moving the position of the clamp on your release valve tubing from time to time. By doing this, the tube won't break down and get crimped at any one spot.
- Rain-gauge maintenance. During the monitoring season, clean the outer and inner cylinders of the rain gauge regularly to get rid of any soil or uninvited bugs that might influence your reading. Before the first hard freeze each year, bring the inner cylinder and top funnel indoors to prevent cracking. If you want to record snowfall, leave the outer cylinder outside during the winter months. When it snows, melt the snow indoors and pour snowmelt through the funnel into the inner cylinder to take your reading.

CSMP coordinator to take leave this spring.

Your CSMP coordinator, Laurie Sovell, is expecting the arrival of a baby this April and will be taking a three-month leave. If you have any questions or needs while Laurie is away, contact Jennifer Klang in the MPCA St. Paul office at (651) 282-2618. This arrival will delay completion of the 1999 annual report a bit. Look for a 1999 report in the mail by the end of this year.



MPCA monitoring data coordinators: your CSMP contacts across Minnesota

The Minnesota Pollution Control Agency has the following staff who serve as CSMP contacts in different regions of the state:

Jesse Anderson
Northeast Region
Duluth office:
(218) 529-6218

Jennifer Klang
Metro Region
St. Paul office:
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Laurie Sovell
Statewide Coordinator
Southern Region
Mankato office:
(507) 389-1925

Mike Vavricka
Northwest Region
Detroit Lakes office:
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