

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
SURFACE WATER QUALITY DIVISION
MARCH 2001

STAFF REPORT

THE USE OF MICHIGAN VOLUNTEER MONITORING DATA
BENEFITS AND CONSTRAINTS

INTRODUCTION

In January 1997, the Michigan Department of Environmental Quality (DEQ) completed a water quality monitoring report titled, "A Strategic Environmental Quality Monitoring Program for Michigan's Surface Waters" (Strategy). A goal of the Strategy is to assess 80 percent of stream and river miles. One method identified by the DEQ to help to achieve this goal was to develop partnerships with citizen volunteer monitoring groups. Many states have successful programs to work with citizen volunteers in the collection, interpretation, and management of water quality data. Similarly, the Land and Water Management Division (LWMD) of the DEQ has worked with volunteers since the 1970s to monitor inland lakes through the Self-Help Program. Based on these successful programs, the Surface Water Quality Division (SWQD) of the DEQ proposed to work with groups to establish a statewide volunteer program for wadable streams.

Many volunteer groups already monitor Michigan rivers and streams at various levels of effort. Almost 200 organizations have programs designed to protect and monitor Michigan waters. These groups have a variety of objectives, including public education, clean-ups, establishment of baseline conditions, and measuring the effectiveness of remedial activities. They offer a tremendous potential resource for assessing water quality in Michigan. However, many issues must be resolved before the SWQD can reliably use such data for decision-making purposes. These include the establishment of consistent monitoring goals and objectives, standard data collection, management, and reporting procedures, volunteer training, and Quality Assurance (QA) procedures.

In fiscal years 1998 and 1999, nine organizations received a total of \$76,000 for volunteer monitoring projects from the \$500,000 general fund appropriation. Five additional organizations received a total of \$47,019 in Fiscal Year 2000 from the Clean Water Fund, and are just beginning their projects. Based on our experience to date, this report describes program accomplishments and summarizes the benefits of volunteer monitoring and the use of volunteer data as a screening tool to assist SWQD water quality monitoring efforts. This report also identifies some constraints or limitations of volunteer monitoring, as well as issues that require additional study. Overall, we believe that volunteers provide a valuable service to the SWQD monitoring program, as long as they are properly trained and follow specific QA procedures.

Program Accomplishments

- Fourteen groups received grants totaling \$123,019 between Fiscal Years 1998-2000 (Fig. 1).
- The SWQD staff has trained 15 volunteer organizations. The five groups that recently received Fiscal Year 2000 (FY00) grants will be trained in spring 2001.
- Volunteers have assessed approximately 120 sites, with data collected on benthic invertebrates, habitat, water chemistry, and/or temperature. We expect that organizations funded in FY00 will monitor approximately 50 additional sites.
- Standard data forms and collection procedures have been developed and are used by all volunteers that have received SWQD funding and/or training.
- A database (Microsoft Access) has been developed to store and retrieve volunteer data. This database soon will be available (read-only) to the public via the SWQD web site.
- QA procedures have been established to ensure data quality. All volunteers are required to provide specimen jars to SWQD for verification of taxonomic identifications. This also allows SWQD biologists to identify the invertebrates to the Family level. The SWQD biologists also have conducted follow-up sampling to determine whether volunteers are effectively collecting invertebrates and assessing habitat. Additional follow-up sampling will be performed in spring 2001.
- The first quarterly newsletter for volunteers has been drafted and will be released soon. The newsletter will provide an opportunity to communicate with volunteers on key issues, and for volunteers to learn about the activities of other organizations.
- For the first time, volunteer data were provided to SWQD biologists to assist in the planning of year 2000 watershed surveys. Data were used to identify locations for which site visits were warranted, compared to those that appeared to be in good condition and did not require additional assessment by the SWQD. Initial feedback from the biologists has been positive, and in future years we will continue to provide volunteer data to the watershed biologists.

Benefits

1. Volunteer Data Can Serve as a Valuable Screening Tool for SWQD Biologists.

A primary objective of the stream volunteer monitoring program is to produce high-quality data to assist DEQ managers and staff in aquatic resource management decisions. This requires that all volunteers collect data on a core set of parameters using standard forms and consistent procedures. The SWQD has developed procedures for the collection and analysis of benthic invertebrate and habitat information, and is considering the development of procedures for the collection of water samples. All groups participating in the state program are collecting data on stream habitat and benthic invertebrates. Invertebrates are identified to Order, as a minimum, and assessments (both invertebrate and habitat) are qualitative. This information is intended to serve as a screening tool for SWQD biologists to help identify which sites in a given watershed are most likely supporting the aquatic life designated use or require additional assessment. A few groups are collecting water chemistry data (primarily nutrients), and one organization routinely reports water temperature data.

Completed volunteer data sheets were provided to SWQD biologists for the first time in early 2000 to assist with the year 2000 watershed surveys in the Pentwater and Devils River watersheds. DEQ biologists used the data to develop watershed assessment plans. They identified sites from which volunteers collected a diverse array of benthic macroinvertebrates and therefore did not require a visit, as well as locations that required further evaluation based on poor habitat and/or few benthic taxa found by volunteers. In addition, the water temperature data

collected by volunteers in the Pentwater River watershed were used as part of the Section 401 Water Quality Certification development process for the City of Hart hydroelectric project. Therefore, initial feedback is that the volunteer data have been useful.

Each year, after the conclusion of the field season, all biologists who were provided volunteer data to assist with stream survey planning will be surveyed. Specifically, we want to know whether the biologists used the information in planning their surveys, how they used the data (and if not, why not), whether it was useful, whether they would like volunteers to collect additional types of information, the quality of the data, etc. These surveys will help to ensure that the volunteer data provided to biologists are timely, useful, and informative. We also will be able to identify any problems that may arise, such as poor data quality from specific volunteers, and take the necessary corrective steps to ensure proper training.

2. Volunteer Data can be used for Attainment Decisions in Some Circumstances.

In some cases, volunteer data can be used as a basis for determining that a waterbody is attaining water quality standards. If volunteers find an abundance of taxa, especially stoneflies, mayflies and caddisflies, in a particular stream reach (which are verified by specimens in a jar sent to SWQD), it can be concluded that the site is meeting standards and does not require a site visit. Some sites in the Pentwater and Devils River watersheds were listed as attaining standards based on the volunteer data. This approach helps the biologists allocate limited field time more efficiently.

3. Working with Volunteers Provides a Valuable Opportunity to Educate the Public about Water Quality Issues.

Aside from the value of the data, there is a tremendous benefit to discussing water quality issues with volunteers and explaining what to look for when they visit a site. They learn about issues such as how sediment affects aquatic life and potential sources. Volunteers can look for eroding banks, poorly constructed road crossings, or construction sites that are contributing sediment to the stream. They learn about the importance of riparian vegetation as a buffer zone, and why they shouldn't mow right up to the river's edge. They find out why they should not dump leaves or grass clippings into the river, and can then communicate this message to neighbors. We believe that providing this information as part of the volunteer training sessions improves water quality, although it is impossible to quantify.

4. Data Collected by Volunteers can Spur Local Decisions and Action to Protect Water Quality.

The SWQD recently provided a grant to a group of volunteers on Mill Creek in Lapeer and St. Clair counties. Prior to this grant award, we trained the volunteers and assisted with QA. The volunteers are using the data they collect to compare the effects of stream dredging on aquatic life versus the use of subtle stream restoration techniques to improve drainage. The drain commissioners of the two counties agreed to factor the benthic invertebrate and habitat data into their decision on whether to conduct additional dredging. This provides an excellent example of volunteers using their data to affect local planning and decision-making. As the program develops, we expect other organizations to use volunteer data to influence local actions.

5. *Volunteers can Monitor Watersheds more Frequently than SWQD and can Quickly Inform us of Pollution Incidents.*

Based on our five-year NPDES cycle, SWQD only surveys a watershed once every five years. In contrast, volunteers can monitor sites twice per year. These additional volunteer surveys should detect any problems that may arise in between our five-year cycle. The volunteers can quickly alert us to any indication of pollution incidents or habitat degradation, rather than having to wait until the next SWQD survey which may be years away.

6. *The Volunteer Monitoring Program is Good Public Relations for SWQD.*

The SWQD staff frequently receives positive comments and feedback from the volunteers with whom we interact. Volunteers are very appreciative of the time and technical support provided by SWQD. We interact with people in a positive, non-confrontational setting where we are working together for common goals. People want their data to be used by the department and are very receptive to using our procedures. This activity has a positive effect on DEQ's image with the public.

Constraints

1. *Schools are not as Reliable as Adult Volunteers in Providing Reliable, High-quality Data.*

Based on volunteer participation to date, we have observed that working with adult volunteers is preferable to working with schools. A number of reasons may contribute to this observation. Training logistics are more difficult with schools. All adult volunteers are trained, whereas only teachers are trained and not the students. Unless the teacher is very knowledgeable and dedicated to water quality monitoring, it is difficult to make sure that the students do a thorough job of collecting benthic invertebrates. Overall goals of the groups are different as well. Adults tend to be very interested in water quality issues and want to make something happen, whereas schools focus on education. Data quality seems to be a secondary consideration for schools. For example, the Friends of the St. Joe received a volunteer grant in Fiscal Year 1998 (FY98), and are working through teachers and schools to collect data in the watershed. Most classes did not begin sample collection until fall 1999 or even spring 2000. Some of the classes have not submitted data forms or specimen jars. Likewise, the Northern Tittabawassee River Task Force worked through schools to sample locations on the Cedar River in Gladwin and Beaverton. These schools did not collect data until spring 2000, one year after receiving training and grant funds. Few data forms have been received, and it is difficult to contact teachers. In contrast, most groups with primarily adult volunteers have collected samples within weeks of training and generally submit their data forms immediately. Therefore, we recommend that SWQD focus limited staff time and funding on adult volunteers. These adults can encourage children/students to participate in the surveys to generate additional interest.

2. *Volunteer Data Alone Should not be used for Nonattainment Decisions.*

It was previously stated that we can use volunteer data to conclude that a site is attaining water quality standards, as long as proper QA procedures are followed. However, volunteer data alone should not be used to determine that a site is not meeting standards. Follow-up visits by a SWQD biologist at volunteer sites have indicated that a small percentage of the volunteers are not effective at collecting invertebrates, despite the training session. This is not surprising, especially early in the program. We expect that volunteers will improve as they gain experience.

Few taxa at a volunteer site may indicate that the SWQD biologist should include the location for a follow-up visit on his/her list when planning a watershed survey. Only after a SWQD biologist confirms the volunteer data should a site be considered for the nonattainment list. Thus, volunteer data serves its intended purpose as a "screening tool".

3. A Few Volunteers Do Not Appear to be Thorough in Collecting Benthic Invertebrates.

Follow-up assessments have been conducted for four of the volunteer groups (Pentwater, Flint, Devils Rivers and Mill Creek). These assessments involve a SWQD biologist visiting a subset of the sites sampled by volunteers in each watershed. At many sites, the DEQ biologist found taxa that the volunteers had missed. However, in most of these cases, the number of individuals found by the DEQ biologist were three or fewer, indicating that the volunteers generally did not miss common taxa. There were a few sites where the volunteer team missed some common taxa and clearly were not effective in the collections. These individuals require additional training, or should be paired with volunteers that performed better. Follow-up sampling in other watersheds, at a subset of the volunteer sites, will be conducted in spring 2001.

With regard to identifications, DEQ requires that volunteers provide specimen jars so that we can verify volunteer identifications. These reviews indicate that volunteers are doing an outstanding job identifying to Order (or in some cases Family). The only common problem is that some volunteers incorrectly identified Tabanidae as Tipulidae. Almost all other taxa are correctly identified. Based on these reviews, it appears that incomplete sample collection is a greater source of error than incorrect identifications. The QA assessments will continue and we will work with volunteers to address problems that may arise. We expect fewer problems (which have been minimal so far) as volunteers gain experience and confidence.

There is a question as to whether we can draw reasonable conclusions about water quality based on benthic invertebrates identified to Order. For most volunteers, it is not practical to expect Family-level identifications unless they have access to someone with a background in stream ecology (such as a professor at a local college or university) who is willing to provide assistance. There is no question that our ability to interpret data improves with greater taxonomic resolution. For example, if a volunteer data sheet indicates that stoneflies, mayflies, and caddisflies are abundant, we might conclude that a given location is healthy. A potential problem, however, is that it is impossible to tell from the sheet whether all the caddisflies were Hydropsychidae or the mayflies were all Baetidae (both of which are quite tolerant of marginal water quality), or whether many types of these organisms were present. We have resolved this potential problem by requiring volunteers to submit jars that include specimens of all types of collected organisms. As a result, SWQD staff can quickly identify the specimens to Family. This information can be provided to the biologists and can be used to identify locations that are meeting Michigan Water Quality Standards.

4. It Remains to be Seen if Groups Continue to Monitor Over Many Years.

One concern for the volunteer program is how long individual groups will continue to monitor their watersheds. We do not want to provide grant funds to groups that monitor for a couple years and then lose momentum or move to something else. One of the criteria used to select groups for funding is a demonstrated ability to continue their efforts when grant funds run out. All nine of the organizations funded in FY98 and FY99 are still collecting data, although some of the school-based groups are not turning in many data sheets and specimen jars (as discussed above). In future grant awards, we intend to include language in the contract that any equipment

purchased by volunteer organizations with grant funds is theirs as long as they use it. If they do not use the equipment for one full year, then the equipment reverts back to SWQD. It is too early to determine whether a lack of long-term volunteer participation will constrain program effectiveness.

Other Issues

One observation is the advantage of working with an existing organization rather than one formed specifically for volunteer monitoring. Existing groups generally have access to a reasonably large pool of volunteers, can do more in the way of outreach and linking monitoring with other activities, and seem likely to stick with projects over a longer time period (although only time will tell whether this actually bears out). Existing groups also generally have a paid staff person who takes the lead in coordinating volunteers and making sure that sites are assessed at the appropriate time. Whether an existing organization or not, it is imperative that volunteer groups have strong local leadership willing to take responsibility to get things done. One potential problem with existing groups is that they might not be willing to change their procedures or data forms to be consistent with DEQ. However, all groups approached to date have been willing to use DEQ procedures if it means that their data will be used. Therefore, this issue hasn't yet been a problem.

When providing training, the instructor must assume that volunteers have very little experience with stream terminology and benthic invertebrates. While a few volunteers have some experience or background in the area, most are simply concerned citizens interested in water quality who want to get involved. Therefore, it is essential that all terms and concepts on the data forms are explained. It also has become apparent that slides are very helpful in explaining concepts and showing concrete examples of different types of substrate, riparian vegetation, sedimentation, stream flows, etc. In this case, a picture really is worth a thousand words.

While practicing benthic invertebrate identifications, volunteers usually work in groups of 2 or 3, depending on the number of trainees, due to limitations in the number of practice specimens. The instructor has to watch how each group interacts, because many times there is one person in the group who has more experience or just takes charge, while another person may be very quiet or unsure of themselves. What can happen is that the more vocal person takes charge of the identification, with the quiet person just going along, perhaps without understanding how or why a specimen was identified. The instructor has to make sure that all volunteers are participating in the identifications, and not just getting pulled along by others in their group.

The field component of the training also is important. This is when an instructor can determine how well the volunteers understand various terms, concepts, and benthic macroinvertebrate collection procedures. It gives the volunteers a chance to work independently, but also to have someone available to answer questions and clarify problems. It gives volunteers some confidence in their ability to successfully assess the stream.

Finally, a successful volunteer monitoring program requires the participation of district staff and the watershed biologists. The district staff can help to identify volunteer organizations and stimulate interest in the program, as well as serve as the main communication link with these organizations. The watershed biologists similarly play an important role in this program, by using the volunteer data in watershed survey planning and identifying monitoring needs (locations, parameters) to the volunteers.

SUMMARY

Based on our experience to date, the volunteer monitoring component of the monitoring strategy seems to be working well. For the most part, volunteers appear to be reasonably effective at benthic invertebrate collection and identifications after going through a training session. We expect volunteer performance to improve as they gain more experience. For the first time, volunteer data were used to assist with watershed survey planning in 2000, and we intend to seek biologist feedback to determine whether the data were helpful and how data presentation can be improved. Some sites have been listed as attaining water quality standards based on volunteer data.

Effective training and QA procedures are critical components of this effort. We should only accept data from volunteers that are properly trained. It is important for volunteers to submit specimen jars so that results can be verified and we can identify the specimens to Family. Staff also needs to conduct follow-up surveys for many groups next spring to evaluate the accuracy of their work. When problems are identified, steps will be taken to improve volunteer performance.

RECOMMENDATIONS

- We recommend maintaining the current level of resource support for volunteer monitoring, specifically 1 FTE and \$50,000 for grants. This will ensure that the volunteer program continues to grow and improve, but not too much such that data quality is compromised.
- Grants generally should be provided to established watershed groups to ensure data quality and the likely continuation of monitoring after the grant expires.
- The volunteer data should be made available on the SWQD Web site, so that the public can readily access this information in a user-friendly manner.
- A periodic newsletter should be produced and distributed, to demonstrate that volunteer data are used and to communicate among volunteers and between SWQD and volunteers.
- SWQD should develop formal recommendations for water chemistry sampling by volunteers, as well as associated QA procedures. Some groups are collecting water samples and having them analyzed by qualified laboratories, but we should formalize these procedures.

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