The Volunteer Monitor

The National Newsletter of Volunteer Water Quality Monitoring
Volume 13, No. 1, Spring 2001

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Issue Topic: Clean Water Act

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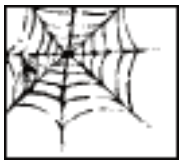

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Next issue

Coast and Ocean Monitoring

In the Fall 2001 issue of The Volunteer Monitor we will focus on the theme of "Coast and Ocean Monitoring". The coediting group will be The Nature Conservancy in the Florida Keys. Please contact the editor (address below) with any ideas for topics.

About *The Volunteer Monitor*

The Volunteer Monitor is a national newsletter that facilitates the exchange of ideas, monitoring methods, and practical advice among volunteer monitoring groups.

A different volunteer monitoring program serves as coeditor for each issue. This issue was coedited by the Lower Colorado River Authority's Colorado River Watch Network, the first established and largest regional volunteer water quality monitoring network in Texas.

Reprinting material from *The Volunteer Monitor* is encouraged. Please notify the editor of your intentions, and send us a copy of your final publication.

For editorial inquiries only, contact Eleanor Ely, Editor, 133 Ninth St., Providence, RI 02906; 401-521-8104; ellieely@earthlink.net.

(Note new address and phone number.)

How to Subscribe

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The Volunteer Monitor is also available online at http://www.epa.gov/owow/volunteer/vm_index.html.

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How Does the Clean Water Act Fit into My World?

by Gayle Killam and Eleanor Ely

Q: What do these scenarios have in common?

Vounteers walk the Los Angeles River's concrete "canyon" taking samples at storm drains

Rhode Island lake monitors provide water quality data to the state agency

Citizens in Texas use their data in a hearing to get a sewage treatment plant upgraded

A: All these citizens are taking advantage of some provision of the Clean Water Act to protect their water-body. The Los Angeles volunteers are collecting data for TMDLs, the Rhode Islanders' data are being used in the state's 305(b) report and 303(d) list, and the Texas citizens are basing their case on their state's water quality standards.

> For readers who may feel a bit boggled by the above terminology - TMDL, 303(d), water quality standards - this article aims to provide some guidance. Admittedly, the federal Clean Water Act (full text available online at www4.law.cornell.edu/uscode/33/ch26.html) can be pretty inscrutable unless you're lawyer, and state water quality standards also tend to be challenging to navigate. But knowledge, as they say, is power. The Clean Water Act, originally passed in 1972 and amended several times since then, guides almost everything states do to protect and restore their waters. Arming yourself with an understanding of this crucial law will put you in a strong position to defend and improve your waterbody. This short article is of necessity very oversimplified. (For more comprehensive help, refer to the resources listed at the end of the article.) Any attempt to discuss the Clean Water Act for a national audience is complicated by the fact that the federal Act provides only a general framework, within which states have considerable leeway. To find out how your particular state implements the Clean Water Act, sooner or later you will have to buckle down and study your own state agency's documents. Below we will focus on four important provisions of the Clean Water Act: water quality standards, the 305(b) report, the 303(d) list, and the TMDL program. It may be helpful to visualize these provisions as a train, with water quality standards as the "engine" and each car to a large extent dependent on the one before. (Note: Thanks to Georgia Legal Watch, from whom we are borrowing the train motif.) In reality, of course, the Clean Water Act is much more complex - it has more parts, and they are interconnected in a nonlinear way - but ultimately all the provisions relate back to the fundamental question, "Are water quality standards being met?"

There are plenty of ways for volunteer monitors to get on the train - and, to quote the folks at Georgia Legal Watch, "Citizens should be in every car."

What is the waterbody supposed to look like?

It makes sense that we should start with a picture of health in order to determine whether the patient is sick, right? In the case of a waterbody, the picture of minimum health should be represented by the state's water quality standards. As the train "engine," water quality standards can be a matter of life or death for waterbodies because nearly

every Clean Water Act provision depends on them. If standards are weak, harmful activities can be perfectly legal.

These standards consist of three components: (1) designated uses of the water, (2) water quality criteria to protect the uses, and (3) an antidegradation policy directed at keeping healthy waters healthy.

1. **Designated uses**

   Your state water quality agency is required to "designate" the uses for each waterbody. Important uses are swimming, drinking water, and aquatic life. The 1972 Clean Water Act set an objective that all the nation's waters should be "fishable and swim-mable." (Note: "fishable" is shorthand for protecting all aquatic life, not just fish for human consumption.)

   Sometimes people wonder why, for example, a certain waterbody has a designated use of swimming even though the water is not clean. The answer is that designated uses are goals. Even though the waterbody may not be safe to swim in now, attainment of water quality suitable for swimming is the goal. Getting the designation of uses right is important because the water quality criteria are developed to protect the designated uses.

   ## Designated Uses

   What does this mean for you?

   - Get your state water quality standards from your state water quality agency. They are usually available on the Web. (Go to www.rivernetwork.org/library/librivcwastate_intro.cfm to see references to each state's water quality standards and contact information.)
   - Look up the designated uses.
   - Compare what you know about your waterbody to the uses that have been officially designated.
   - Inform the state water quality agency about current uses that have been overlooked.

2. **Criteria**

   Your state water quality agency is required to develop water quality criteria that

protect all the designated (and existing) uses. For example, swimming is typically protected by numeric criteria specifying the maximum bacteria counts allowed. What characteristics are important to protect aquatic life? To date, most states have relied on criteria for "stressors" to living organisms, such as pollutants, temperature, or dissolved oxygen. Only a few states use criteria that look directly at aquatic life itself - that is, biological criteria based on assessing communities of macroinvertebrates, fish, or other living things. Indeed some volunteer monitoring groups may be ahead of their state agency in using living organisms as indicators, and may be able to encourage the state agency to move toward using more biocriteria.

In addition to numeric criteria for quantifiable parameters like bacteria or dissolved oxygen, standards generally include narrative criteria (e.g., "no sediment loading above natural conditions" or "must be free from oil deposits and floating debris or scum"). These narrative criteria serve as a backstop or catch-all when specific numbers have not been developed or for problems that cannot be explained by numbers. Violations of these criteria are sometimes harder to prove.

Criteria

What does this mean for you?

- Check whether the criteria are adequate to protect the designated uses. For example, is the temperature criterion low enough to protect all stages of aquatic life in your river?
- Check whether the criteria are being met. Compare numeric criteria with your own data and data from other sources.
- Let the water quality agency know about places where your data show violations of numeric criteria or where you have observed violations of narrative criteria.

3. **Antidegradation**

The antidegradation policy was incorporated into the Clean Water Act to prevent or limit activities that will chip away at existing water quality or improvements that have been achieved - in other words, to keep clean waters clean. The policy contains three tiers:

- Tier 1: Absolute protection of existing uses
- Tier 2: Prevention of degradation to waters whose quality is above the

minimum standard, unless allowing lower water quality is necessary "to accommodate important economic and social development"

- Tier 3: Prevention of any new pollution into Outstanding National Resource Waters

Several states have created an additional "tier," designating waters as either Outstanding State Waters (for example, Outstanding Florida Waters) or Outstanding Resource Waters. These designations are described as giving a greater level of protection than Tier 2 but not quite as much as Tier 3's prohibitions on new discharges. Unfortunately, in many states this designation does not even offer the protection that Tier 2 should offer if it was properly implemented.

Here are some examples of how citizens can use antidegradation policies:

- Tier 1:
  Scenario: Your river is currently designated for swimming and people do swim at the public beach. Just upstream of the beach, the city is proposing to build a new wastewater treatment plant that will discharge into the river. Bacteria are expected to exceed the levels safe for human contact. The city is proposing to make the beach a "boating-only" beach and open another public swimming area upstream of the new treatment plant.
  Application: A Tier 1 review of the permit for the proposed treatment plant should not allow the existing and designated swimming use of the river to be eliminated.
- Tier 2:
  Scenario:A new hard rock mine is proposed on your river. The mine owner has applied for a NPDES (National Pollutant Discharge Elimination System) permit for the discharge. Copper in the discharge is not expected to cause the water to violate water quality criteria, but it will bring the quality of the water down to the bare minimum above the standards.

Application: A Tier 2 review should be performed as part of the NPDES permit review. Projects should not be allowed to erode high quality water that is above the criteria, unless economic and social necessity can be demonstrated.

- Tier 3:

Scenario: Your river is used by whitewater enthusiasts and also supports an endangered fish population. There is a proposal to build a new resort on the river.

Application: This river could be petitioned as an Outstanding National Resource Water. If it is designated as an ONRW, it should be protected from any new discharges or impacts. The state should have a petition process, and it should have the protections built into regulations, but most states do not.

Antidegradation

What does this mean for you?

- When projects and activities are proposed, require the water quality agency to do an antidegradation review.
- When lowering of water quality is being allowed for "economic and social" reasons, require the agency to document the alternatives and justify reasons for degradation. Do some community work yourself to try to prove that the pollution is not socially or economically justified.
- Identify the waters that you know to be ecologically or recreationally significant and submit them as candidates for Outstanding National Resource Waters or Outstanding State Waters.

305(b) Report: Are there problems in your waterbody?

It is worthwhile to do some research on what your water quality agency is publicly saying about the quality of your river. Your state's Biennial Water Quality Report to Congress, or 305(b) report, provides general summary information about the quality of the state's waters. This report is required by Section 305(b) of the Clean Water Act, which says that states must assess their waters every two years to determine whether designated uses are being met. From your state 305(b) report you can extract essential information including (a) whether designated uses are considered "fully," "partially," or "not" supported by the current water quality, (b) what pollutants are causing problems, and (c) what are the sources of the pollutants. [Note: For more on the 305(b) report, see the article on page 16.]

305(b) Report

What does this mean for you?

- Get a copy of your state's 305(b) report from your state agency. (These reports are often but not always available on the Web.)
- Compare what is in the report to what you know about your waterbody.
- Explore the possibility of contributing your monitoring data for inclusion in the 305(b) report.

The train gets moving (citizen lawsuits)

Until recently, the last two cars in our train were stuck on a sidetrack. While states had established water quality standards and were submitting 305(b) reports, Section 303(d) of the Clean Water Act was being largely ignored. Section 303(d) mandates that states prepare a list of threatened and impaired waters (the 303(d) list), then develop cleanup plans for waters on the list based on the total maximum daily load (TMDL) of pollutants that the waterbody can receive and still meet water quality standards.

Technically the 303(d) list is supposed to include threatened waters - i.e., waters that are not expected to meet water quality standards within the next listing cycle. However, in practice most state agencies do not list or prepare TMDLs for threatened waters.

Why was Section 303(d) ignored? The National Wildlife Federation's publication Saving Our Watersheds identifies a number of reasons, including "the political difficulty in confronting the powerful agricultural and timber lobbies, and industries and municipalities; the lack of federal and state financial and staffing resources to implement controls; the lack of monitoring data on background and current water quality conditions; the diffuse nature of nonpoint sources; and the difficulty in tracing diffuse sources of pollution."

Seeing in the TMDL process a valuable tool for cleaning up nonpoint source pollution, environmental organizations launched a series of lawsuits in the 1980s to force the Environmental Protection Agency (EPA) to require states to implement the provisions of Section 303(d). The citizen groups lost the first few lawsuits but by the mid-1990s they were winning in state after state. In a dramatic illustration of citizen power, these lawsuits have succeeded in resurrecting the TMDL provision of the Clean Water Act. As of June 2001, cases have been brought in 37 states and the District of Columbia. Of these, 22 (in 20 states) have resulted in EPA being placed under court order or consent decree to establish TMDLs if the state does not do so in a timely manner. (For details and status of litigation, see EPA's TMDL Website, www.epa.gov/owow/tmdl/. For a lively account of the legal battles, see Oliver Houck, The Clean Water Act TMDL Program: Law, Policy, and Implementation.)

> "It is hard to think of any program more precipitously driven by citizen suits from absolute zero toward its statutory destiny than TMDLs. ... The genius of American public environmental law - and the reason American laws work where the similar and often stronger-looking laws of other countries do not - is brought home again by this experience."
>
> --Oliver Houck,
> The Clean Water Act TMDL Program:
> Law, Policy, and Implementation

The TMDL approach represents a change of focus because it addresses all sources of pollution to a waterbody, both point and nonpoint. By contrast, earlier efforts under the Clean Water Act focused mainly on point sources of pollution, like industrial discharges and wastewater treatment plants, which can be regulated with a discharge permit under the NPDES program.

It is important to realize that although the TMDL process applies to both point and nonpoint polluters, it does not establish any federal regulatory authority over nonpoint sources. It is up to states to employ whatever approaches they choose to clean up nonpoint source pollution in waters for which TMDL plans have been created. Here again we can expect to see variability from state to state, with some states relying solely on voluntary programs while others give the TMDL process more "teeth" by establishing state regulatory programs for nonpoint sources.

Today TMDLs are at the center of water quality protection. State and federal agencies are being guided by them; funding decisions at the federal, state, and local levels are being influenced by them; elected officials are arguing about them; and watershed groups around the country are trying to have a say in them.

303(d) List: What is impaired?

To carry our Clean Water Act train analogy a step further, we can think of the train as having two possible "destinations" or goals: protection and restoration. In the case of high-quality waters the goal is protection, achieved by means of antidegradation policies as discussed above. When waters don't meet their designated uses, we want to head toward restoration. To achieve this goal, we use the TMDL process described in Clean Water Act Section 303(d).

> Helpful hint for those who may be getting 303(d) confused with 305(b): Joan Kimball of Massachusetts Riverways recommends the mnemonic "d is for dirty."

The first step in this process is for the state to create a segment-by-segment listing of all waters that are considered threatened or impaired. This is the 303(d) list or "impaired waters list." In compiling the 303(d) list, most states start with data and findings from their 305(b) assessment process - another good reason for getting your monitoring data into your state's 305(b) report.

The 303(d) list specifies all the criteria that are violated for each segment, which is why you will hear people describe a waterbody as "listed for fecal coliforms" or "listed for temperature and dissolved oxygen." The 303(d) list also assigns a priority to each listed

segment, which determines the order in which TMDLs will be established.

States are required to submit a 303(d) list to EPA every two years, but 1998 (thanks to the lawsuits) was the first year that every state actually filed a 303(d) list. (Because of EPA rulemaking, the 2000 lists were not required, so the next 303(d) lists are due in 2002. Some states filed a 2000 report anyway.)

States are trying to remove segments from the 303(d) list, either to reduce their responsibilities for developing TMDLs or because they are pressured by polluters. Legally, waters should be removed only if (1) the original listing was based on demonstrably faulty data; (2) the waterbody has been cleaned up since the previous listing; or (3) the waterbody is the subject of an approved TMDL.

Remember the interconnectedness of the cars on the train. If your state has weak water quality standards, waters that would be considered impaired in another state with stricter standards won't be on the 303(d) list. And if a segment is not on the 303(d) list, it won't be in the line-up to receive a TMDL plan.

303(d) List

What does this mean for you?

- Get a copy of your state's 303(d) list from your state agency or from EPA's TMDL Website (www.epa.gov/owow/tmdl/).
- Get on the state's mailing list to be informed of opportunities to review and comment on the 303(d) list.
- Check the list to see if waterbodies you're concerned about are listed for all criteria that are not being met. Submit your monitoring data to document additional violations. States are required to consider "all existing and readily available water quality-related data and information" in compiling the list.
- Compare and contrast the state's

305(b) report and 303(d) list. Are waters that are impaired according to the 305(b) report included on the 303(d) list?
- Be alert to changes, especially removal of segments from the 303(d) list.

TMDLs: How can we fix problems?

A TMDL is essentially a pollution "cap" that needs to be set for every problem pollutant in each waterbody on the 303(d) list. The cap defines the maximum amount of each pollutant that the waterbody can receive and still meet water quality standards for all its designated uses. Or, as Doug Haines of Georgia Legal Watch puts it, "TMDLs are the scream levels - the point where a waterway can take no more."

Once the cap is set, the allowable loading for each pollutant is divvied up among the potential sources. This "pollution budget" or "pie" should include the following:

- Background conditions
- Allocations for all the point sources; termed "wasteload allocations" (WLA)
- Allocations for all the nonpoint sources; termed "load allocations" (LA)
- A margin of safety (MOS)

In short: TMDL = background + all WLAs + all LAs + MOS

Then the state should draw up a plan (called a TMDL plan or simply a TMDL) for achieving the pollution reductions called for in the "budget" and bringing the water into compliance with standards.

The process of assigning TMDL load allocations is bound to be controversial, as the different dischargers will inevitably try to maximize their allocation and thereby minimize impacts on their activities. (For an interesting glimpse at the perspective of the "regulated community," see the resources listed at the end of this article.)

A TMDL (total maximum daily load) specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and allocates pollutant loadings among point and nonpoint pollutant sources.

- from EPA's TMDL Website (http://www.epa.gov/owow/tmdl/)

TMDLs are evolving into watershed restoration plans. While debates are still raging about exactly what needs to be in the plans and how enforceable they are, you can help your state water quality agency, local jurisdictions, and local businesses set up the best plan for the river or waterbody you care about most. For example, in order to calculate pollutant caps and allocations for TMDLs, states often use sophisticated (and data-hungry) techniques to model pollution sources and transport. Volunteer monitors are already helping collect data for these models, as several case studies in this issue demonstrate.

TMDL

What does this mean for you?

- If your waterbody is on the 303(d) list, call your state water quality agency and ask when it is scheduled for a TMDL.
- Get on the mailing list for the TMDL and participate in the development of the TMDL as well as the formal comment period.
- Submit information regarding sources of pollution, data that can help derive numeric water quality targets (for pollutants that have narrative criteria in the water quality standards), and data that could be useful in modeling pollution loads.
- Get a copy of the TMDL guidelines from your regional EPA office. Check that the proposed TMDL for your waterbody contains all the components specified in the guidelines.

That's not all! (Implementation)

Development of the TMDL is not the end of the process. Without a strategy and schedule to accomplish the goals, a restoration plan is just a piece of paper. For point

sources such as municipalities, industry, mining, or feedlots, the TMDL will typically call for permit revisions. For nonpoint sources such as urban, agricultural, or forestry runoff, the plan should propose improvements to management practices. The changes prescribed in the TMDL plan are much more likely to happen in a timely fashion if citizens are calling or writing the agency to inquire about the plans and timeline.

The state should include milestones and monitoring in the TMDL. However, this is not yet happening on a consistent basis. Citizens should ask for these essential tools for success, but in the absence of adequate state monitoring volunteer monitors can identify problems in the plan and bring them to the state's attention.

Things to watch out for!!
Just as citizen actions got the TMDL train moving, citizen input will be needed to keep the process on track. Watch out for the following:

Keep your eyes on your state standards. Across the country, the engine driving the Clean Water Act train is being attacked. States are finding it difficult to complete all the TMDLs required to address the problems in their impaired waters. To reduce the workload, several states are trying to weaken their water quality standards so that fewer waters will be classified as "impaired." If your waterbody is removed from the impaired waters list, check to see whether the standards were weakened. Weakening of standards is not allowed without substantial documentation and justification - request these, and challenge the changes if they remove protection of uses that you care about.

Watch for "business as usual". Some states are blaming all the pollution on background conditions and/or nonpoint sources and then claiming in the TMDL that either (a) nothing can be done or (b) best management practices are going to be put in place or improved - but with no "reasonable assurances" that proposed changes will help the problem. Watch for these TMDLs that really don't call for changes.

Think about future growth. Many TMDLs are being developed without reserving any part of the "pie" for future development that is already planned or likely. This future growth component can show up in a

"margin of safety" calculation, but it is better to see the growth addressed directly.

Models are not perfect. Find out what data and assumptions were used in modeling your waterbody and developing pollution reduction targets. If the data are extremely old, or the model is designed for a river but it is being used on a lake system, there may be a problem.

Threats to high-quality waters. The pressure of TMDLs may send polluters to discharge into clean waters, unless we strengthen and enforce antidegradation policies. From a polluter's point of view, waters that are cleaner than the minimum specified in water quality standards are attractive because of their "assimilative capacity" - that is, their capacity to receive more pollution and still meet standards.

Legal challenges. The TMDL process is under attack in court. Nonpoint source polluters such as agriculture and timber industries are arguing that nonpoint pollution should not be subject to the TMDL process.

The important point is that volunteer monitoring is key to making TMDLs work, because you know your basin well. As the TMDL process moves forward and plans are put in place, you can keep a close eye on what is being changed, what is improving as a result, and what adjustments to the TMDL plan are needed. We are not talking about an exact science here. The truth is, there are too many uncertainties to make the plans perfect on the first try. We will all be learning together. There are many resources for you in your state and around the country. Use your connection to the waterbody as your strength, and good luck!

Gayle Killam *is the manager of River Network's Clean Water Project and co-author of The Clean Water Act: An Owner's Manual. She may be reached at gkillam@rivernetwork.org; 503-241-3506. Eleanor Ely is the editor of The Volunteer Monitor.*

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Clean Water Act Resources

Comprehensive Clean Water Act Guide

River Network's The Clean Water Act: An Owner's Manual (1999) really does live up to its "owner's manual" claim. Clearly written and attractively designed, this is the most comprehensive guide available for citizens who want to find out how the Clean Water Act can help them protect and restore waterbodies. It covers NPDES (Nonpoint Pollutant Discharge Elimination System) permits, water quality standards, the TMDL process, Section 404 (wetland protection), and many other provisions, in each case focusing on opportunities for citizen involvement. Order from River Network, 503-241-3506; $25 + $4 shipping (or order online at http://www.rivernetwork.org EXIT EPA).

EPA Websites

- Water Quality Criteria and Standards Website (http://www.epa.gov/ost/standards): Numerous guidance documents on standards, criteria, and permits.
- 305(b) Website (http://www.epa.gov/owow/monitoring/wqreport.html: Includes 305(b) report guidelines and EPA's national summary report to Congress.
- TMDL Website (http://www.epa.gov/owow/tmdl/): TMDL regulations and guidance, atlas of the nation's polluted waters (based on information in states' 303(d) reports), status report on TMDL litigation, and more.
- WATERS (http://www.epa.gov/waters): A new interactive Website that unites

information on the designated use of waterbodies with state 303(d) lists. Users can find local water quality information for a particular body of water by clicking on an interactive map; they can also generate summary reports for their state. Future releases of WATERS will include additional water quality criteria information; data on ambient water quality and drinking water quality; projects to control polluted runoff; fish consumption advisories; discharge facility outfall locations; and other types of information.

Clean Water Network

The Clean Water Network's very useful Website, www.cwn.org, features a wealth of Clean Water Act-related documents and links. In the section on "impaired waters" you'll find the "TMDL Development and Implementation Toolkit," a compendium of helpful documents from CWN, other citizens' groups, and the federal government.

CWN's latest report, The Ripple Effect: How to Make Waves in the Turbulent World of Watershed Cleanup Plans, is an activists' handbook that walks readers through the TMDL process and suggests questions to ask, policy and technical issues to raise, and organizing and media tactics to try. Download from the "Toolkit" on the CWN Website or order from Merritt Frey at mkfrey@micron.net or 208-345-7776 ($10; free for CWN members).

For more information contact Clean Water Network, 1200 New York Avenue, NW, Suite 400, Washington, DC 20005; 202-289-2395; cleanwaternt@igc.org.

Citizens' TMDL Handbook

The National Wildlife Federation's Saving Our Watersheds: A Field Guide to Watershed Restoration Using TMDLs (1998) offers practical guidance on participating in the TMDL process, including checklists of specific actions citizens can take. Available from National Wildlife Federation, 58 State St., Montpelier, VT 05602; 802-229-0650. 71 pages; $10.

Georgia Legal Watch

Georgia Legal Watch's Community Watershed Project (CWP) is a comprehensive statewide campaign to help Georgia grassroots organizations have input into the state's TMDL process. CWP's tools - brochures, workshops, state TMDL database and maps, TMDL "action alerts," and tips on deciphering the state's 303(d) list - are all designed to give concrete guidance on the "what-when-how-who" of citizen involvement in 303(d) listing and TMDL development. Though geared toward Georgia, these materials serve

as models for groups nationwide. For more information visit www.georgialegalwatch.org/cwp/cwp_main.html or contact CWP Coordinator Beth Fraser at 706-546-9008; glw@georgialegalwatch.org.

TMDLs: A Lawyer's Perspective

In his pithy and provocative book, The Clean Water Act TMDL Program: Law, Policy, and Implementation, Tulane Law Professor Oliver A. Houck takes the reader on a historical and political tour of the TMDL program, with side excursions into many other parts of the Clean Water Act. Deftly cutting a swath through this usually impenetrable landscape, Houck reveals the issues and players behind the policies as he discusses the citizen lawsuits to force TMDL implementation, the responses from states and EPA, and two possible obstacles to the TMDL program's success: the limits of science and the limits of political will. Perhaps the biggest lesson to emerge from this account is the critical role of public opinion and public action in influencing environmental policy.

Based largely on a series of articles published in The Environmental Law Reporter in 1997 and 1998, the book is heavily annotated and includes hundreds of quotes from congressional debates, court battles, agency reports, industry representatives, and others. Published by Environmental Law Institute, Washington, DC (1999); to order call 800-433-5120 ($39.95 + shipping).

Watershed Academy

The EPA's Watershed Academy offers a 2-day course, "Watersheds 101: The Clean Water Act: A Key Tool for Watershed Protection" that provides a broad overview of key elements of the CWA. An expanded 3-day version entitled "The Clean Water Act and Other Tools for Watershed Protection" also includes information about other key federal statutes. For people who will actually be developing TMDL plans, Watershed Academy offers a 1-day course called "Watersheds 103: TMDL Training for Practitioners."

To find out dates and locations of these and other upcoming courses, visit the Watershed Academy Website at http://www.epa.gov/owow/watershed/wacademy/corsched.htm or contact the Watershed Academy, USEPA (4503F), 1200 Pennsylvania Avenue, NW, Washington, DC 20460; 202-260-5368; wacademy@epa.gov. Note: Course space is limited, and often priority is given to government agency staff.

Industry's Point of View

Check out what the wastewater treatment industry is saying about TMDLs. The

Association of Metropolitan Sewerage Agencies' "Evaluating TMDLs ... Protecting the Rights of POTWs" outlines strategies treatment plant operators can use to protect their interests in the TMDL process. Download from www.amsa-cleanwater.org. Also see the article "Stormwater Control and the TMDL Program: The Next Clean Water Act Battleground," by Paul Calamita, in the journal Stormwater. Available online at http://www.forester.net/sw_0103_tmdl.html .

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How to Sweep Away Algae with the Clean Water Act

by Dianne Wassenich

It started out slowly, almost imperceptibly. The green and slimy algae growth crept up gradually, getting thicker every year in the San Marcos River in central Texas. A local bed-and-breakfast owner went from raking the white gravel beach in front of her cabin only once or twice each summer to raking weekly, then daily. Finally, by 1990, raking did no good at all, since the whole river was covered with algae. The build-up of slime started to smell like rotting garbage.

The San Marcos River, which pours out of very large springs in the center of the City of San Marcos, is well known all across Texas for its crystal-clear waters and excellent swimming, tubing, and canoeing. But now, for the first time in memory, locals downstream of San Marcos thought twice about swimming in the river. On hot summer afternoons large bubbles of algae would rise from the river bottom, forced up by the gases from the rotting algae mats. Canoeists could float among these large balloon-like shapes, which seemed to be tethered on strings of algae to the river bottom, and poke the mounds with a paddle, causing a loud "Bloop!" as the gas escaped. It was truly a disgusting sight, and the San Marcos River Foundation (SMRF), a nonprofit group formed to protect the river in 1985, felt that something had to be done quickly to discover and remedy the cause of this out-of-control algae bloom.

Looking for the cause

Some people in town suggested that the algae bloom was caused by lack of flushing action, pointing out that several dams had been built on tributaries to the upper river over the last 20 years. Others (including many at SMRF) thought the culprit must be the City's antiquated sewage treatment plant, which discharged into the river. The City countered that two other facilities, the State Fish Hatchery and an old Air Force base which was now a federal job training center, discharged wastewater that was more polluted. Other possible sources were rural septic tanks and agricultural runoff.

To get to the bottom of the problem, so to speak, SMRF went looking for data. We found that city and state agencies had very little. However, Steven Fonville and Duane TeGrotenhuis, two volunteer monitors with Texas Watch (the statewide volunteer monitoring program), had several years of data showing that dissolved oxygen levels and water clarity were deteriorating downstream of San Marcos.

SMRF then commissioned a study by a local professor, Al Groeger of Southwest Texas State University in San Marcos, to assess exactly which nutrient was causing the algae problem. By measuring nitrogen and phosphorus levels at various points Groeger showed that the water coming from the springs was naturally high in nitrogen but low in phosphorus, meaning that phosphorus was the limiting nutrient. The City's wastewater discharge was found to be much higher in phosphorus than the river upstream of the plant. Groeger also suspended unglazed tiles in the water to see which discharges would produce the most algal growth on the tiles. Groeger's studies clearly implicated the City's wastewater discharge.

SMRF corrects the state's computer model

The City's permit for a secondary level of wastewater treatment had been approved by the Texas Natural Resource Conservation Commission (TNRCC) based on a computer model of dissolved oxygen in the river. So SMRF obtained a copy of the state's model and ran it on our own computers. Fortunately SMRF member Jack Fairchild, who at the time was our board chairman, is a retired aeronautics engineer with extensive experience in computer modeling.

"We noticed that the state's model had entirely overlooked a large dam," says Jack.

"Also, we saw that whenever the state didn't have site-specific data they had used 'Texas default values,' based on the average value for rivers all over the state. For depth, this default value was about 1 meter." SMRF members knew the river was much deeper than that. Using a homemade depth gauge made from PVC pipe, SMRF volunteers took measurements at over 100 sites and found that the average depth was nearly 3 meters. In addition, SMRF persuaded the City to measure benthic oxygen demand, which turned out to be about ten times higher than the default value used in the model.

By inputting the corrected values into the model, Jack proved that the wastewater plant would not satisfy required dissolved oxygen levels with current levels of treatment. TNRCC hydrologists agreed. At this point the City was ready to go ahead and build a tertiary treatment plant, with stricter limits on total suspended solids, biological oxygen demand, and nitrogen. But the question of phosphorus was a sticking point. In spite of SMRF's scientific studies, the state hydrologists and the City's engineering consultants still maintained that treatment to remove phosphorus was not necessary.

Using the Clean Water Act

Finally, as the permit protest went to a formal hearing in 1994, SMRF decided to use the anti-degradation sections of the Federal Clean Water Act, implemented in Sec. 307.5 of the Texas Water Code, to make its case. Antidegradation policies protect existing uses in all waters and protect high quality waters from being brought down to a lower level.

"The objective of the Clean Water Act is not to make each stream equally dirty, but to preserve the water quality that is there to begin with," says Jack. "What distressed us was that we have this beautiful spring-fed river, whereas most Texas rivers are fairly shallow and muddy. It didn't seem fair to us to allow polluters to degrade our river down to the same level as these dirty rivers all over the state."

SMRF argued that phosphorus from the discharge was causing algae blooms, thereby impairing several designated uses including swimming, aquatic life (especially the endangered fountain darter), and aesthetic values. The data from the Texas Watch monitors, SMRF volunteers, and the nutrient studies commissioned by SMRF were all used in the two-week hearing, which was a tough fight for SMRF against the City and a large nationally prominent engineering company chosen by the City to represent them in this case. The state chose to defend the City's permit in the hearing as well.

In the end, the hearing examiner agreed with SMRF that the Clean Water Act required removal of phosphorus from the City's wastewater in order to keep from degrading this very unique river ecosystem. Bill Bunch, the lawyer who represented SMRF in the case, later commented that in 12 years of representing citizen groups in cases involving wastewater discharge permits he had never seen such an extraordinary citizen effort at

gathering data that was critical to achieving tighter standards.

Faced with the hearing examiner's decision, the City finally decided to go ahead and build a tertiary plant including phosphorus treatment, particularly since SMRF had shown that the City's engineering firm had overestimated the cost of such treatment. In fact, the City was embarrassed to find that it had spent more on the legal battle to avoid building the phosphorus treatment than it would have spent by just building it.

Outcome: Clean water

It took several more years to build the new sewage treatment plant, but as soon as it went on line, the improvement to the river's water quality was quite apparent. Meanwhile, SMRF continued to work on improving the discharges from the fish hatchery and job center, using more data provided by the new large group of volunteer monitors named the San Marcos River Rangers, who were inspired to form their group by the previous hearing. The State Fish Hatchery agreed to build a treatment plant (the first one in Texas for a fish hatchery) when further scientific studies by SMRF documented the impact their large operation was having on the water quality and endangered species of the river. The federal job training center shut down its antiquated small sewage treatment plant and began sending its waste to the City for treatment. Permit protests and hearings were not needed in these two efforts; SMRF's data - plus our reputation for persistence - carried the day.

Now old-timers are seeing river water clarity that they remember from 50 years ago. People are even snorkeling for miles downstream! And the City is able to sell its good-quality wastewater for industrial use and golf courses, further sparing the river of even minor pollution. "The improvement is incredible," says Jack Fairchild. "I can see fish at the bottom of 8-foot pools where before you could not see 2 feet into the water."

The river may be clean, but our task isn't over; now we need to make sure it stays clean. With support from SMRF, the River Rangers volunteer monitoring group has grown to 20 volunteers testing 15 sites, providing a steady eye on the river year-round.

Through our battles to clean up our river, SMRF learned that the Clean Water Act - when combined with good water quality data and judicious use of protests and pressure -

makes an excellent tool for clearing away algae.

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Looks Do Matter

by Scott Kishbaugh

Volunteer monitoring programs can save water resource managers more than an arm and a leg. In addition to these contributions to limb-nology, lay monitors generously provide other body parts to the greater monitoring good. They provide many hands to grasp sample bottles (and larger truths about their stream or lake), feet(s) for kick-netting feats, and voices to provide managers with better stewardship choices. But increasingly their eyes are reflecting greater insights about the waters they monitor.

To be sure, the eye-deal lake monitoring tool, whether used by professional or layperson, has been the observation of water clarity using a simple Secchi disk. In addition, both stream and lake monitoring programs have long included visual observations of weather and habitat, and reports when things just don't look right. But in recent years, many lake monitoring programs have asked lay monitors to record their observations about lake conditions as related to recreational suitability of the lake. This "user-survey" approach was pioneered in the 1980s by volunteer lake monitoring programs in Minnesota and Vermont, and is being adopted by more programs each year.

User perception surveys

User surveys typically ask the lay monitor to assess the physical condition of the lake (how it looks) during each sampling session on a five-point scale, from 1 ("crystal clear") to 5 ("severely high algae levels"). At the same time monitors assess the "recreational suitability" of the lake on a similar scale, from 1 ("could not be nicer") to 5 ("swimming and aesthetic enjoyment ... impossible"). Some surveys, including those used in New York State, also ask monitors to try to identify the reason for any reported impairment (e.g., weeds, odor, poor water clarity, debris). Broadly termed "lake perception," these observations are playing an important role in evaluating whether lakes support their "designated uses," particularly recreational uses such as swimming or aesthetic value.

Let's look at bathing, a common recreational use for lakes. How "swimmable" a lake is can be evaluated from both a safety perspective (Will I get sick? Will I get hurt?) and an aesthetic perspective (Will I get slimy? Will the water smell bad? Will I enjoy myself?). The first safety question (Will I get sick?) is assessed using bacterial counts. The second (Will I get hurt?) is related to water clarity - i.e., the ability of swimmers to see broken glass or snapping turtles that may be underfoot. Clarity can be measured by a Secchi disk, or, more indirectly, by testing for phosphorus. High levels of phosphorus, a nutrient, often mean heavy growth of algae, which in turn means murky waters. While all states include numeric bacteria criteria in their water quality standards, most do not include numeric criteria for Secchi depth or phosphorus levels.

But what about the "aesthetic" questions? How enjoyable is it to swim in the lake? Here numbers don't always tell the whole story. For example, in New York State 20 µg/L is used as a "guidance value" for total phosphorus (that is, even though New York doesn't include numeric phosphorus criteria in its water quality standards, when issuing permits to point sources such as wastewater treatment plants the state tries to keep phosphorus in lake receiving waters below this critical value). However, let's say that data for "Spitz Lake" show phosphorus exceeding 20 µg/L, yet swimming is still a popular (and unabated) use of the lake. In this case, water quality data suggest impairment without any evidence of swimming problems. Meanwhile, over at Lake Greensleeves, residents are having difficulty persuading state managers to identify the lake as impaired based solely on reports that swimmers risk looking like the Creature from the Green Lagoon, without any water quality data to support impairment. This situation can occur in very weedy swimming holes with otherwise good water quality conditions.

Making the link

Without information about public use and perception of resources, aesthetic impairment can at best only be inferred from water quality data. Perception surveys supply the missing link between water quality and use impairment by asking, in essence, "How does the lake look and how does that affect your use?" Both tools - perception surveys and the water quality data - become more powerful when used together. When both indicate conditions that don't support swimming, the validity of this assessment is enhanced. In New York, perception data figure prominently in assessing lake uses for the New York State Priority Waterbody List (PWL) and the state's 305(b) report. A high "level of documentation" is required to move waterbodies from the PWL to the 305(b) listings. This "burden of proof" is increasingly met by the use of linked water quality data and use perception tools.

These perception data, not commonly collected in state-run monitoring programs, can also be used to "calibrate" standard water quality data from other databases. This may ultimately allow for "strictly" water chemistry or biological data to serve as reasonable surrogates for more comprehensive volunteer monitoring datasets that also include perception data. For instance, if perception data show that complaints about bathing conditions occur "too often" (using EPA criteria, this may mean more than 10 percent of the time) in Lake Spitz once phosphorus levels exceed 30 µg/L, impairment could be inferred in other similar (same drainage basin, water quality classification, etc.) lakes with the same levels of phosphorus. While there is certainly some risk in presuming that user perceptions carry over from one waterbody to another, this risk should be weighed against the large risk of presuming impairment status from water quality data that is "user-blind" (i.e., without perception information). Data collected through CSLAP have shown a surprisingly strong convergence of opinion about lake recreational quality in lakes with similar water quality conditions.

Developing ecoregional nutrient criteria

In recognition of the role that nutrients play in the overenrichment of surface waters throughout the country, EPA has recently established the National Nutrient Criteria Program. This program will develop guidelines for states to use in setting nutrient criteria for each ecologically distinct region ("ecoregion") of the state. One step in the process will be for states to identify "reference waterbodies" representing minimally impacted conditions. However, waterbodies with the "best" water quality conditions are not necessarily those that best support bathi{ª and recreation. Lake perception data, collected (only) in volunteer lake monitoring programs, can be used to identify which waterbodies within each ecoregion fully support recreation, the protection of which is the primary goal of developing nutrient criteria. This approach is essentially an extension of the process used earlier in Vermont and Minnesota, where volunteer-

derived lake perception data provided the basis for developing phosphorus standards. [Editor's note: For this story, see The Volunteer Monitor, Spring 1994.] Currently, several Northeast and Midwestern states are beginning to work with EPA to explore the use of these lake perception data in developing nutrient criteria within their states. This work may help to prove the adage that "looks do matter."

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Just What Is Public Participation?

by Sharon Clifford

A lot of lip service is paid to public participation in this country today, but nowhere more than in the TMDL process. As the coordinator for Missouri's TMDL program, I have wondered, What is the true definition of public participation?

Traditionally, public participation in water resource management has taken three forms:

(1) Public meetings. Too often such meetings result in many people speaking about an issue they do not fully understand.

(2) Stakeholder committees. Participants usually belong to one of three groups. Government agency employees always participate because it is their job. A second group consists of organizations - agriculture or industry groups, environmental organizations - whose constituents have an interest in the issues being discussed. Third are those who have money at stake: landowners, regulated facilities, consultants, lawyers, and a host of others. Obviously, all these people are true stakeholders. But do they fully represent the public? Where are the people who care about the stream because they live near it, or float on it, or fish or swim in it?

(3) Public comment periods. Agencies are required to set aside a 30-day period to receive written or verbal comment on such matters as discharge permits, 303(d) impaired waters listings, changes to water quality standards, or TMDL plans. The number of people even aware of this opportunity is limited, and fewer still exercise their right to participate in this manner.

My old American Heritage Dictionary defines public as "of, concerning or affecting the community or the people" and participate as "to take part; join or share with others." Guess this says public participation is the community or the people taking part, joining and sharing with others on issues of concern. Lovely idea, isn't it? It can and should be more than just an idea, if managing water quality on a watershed basis is ever to become a reality.

My dictionary also defines public relations ("the methods and activities employed ... to promote a favorable relationship with the public") and public-spirited ("motivated by or showing active devotion to the good of the community"). Could govern-ment agencies really engage in public relations and promote "a favorable relationship with the public"? Could there be watershed committees made up of public-spirited people, regardless of their stake in the issue?

Volunteer monitoring and the TMDL process

Among state TMDL coordinators I have a unique background: for six years prior to accepting my current position, I was a coordinator for Missouri Stream Teams, a volunteer-based stream stewardship program that includes water quality monitoring as one of many activities in which teams may participate. Through my work with Stream Teams, I saw firsthand the real meaning of public participation. And for government agencies who are seeking true public participation in the TMDL process, my message is: volunteer monitoring groups can be one of your most valuable resources. Other articles in this issue of The Volunteer Monitor describe how volunteers' data are being used in developing TMDL plans, but that is only the beginning of what volunteer monitors can contribute.

If an agency is trying to engage in public relations to gain the public trust, sponsorship of a volunteer monitoring program is one of the best ways to promote a positive relationship with constituents. If it wants to reach out to public-spirited people, volunteer monitors are citizens who have proven their willingness to donate their time out of a concern for the quality of life in their community. And if the agency is seeking involvement from a broader spectrum of the public than the usual interest groups - well, funny thing about volunteers: they are homeowners, farmers, urbanites, county commissioners, public works and industry employees. They are part of every stakeholder category that exists.

But there is an even greater advantage to volunteer monitoring programs: they are the BEST way to give citizens a working knowledge of aquatic ecosystems. As a Stream Team coordinator, I saw what knowledge can do for people. It can change their personal behavior. It can give them the courage to speak out about an issue they care about and the ability to do so in a meaningful way. Having local individuals state publicly that

water quality is important to the quality of life in their community is a tremendous asset - particularly if you are a TMDL coordinator who is trying to convince local farmers, industries, and other nonpoint source polluters of the value of voluntary participation in a TMDL implementation plan.

Case study: Eighth-graders testify for river

The following is an example of how volunteer monitoring can result in better public participation. Last year, the Missouri Department of Natural Resources was trying to strengthen protection of National Scenic Rivers. The existing water quality standards stated there could be no discharges to these rivers, with the exception of mine dewatering. The proposed change would eliminate the words "except mine dewatering."

Missouri is the source of 90% of the nation's lead. Now, with the state's old lead belt becoming depleted, the mining industry wants to have the option of extending operations into the watersheds of several National Scenic Rivers. But for mining to be profitable, the company must be able to discharge the groundwater that continually seeps into the mine and pump it into a nearby stream.

The Stream Team Program sent a mailing to all 1,600 Stream Teams about the public hearing regarding the proposed rule change. Justin Mutrux, a Stream Team volunteer and 8th-grade teacher, called the Stream Team office to say that by chance the class was already planning a trip to the Capitol on the day of the meeting, and he wondered if his students could testify. The class had been monitoring water quality in the Current River, one of the National Scenic Rivers that would be affected by the rule change. After we checked with the Attorney General's Office and found that children over the age of 10 could be sworn in, they decided to attend. The kids showed up dressed in their finest (even if the boys didn't have their dress shirts tucked in or their ties on straight). Three boys signed up to testify. The head of the commission was overwhelmed at the sight of 25 kids sitting in the front rows and thanked them for participating in the public process. It was the first time young people had ever attended a Clean Water Commission meeting.

First the lead company representative testified against the proposed change, arguing that the impact of mine dewatering on the river would be minimal and that this was the only way lead mining could be profitable in the area. Then it was the 8th-graders' turn. The first young man spoke eloquently about the immeasurable aesthetic value of our

National Scenic Rivers. The second testified about the nitrate, dissolved oxygen, and macroinvertebrate data the class had collected on the Current River. He pointed out that mine dewatering discharges are frequently high in nutrients and could result in algal blooms, lower dissolved oxygen levels, and a decrease in the diversity of aquatic life. The last student acknowledged the lead industry's contribution to the area's economic well-being and encouraged the industry and the state to work to find environmentally sound solutions. But, please, he asked, do not allow lead mine dewatering to be discharged into National Scenic Rivers.

Later that day the Commission reached its decision. The language exempting lead dewatering would be deleted. River protection had carried the day.

Now that is real public participation. Perhaps the impact of these young people stating their case so well was an unfair advantage. Some people even accused me of setting it up. But this was not orchestrated. It just happened because a teacher and his students cared, understood, and participated.

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Volunteer Monitoring Data in the 305(b) Report

by Alice Mayio

Somewhere deep in the heart of your state water quality agency is a bleary-eyed person - or maybe, if you're lucky, two or three bleary-eyed people - writing your state's water quality assessment report to EPA. Known as the "305(b) report" after the section of the Clean Water Act that mandates it, this document is the greatest single tool in communicating water quality findings to the public, to EPA, and to Congress. It is also beset by controversy and the object of intense scrutiny. Active efforts are underway to improve it.

Many volunteer programs think of the 305(b) report as the ultimate endpoint for their data. They may be right. What is the 305(b) report all about, and should a volunteer program try to get its data included in it? If so, how?

What is the 305(b) report?

First, a visit to the Clean Water Act is in order. Section 305(b) itself is unchanged from its original incarnation in 1972, when the Clean Water Act was first made into law. It tells states to develop a report every two years that, among other things:

(1) describes the extent to which all their navigable waters are achieving the fundamental Clean Water Act goal of providing for the protection and propagation of a balanced population of shellfish, fish, and wildlife and allowing recreational activities (a goal that is often referred to by the shorthand expression "fishable/swimmable");

(2) estimates the extent to which control programs have improved water quality, recommends necessary future actions, and identifies waters needing action;

(3) describes the nature and extent of nonpoint sources, and recommendations to control them;

(4) estimates the costs and benefits of achieving the goal of the Act; and

(5) provides an estimate of the quality of all publicly owned lakes.

The report is submitted to EPA on April 1 of even-numbered years. EPA, in turn, summarizes all these state reports (and reports from tribes, interstate commissions, and jurisdictions of the U.S.) into a national report to Congress.

The problem is that Section 305(b) doesn't give any specific details on how all of this monitoring, assessment, and reporting are to be accomplished. Since the 1980s EPA has been working with a team of state 305(b) coordinators and monitoring experts to regularly produce and update guidance on how the state reports should be created - from what should be monitored and how assessment decisions should be made to what figures and graphics should be used to summarize it all. (To see the most recent EPA 305(b) reporting guidance, visit http://www.epa.gov/owow/monitoring/guidelines.html .)

How 305(b) reports are used

States ideally use their reports as management tools to determine where problems exist

and what's causing them; whether pollution controls are working; and where resources will have to go to fix problems. Most states use their 305(b) process to identify impaired waters under Section 303(d), although some may use a stricter assessment approach in compiling the 303(d) list, presumably because 303(d) carries with it the need to actually install pollution controls while 305(b) report findings do not trigger any sort of regulatory action.

EPA's national summary of the state reports is also used as a management tool. The most recent report to Congress (available at www.epa.gov/305b/98report) tells us, for example, that agriculture is the leading source of impairment in rivers and lakes, contributing to nonsupport of designated uses in 59% of 291,000 assessed stream miles and 31% of 17 million assessed lake acres. This type of information is then used to guide where funding and technical assistance are needed. Information on the water quality impact of agricultural and other nonpoint sources, for example, is used (along with other factors) in justifying requests for EPA grant funds under Section 319 of the Clean Water Act.

Lack of uniformity among states

State monitoring programs vary greatly depending on resources, expertise, and, possibly, political will, and there is no federal regulatory requirement to make states conform to a specific monitoring regimen. The 305(b) reports reflect this problem: the percentage of waters assessed varies greatly from state to state (and sometimes from cycle to cycle within a state), as do the monitoring approaches used to make those assessments, the water quality standards upon which the assessments are based, and the water quality characteristics measured. It's difficult to compare 305(b) reports between states because a state that has weak water quality standards or only monitors a few parameters may look good "on paper" compared to a state with more stringent standards and more thorough monitoring (in other words, a state with a better program may uncover more problems).

For these reasons, the General Accounting Office and other organizations have found fault with the 305(b) reporting process and urged wide-ranging improvements (Water Quality: Key EPA and State Decisions Limited by Inconsistent and Incomplete Data, March 2000, GAO/RCED-00-54, www.gao.gov). EPA is, in fact, deep into a partner-based effort to do just that; guidance known as the Consolidated Assessment and Listing Methodology (CALM) is being developed to improve the accuracy and completeness of 305(b) reports and 303(d) lists of impaired waters and streamline these two reporting processes. CALM includes, among other things, guidance on making decisions on attainment and non-attainment of state water quality standards (covering listing/delisting decisions) and designing comprehensive state monitoring networks. Further information on CALM is available at http://www.epa.gov/owow/monitoring/calm.html .

Assessed Waters in 305(b)

Monitored waters are those for which well-documented ambient monitoring data believed to accurately portray water quality conditions are used to determine whether water quality standards are met.

Evaluated waters are those for which lower quality or less reliable information, such as data on land use, location of sources, and predictive modeling, are used to determine whether water quality standards are met.

If a volunteer monitoring program is using documented, state-approved QA/QC procedures, EPA's 305(b) reporting guidelines say that the waters it has sampled can be considered monitored. It's up to the state to make that determination.

Where volunteer monitors fit in

What does this mean for your volunteer monitoring program? You may have data that can increase the comprehensiveness of your state's 305(b) report. Only 25% of the nation's stream miles, 40% of lake acres, and 30% of estuarine square miles were assessed by the states in 1998, and states are under pressure to increase the amount of waters they assess each cycle.

So that bleary-eyed 305(b) report writer may well be on the lookout for documented, high-quality data. Depending on this person's schedule, resources, and familiarity with your program (and with volunteer monitoring in general), he or she may be open to looking at what you have and seeing how it fits into the report.

Of course, some states are far more welcoming toward volunteer data than others. One volunteer monitoring program coordinator recently lamented that "the only way the people at our agency would look at volunteer data is if we nailed them to their chairs and pasted the data to their faces." At the other end of the spectrum, Connie Carey of the Rhode Island Department of Environmental Management says, "Most of the lake data in Rhode Island's 305(b) report comes from volunteer monitors with the University of Rhode Island Watershed Watch program. We rank their data as 'high quality' because they went through an extensive quality assurance process with our agency." Not all states are as willing as Rhode Island to consider volunteer data on par with the state's, but even if your state classifies your data as "evaluated" - meaning the agency has less confidence in it than in state-collected data - your data will still become part of your

state's water quality story.

The answers to the following four questions will help you evaluate the suitability of your data for inclusion in your state's 305(b) report. (Note: These questions were provided by Scott Kishbaugh of the New York Department of Environmental Conservation.)

1. Do you have a Quality Assurance Project Plan in place? A QAPP that has been previously approved by the state and/or EPA is a big plus. Without such a plan, the state won't have much confidence in the monitoring and analytical methods you used, how you trained your volunteers, how you handled samples, and so forth.

2. Are you monitoring the right parameters? If you can provide good data for the parameters the state uses to determine whether designated uses are supported, your data are more likely to be used.

3. Are you monitoring in the right place? The state is more likely to use your data if you are monitoring where they aren't. For example, several states have a tradition of using volunteer lake data because they do little lake monitoring of their own.

4. Are your data in an acceptable format? Perhaps nothing frustrates 305(b) coordinators more than finding useful data in an incompatible database or (gasp) only in hard copy. They usually don't have the time, energy, or staff to translate your information into something they can use.

What's in your state's 305(b) report

Before you approach the 305(b) coordinator, educate yourself about your state's report. Not only will you gain a better sense of where your data might fit in, you'll learn a lot about water quality in your state and how the state agency assesses it.

Generally, 305(b) reports follow a standard format that begins with summary information for all the state's assessed rivers and streams, lakes and reservoirs, estuaries and bays, coastal waters, and wetlands. This information should include how many waters are assessed, and, of those, the area fully, partially, and not supporting designated uses; the area impaired by specific pollutants; and the area affected by different sources, such as agricultural or urban runoff.

The report should also cover the state's monitoring and pollution control programs, its assessment methodology, issues of special concern (such as shellfish bed closures or fish consumption advisories), a separate groundwater assessment, and a cost/benefit discussion.

Because these reports are state-level summaries, it may be difficult to find much information about individual waters unless they are featured in some way as part of a special study or program, or the site of a significant problem or success story, or if they are of particular importance to the state. However, a number of states do provide watershed-level summaries as part of their reports.

Submitting your data

Once you are familiar with your state report, it will be easier to establish friendly and open relations with state monitoring and 305(b) staff and find out what the specific requirements might be for submitting data for consideration in the next report. Each coordinator is different and is operating under a variety of scientific and management pressures that tell him or her what data are acceptable.

Your task will of course be much easier if your state water quality or natural resource agency has a designated volunteer monitoring coordinator. That person should already be working to ensure that volunteer data are considered in the 305(b) process, and can be your advocate. And volunteer data are most likely to be considered when the state itself manages a volunteer monitoring program, although this is by no means guaranteed.

Weigh the pros and cons

After researching the issues, becoming familiar with your state 305(b) report, and

speaking to your state coordinator, you may find that in order to be included in the report you'll need to change how, what, or where you monitor, and/or how you manage and present your data. Now you have to decide if the rewards are worth the effort. In some cases creative local use of volunteer data may be more appropriate and satisfying. But those groups who decide to persevere, and who succeed in getting their data used in the 305(b) report, will be making a tangible contribution to their state's knowledge base. Volunteers can feel justifiably proud of their role in making this knowledge base as complete and accurate as possible.

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Do Waters Support Their Designated Uses?

by Geoff Dates

It's important to remember that while 305(b) is generally thought of as a report or a list, it is first and foremost a process. This process is all about gathering and interpreting information about a state's waterbodies. The goal is to determine whether water quality supports the uses assigned to the waterbody (see page 2 for a discussion of designated uses). Use support is determined by com-paring water quality data to the criteria in the water quality standards, which define conditions needed to support those uses.

Whether you are evaluating your state's 305(b) report or trying to contribute your own monitoring information to the process, you will need to understand your state's assessment approach. States differ greatly in their approaches, but they all face some common challenges. How your particular state has decided to meet these challenges will affect how useful your data might be to them and how useful the whole 305(b) process might be to your program.

First there's the problem of scale. How can an agency possibly continuously assess all of its waterbodies, with a staff of 4 or 5 (or even 100) people? The answer is: they don't. Like a volunteer monitoring program, agencies must make a series of decisions about the what, how, when, and where of gathering information to use in their assessments. They use any of several assessment designs.

Comprehensive Assessment: This is the gold standard. It provides complete spatial coverage of the state's waters, including information on their condition, trends over time, and causes and sources of impairment. The only catch is, no state is really able to

do it. They may say they do, but look carefully at how they define "assessed" waters. You may find that they consider a 100-mile reach "assessed" if they collect and analyze a sample from one site on that reach 2 or 3 times a year!

Macroinvertebrate assemblages can help determine if waters support a designated use of "aquatic life support".

Targeted Design: Sites are selected to answer a specific question at a local level. In many states, sites are chosen to focus on known or suspected problems. A common criticism of this approach is that it is biased toward problem areas and doesn't give a true picture of the condition of all the state's waters.

Sample Survey Design: This approach aims to sample one or more subsets of all possible sample sites so that statistically valid inferences may be drawn on the population as a whole. There are many variations. For example, sites may be classified according to waterbody type (statisticians call this "stratification") and a representative subset of each type selected (usually randomly). This type of design avoids the bias associated with targeted design, but is not very useful for finding and solving problems.

Rotating Basin: Some states combine "survey" and "targeted" approaches into a "rotating basin" design. Every year, the state assesses a representative subset of sites throughout the state and also targets certain watersheds, on a rotating basis, for intensive surveys to find problems. For example, on a 5-year rotation, the agency will focus intensively on one-fifth of its watersheds each year.

How do these different approaches affect your program? Well, for example, if your state uses a rotating basin approach you could help the agency fill in gaps by monitoring on the off-years. On the other hand, if the state use a survey approach it may not want to include your data in the 305(b) assessment if you have focused on problem sites, because your sites weren't randomly chosen and therefore may bias the assessment.

Determining use support

When we say data are "used for 305(b)" we mean that the data are used to determine whether designated uses are supported. That determination is, after all, the goal of the 305(b) assessment process. Let's look at how this actually works.

"Use support status" is expressed as a level of support for each designated use. Generally the state will categorize waters as either "fully supporting," "partially supporting," or "not supporting," though some states also use additional categories. How the state defines these categories depends on the use itself. For example, here's a paraphrase of what EPA recommends for determining aquatic life use support:

A. *Fully Supporting:* Sustainable assemblages of fish, macroinvertebrates, or algae which are not significantly different from the reference condition.
B. *Partially Supporting:* At least one assemblage is moderately different from the reference condition.
C. *Not Supporting:* At least one assemblage has been severely modified from the reference condition.

The state's water quality standards would presumably describe the attributes of healthy aquatic life, along with a description of exactly how the difference between collected samples and the reference condition is determined.

Determining use support can get pretty complicated. Consider, for example, the use of fecal coliform counts to determine whether waters support swimming. Let's say you've

got data like this for one month (the numbers represent colony forming units per 100 mL): 10, 463, 20, 210, 650, and 10.

Now, you compare your data to the criterion for bacteria. Here's a typical criterion:

- Part 1 - The geometric mean of the fecal coliform bacteria level should not exceed 200 per 100 mL based on at least five samples in a 30-day period, and
- Part 2 - Not more than 10 percent of the total samples taken during any 30-day period should have a density that exceeds 400 per 100 mL.

First, you calculate the geometric mean for your samples, which is 105 cfu/100 mL. Now you look at Part 2 of the criterion. In your dataset, 2 out of 6 (or 33%) of the samples exceeded 400. So, Part 1 of the criterion is met, and Part 2 is not. Is the swimming use supported? How do you make that determination? States use an "assessment protocol" or some other guidance, which can range (depending on the state) from rigidly prescribed statistical tests to lots of latitude in "best professional judgment."

EPA's 305(b) guidance suggests the following: Fully Supporting: Part 1 and Part 2 met; Partially Supporting: Part 1 met, Part 2 not met; Not Supporting: Part 1 not met. Applying this guidance, the waters at this site partially support swimming.

Next steps

So the state has categorized its waters according to their use support status. So what? Well, if waters fully support their uses, you want to make sure they stay that way, if necessary by invoking antidegradation policies. If waters don't support (or only partially support) their designated uses, these waters are impaired. Most of these waters will (probably) get moved to the 303(d)-TMDL track. Here again you'll need to check with your own state agency because states use different guidelines for placing waters on the 303(d) list.

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To (d) or Not to (d)

by Steven Hubbell

When I joined the Lower Colorado River Authority's (LCRA) Colorado River Watch Network (CRWN) as program coordinator in 1995, one of my goals was to ensure that data we generated would qualify to be integrated into the state's 305(b) process. Volunteer monitoring data from four groups in the state had been used in the state's 1994 305(b) report. Accordingly, we focused on shoring up the site location, data management, and quality assurance components of our program and made every effort to document our adherence to the plan.

Three years went by. Then in 1998 I learned that volunteer data would not be used in the state's 305(b) report. In fact, there was no indication that the TNRCC (Texas Natural Resource Conservation Commission) intended to use volunteer monitoring data for any purpose. However, shortly afterward I attended a public meeting where TNRCC staff invited citizen input for the 303(d) listing process. Discouraged by the news about the lack of systematic citizen data use by the state, I took it as my duty to the monitors to take whatever avenue I could find to have their data at least considered in the listing process.

Having a high degree of confidence in the quality and comprehensiveness of the CRWN volunteers' data, I used our database to generate a "CRWN 303(d) list" using the same criteria the state uses to develop its list. Of roughly 50 sites with year-round flow, appropriate QC documentation, and sufficient data, I found three sites that exhibited potential dissolved oxygen deficiencies, three other sites (two stream segments) that demonstrated fecal coliform exceedences, and a couple of locations that showed slightly elevated conductivity levels.

A number of information exchanges ensued. I talked to someone in TNRCC's stream standards office about available rainfall data for the bacteria sites, which I sent. Someone else from TNRCC called and asked for the raw data, which I sent. Another TNRCC staffer called to talk about the specific monitors - their training and monitoring performance, and any known personal agendas which could have influenced their data reports. I had another couple of conversations with TNRCC staff about the specific methodology for our bacteria test.

In the end, the two stream segments of concern for fecal coliform were placed on the state's 303(d) list based on CRWN's data submission. Does it matter? I think so. To these otherwise overlooked waterways, and to our reputation. Having volunteer data used for the 305(b), 303(d), or other policy-influencing processes demonstrates the potential validity, credibility, and usefulness of citizen monitor data.

The listing of these sites was particularly significant because the data were generated exclusively by volunteer monitors; there was no corroborating data from professional staff. The monitors followed the fecal coliform membrane filter procedure, using nutrient broth and equipment obtained from Millipore Corporation and a waterbath incubator created from ice chests with aquarium heaters and pumps (see The Volunteer Monitor Spring 1993, page 15, and Spring 1994, page 3).

The downside of participating in the 303(d) listing process is the cost in time. The time required to develop, adhere to, and document a state- and EPA-approved QAPP program is substantial, and the effort to persuade the state that you have done so can be considerable. At some point while faxing a document to the fourth person who has requested it, it may occur to you that your monitors' immediate needs are being neglected. Yet many monitors want their data to be used at the highest possible level, so you are, in fact, devoting this time to the monitors. If you decide to take this route, you may find the following components of our successful submission useful.

1 Understand the game.

Follow an approved quality assurance project plan (QAPP). In our case, we were guided by three iterations (1993, 1995, 1998) of the QAPP for Texas Watch, our statewide volunteer monitoring program, as well as the CRWN's 1994 QAPP, all of which were EPA-approved.

2 Gain admission.

When it turned out our data were not going to be used in the 305(b) report, it was necessary to find another way to get the information to the state. The 303(d) public input process afforded this opportunity.

3 Follow the house rules.

We were fortunate to have official guidance to follow, since TNRCC (in adherence to the 1991 Texas Clean Rivers Act) produced a document called "Guidance for Submitting Data and Information for the 303(d) List" that spells out what to include and to whom to submit the information, as well as a deadline for submission. If such guidelines are not available in your state, acquire a copy of your state's latest 305(b) report (Biennial Water Quality Report) and use this, or the 303(d) list itself, as a model for your data summary. The state cannot fault your data assessment, summary, and presentation methods if you use the state's work as your model.

4 Place your bet.

After you identify the appropriate recipient and have analyzed your data, submit the findings so the recipient understands your conclusions and recommendations at a glance. Do the prescribed statistics on the data, and let it be known that the raw data are available if needed (or include them as an attachment). Be concise, yet thorough.

We were able to accomplish the submission in a short timeframe because we had built appropriate statistical reports into our database. This was where our earlier work in designing a good data entry and management system paid off.

5 Show your cards.

In your data submission, refer to the appropriate QAPP(s). Prepare your submission as if you are approaching a skeptical recipient; make it clear that your data should be taken seriously for the following reasons: then list good reasons.

6 Have a winning hand.

Understand that the 303(d) list is a legal document with potentially serious implications for areas listed. To submit your data in this process is to invite scrutiny. In short, the credibility of your monitoring program is being placed on the line. Be sure you are prepared for this.

When your data are taken seriously, you may receive requests for layers of information. Here you will prove the worth of that mind-numbing administration of the meta-data. You may be asked for technical manuals, training records, calibration logs, methods research, or even specific information about monitors. Be prepared to answer every conceivable question, with a smile. If you document the details well, it can be an invigorating (albeit time-consuming) process.

To (d) or not to (d)? Is this the best way your monitoring results can help the creeks? If your intention is to solve an immediate problem, this may not be the most efficient method. Find out all you can about the 303(d) process in your state to determine whether this approach deserves your time and attention.

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Doing the Dirty Work: Volunteers Assess Sediment Sources and Impacts

by Susanna Danner

The Clean Water Act TMDL process - what a horrendous cavalcade of legal definitions and technobabble! Considering the impenetrable language of Clean Water Act Section 303(d), it's amazing that any of the Coastal Watershed Council's (CWC) volunteers were willing to spend their Saturdays collecting baseline data to assist in the establishment of a TMDL for sediment in the San Lorenzo River. What the volunteers realized, and what motivated them to get involved, is that the sediment TMDL provided an opportunity for collecting more comprehensive data on upslope processes and nonpoint sources; data that can be used to inform the management of highly erodible lands. If handled well - and without scaring stakeholders with a perceived regulatory "hammer" - TMDLs can prompt the study of waterways for which data, up until now, have been woefully sparse.

Case Study: San Lorenzo River

In 1964, the San Lorenzo River supported a steelhead trout population of 20,000, which by 1995 had declined to an estimated 900 fish. Sedimentation of spawning grounds and instream rearing areas was an important factor in the decline. Sediment is widely recognized as the most dire problem for watersheds in our region. The steep Santa Cruz mountains, through which the San Lorenzo River flows, are characterized by structurally weak geologic materials, seismic activity, and periods of intense rainfall. Sediment sources in the watershed include roads, timber extraction activities, and urban development.

The San Lorenzo River is the main source of drinking water for the City of Santa Cruz, California, and drains a watershed of 138 square miles in which some 33,000 people reside.

In 1998, the San Lorenzo was placed on California's 303(d) list as an impaired waterbody for sediment, nutrients, and pathogens. The County of Santa Cruz contracted with CWC to assist in the development of the San Lorenzo River sediment TMDL (slated for completion this year) by monitoring streambed conditions and assessing sediment contributions from public roads.

Our existing volunteer monitors were eager to switch gears from water quality to physical monitoring to help with the TMDL project. The learning curve for physical monitoring techniques is quite steep, so the volunteers went through 25 hours of intensive training. During training, special focus was directed toward consistency and thoroughness of data collection and transcription. For the project to be valuable, physical conditions data must be site-specific and the methods replicable many years into the future. Excellent, clear site maps and descriptive field notebooks ensure that this year's data will be comparable to future surveys.

"It's the sediment that counts"

At five sites along the river, ten CWC volunteers completed longitudinal profiles and cross-sections of pool, riffle, and run habitat. Profiles and cross-sections are useful for monitoring changes in stream channel morphology over time - for example, loss of pool and riffle habitat caused by sedimentation. [Note: For more on volunteer monitoring of stream channel morphology see The Volunteer Monitor, Fall 1996.]

Volunteers also performed pebble counts and embeddedness surveys at the sites. A pebble count documents the percentage of different-sized particles - sand, gravel, cobble, and boulders - in the streambed, and an embeddedness survey measures the extent to which particles are buried in fine sediment. Extremely embedded gravels and cobbles make poor habitat for macroinvertebrates and fish.

The road to hell is unpaved

When a local hydrologist recently assessed the river, he found that 35-50% of coarse gravel in spawning habitat was road gravel. Unfortunately, road gravel does not make good habitat for aquatic animals. Fish use the spaces between the rounded pebbles that occur naturally in streams to lay their eggs, but the angular road gravel (usually made up of crushed rock from a quarry) fills in these spaces. A roads engineer in the watershed

says, "You know they say that the road to hell is paved with good intentions? Well, I disagree: The road to hell is unpaved!"

To help identify major sources of sediment and road gravel, CWC volunteers surveyed 55 miles of roads within the watershed, documenting culvert condition and size, road steepness, roadside ditches, and places where roads run directly through a stream.

The big picture

Photographs are an excellent, low-cost way to assess major changes in streambed conditions over time. Photos can capture upslope views, relative height of bankfull and floodplains, and location of pools. CWC volunteers established photo points along cross-section lines and also photodocumented overall site views. Features, landmarks, and references for scale were included in photos for repeatability. Note: The California State Water Resources Control Board is developing a statewide protocol for photomonitoring. When it is completed it will be linked to the CWC Website (www.coastal-watershed.org).

Developing the TMDL

As a first step in the TMDL process, the County produced a Sediment Source Study describing existing conditions. This document, which relies heavily on the volunteers' data, will be the basis for the TMDL and will help set loading limits.

Since roads are the biggest sediment source, the TMDL will focus primarily on road maintenance and improvement projects such as upgrading culverts, putting gravel on dirt roads, and paving some of the steeper gravel roads. After the TMDL plan is in place, we hope to continue with yearly monitoring, comparing future conditions to the baseline already obtained and watching for improvements.

This project was very rewarding to our volunteers because they knew the data would be used to set a limit for a pollutant in their stream, ultimately having a real effect on management practices. At the same time, CWC's efforts preserved valuable agency resources. TMDLs are planned for more than 11 waterways in our area, and agency staff are already overtaxed. Citizen monitors can provide a substantial service to agencies by taking part in what is, for all the acronyms, an important and interesting study of impaired rivers and streams.

Resource

Stream Channel Reference Sites: An Illustrated Guide to Field Technique. USDA Forest

Service. General Report RM-245, April 1994. Free. Order from rschneider@fs.fed.us; 970-498-1392; fax 970-498-1396; or download PDF from www.stream.fs.fed.us/ftparea.html.

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Monitoring a Concrete River

by Heather Trim

Los Angeles knows pollution. Though we're probably most famous for smog, the water is also in trouble; all our rivers are listed on the 303(d) list for a large number of urban-related constituents such as nutrients, organic chemicals, metals, and trash. For this reason, there has been a big push by environmental groups, assisted by recent lawsuits, to force the state to conduct TMDLs.

Under a court-ordered consent decree, the local Regional Water Quality Control Board (which covers most of Los Angeles and Ventura counties) is required to complete 92 total maximum daily load plans (TMDLs) for the Los Angeles region within the next 12 years. What is exciting is that we are going to carry out these TMDLs on a large scale and volunteers are going to be a big part of it.

The volunteer involvement got off to a highly visible start on September 10, 2000, when 85 volunteers fanned out along the entire 54-mile length of the LA River, plus portions of several tributaries, to collect data for use in developing the TMDLs. The event was covered on local news stations.

The river

The LA River has been altered to the point that many Los Angelenos drive over it every day without even realizing they are crossing a river. In the 1930s and '40s the entire river, along with the urban parts of the tributaries, was channelized into a concrete-lined trough by the U.S. Army Corps in response to devastating floods in the lower watershed. In some places the channel floor is as wide as a freeway; city and county trucks routinely drive along the river bottom for maintenance activities. The sides, which are vertical in areas where land was tight and slope up to a levee in other places, rise to a height of 33 feet. When you are in the river, especially where the sides are vertical, it feels as if you are in a deserted blighted downtown - looking up at tall walls, no greenery, lots of graffiti and trash. In the few places where upwelling groundwater made it impossible to lay concrete, you see trees, shrubs, riffles, and birds - AND a lot of trash.

The mountain streams that once fed the river are now caught in a series of dams and reservoirs, most of their water diverted for groundwater recharge to keep up with the water demands of an immense urban area in a semi-arid region. During the long dry season (roughly March through October), the cavernous channel contains just a little water running along its bottom. Eighty-five percent of this flow is treated effluent from three sewage treatment plants; the remainder is urban runoff from such activities as lawn watering and car washes. During winter storms, though, the reason for the channel's size becomes dramatically obvious, for the river can quickly turn into a huge, fast-moving sea of trash- and sediment-laden water that kills several people each year. Because of the danger, the whole length of the river is fenced.

The 834-square-mile Los Angeles River watershed, including six river segments, nine tributary reaches, and three lakes, is listed on California's 303(d) list 98 times for impairments due to nitrates, ammonia, elevated pH, low dissolved oxygen, scum, odors, algae, eutrophication, coliform bacteria, oil and grease, trash, various metals, pesticides, and organic chemicals.

Such a river might sound beyond hope. Yet in the past five years a big grassroots movement to "regreen" the Los Angeles River has emerged. Already a number of riverside walkways, bike paths, and small parks have been created, drawing recreational users to areas previously frequented mainly by tag artists, homeless people, and film

crews shooting post-apocalyptic movies. And although the river's native fish, bird, and plant species are greatly diminished, some have hung on through all the years of degradation and channelization. Some people believe that the return of runs of steelhead trout within 20 years is possible.

The TMDLs

On January 25, 2001, the LA River's first TMDL was completed . . . a TMDL for trash (!).* Next in line are TMDLs for nutrients and coliform, scheduled for completion this summer (2001), and a TMDL for metals targeted for 2004.

In the spring of 2000, USEPA decided to take a more active role in the Los Angeles River nutrient, coliform, and trace metal TMDLs by providing technical assistance such as computer modeling and funds for collecting data. The USEPA collaborated with the Regional Board and the Southern California Coastal Water Research Project (SCCWRP), a public agency specializing in environmental research, to conduct monitoring and modeling for these upcoming TMDLs.

Last summer, SCCWRP called our nonprofit coalition group, the Los Angeles and San Gabriel Rivers Watershed Council, to ask if we could recruit and organize volunteers to help collect data to support these upcoming TMDLs. SCCWRP needed our help to document the numerous nonpoint source contributions that discharge along the river. (Sewage treatment plants were sampled by city personnel.)

Specifically, volunteers were needed to walk the whole LA River plus its 303(d)-listed tributaries, taking water quality samples and flow measurements from all of the storm drains. All the information had to be collected in a one-day blitz in order to create a unique "snapshot" of water quality inputs to the river.

SCCWRP provided equipment such as coolers, thermometers, pH strips, and buckets, and the City of Los Angeles Sanitation Department provided lab analyses for all water quality parameters. Our job was to round up volunteers and coordinate the training and sampling.

We sent out an email appeal to our mailing list and other contacts, and were amazed at the huge response. There is clearly a hunger in LA to do something! Friends passed the email on to other friends and we ended up with almost more volunteers than we needed.

Volunteer training session in the Los Angeles River the day before the monitoring "blitz".

The blitz

A training session was held for volunteers on Saturday, September 9th. The next day, 85 volunteers showed up bright and early. We were in the river by 7 a.m. - somewhat to the surprise of the "professionals" who hadn't expected such enthusiasm. Each team of volunteers was assigned a 2- to 4-mile stretch.

Most participants walked their route, but several bicycled, four rode in a city truck, and four took canoes. We had to fight off eager volunteers for this last assignment. Many people wanted to be able to say that they had "canoed the LA River."

The volunteers were lugging heavy portable coolers and had a number of tasks to perform. At storm drains where flow was present they measured flow rate, temperature, and pH; recorded additional observations, such as the presence of trash and algae, on their field sheets; and collected water samples (to be later analyzed at a lab for suspended solids, biological oxygen demand, dissolved oxygen, nutrients, bacteria, and trace metals). They had to work quickly to get back to centralized pickup points within the 6-hour holding time for the bacteria samples. Nearly everyone made the noon deadline, by which time the volunteers had documented 128 storm drains.

Data use

The volunteers documented that trash and algae were present at more than 80% of the sampled drains. The data for bacteria, nutrients, and metals confirmed expected trends: the storm drains and tributaries were the major source of bacteria and metals, and the sewage treatment plants were the major source of nutrients. Accordingly, the nutrient TMDLs will likely focus on sewage treatment plants and the other TMDLs will focus on urban runoff.

The volunteers' data, along with other data, will be used to create a dynamic computer model of flow and water quality in the Los Angeles River. The model will be able to simulate different management options for controlling the various pollutants, which will become the basis for developing the TMDLs. The volunteers made a very real contribution to obtaining data that will help produce an accurate computer model. The use of volunteers made it cost-effective to be able to collect much more data, especially the nonpoint source contributions.

Grant proposals have already been written to do a similar TMDL monitoring project, including use of volunteers, on the adjacent San Gabriel River. In our region, we are finding that the TMDL process is opening the door a little wider for the participation of volunteers in water quality protection.

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TMDL-ements: The Components of TMDL Plans

by Alison Simcox

What does a TMDL plan actually look like? What's in it? A TMDL is a document or group of documents that includes background information describing a waterbody (usually a stream, lake, or estuary), its designated uses, and the sources and impacts of the pollutant (or pollutants) of concern, as well as an estimate of the waterbody's pollutant loading capacity (TMDL) and load allocations for the various point and nonpoint sources.

To help states prepare these documents, EPA has produced protocols for developing TMDLs for three of the most common surface-water pollutants - sediment, nutrients, and pathogens. In addition, EPA and many states post completed TMDLs on their Web pages.

All regions of EPA encourage states to write TMDLs so that they follow the same format that EPA uses to review a TMDL. The component parts or elements in EPA's TMDL "review template" are listed below. Most of these elements are required by federal law (the Clean Water Act) or regulations, but note that elements related to implementation (numbers 8 through 10 on the list) currently are only "recommended" for nonpoint sources.

Let's look more closely at some of these elements to see (a) how the process works and (b) where volunteer monitors can fit in. A phosphorus TMDL for Cobbossee Lake, which was recently developed by the Cobbossee Watershed District (CWD) in cooperation with the Maine Department of Environmental Protection, will serve as a case study to help illustrate some of the points. Cobbossee Lake is a large lake with a

217-square-mile watershed that includes 10 towns and 28 lakes and ponds.

Elements of a TMDL:
1. Description of waterbody, pollutant(s) of concern, and pollutant sources
2. Description of water quality standards (including designated uses) and numeric water quality target
3. Loading capacity of waterbody
4. Load allocations (LAs) (portion of "allowable pollutant load" allocated to existing and future nonpoint sources and to natural background)
5. Wasteload allocations (WLAs) (portion of "allowable pollutant load" allocated to existing and future point sources)
6. Margin of safety (to account for uncertainties in the pollutant-loading analysis)
7. Consideration of seasonal variation
8. Description of monitoring plan (recommended)
9. Description of implementation plan (recommended)
10. Reasonable assurances (required for point sources; recommended for nonpoint sources)
11. Public participation

Element 1. ***Description of waterbody, pollutant, and sources.*** CWD used a longterm volunteer dataset, which documented excessive levels of nutrients (especially phosphorus) and algal blooms periodically in Cobbossee Lake since 1973, to identify the primary lake pollutant, phosphorus.

Element 2. ***Numeric water quality target.*** In Maine, as in most states, water quality standards currently contain only narrative criteria for phosphorus, so the CWD's task was to define a numeric goal or "cap" for phosphorus that would be low enough to prevent algae blooms. The CWD used water quality data collected by volunteers during the 1980s and 1990s, including data on chlorophyll a, total phosphorus, Secchi-disk transparency, and dissolved oxygen, to identify phosphorus levels at which blooms were likely to occur. These levels were used as the basis for setting a target maximum concentration of 15 micrograms per liter (µg/L) for the lake for all seasons.

Element 3. ***Loading capacity.*** The CWD used estimates of the amount of phosphorus contributed by each land-use type to estimate the loading of phosphorus (in kilograms per year). They then estimated the amount by which this loading would have to be reduced to meet the water quality target of 15 µg/L. This gave the CWD an estimate of the "loading capacity" - i.e., the greatest amount of phosphorus loading the lake could receive without violating the target.

Volunteers contributed to this TMDL element by providing or field-checking information about land use and pollution sources (e.g., location of storm drains, waste piles, pasture areas, and eroding streambanks).

Elements 4, 5, & 6. ***Load allocations, wasteload allocations, and margin of safety.*** A full accounting of the pollutant loading to a waterbody includes pollutant loadings from both point sources, such as industrial and municipal dischargers, and nonpoint sources, such as agricultural and urban runoff. Rather confusingly, these pollutant loadings are termed "wasteload allocations" (WLA) for point sources and "load allocations" (LA) for nonpoint sources. The sum of all the WLAs and all the LAs, plus "natural background" and a "margin of safety," is the total maximum daily load or TMDL.

In the case of Cobbossee Lake, the WLA was set to zero as there were no sources of phosphorus identified as point sources. CWD used volunteer data to estimate the current in-lake concentration of phosphorus, and information on land use to estimate the current phosphorus loadings from nonpoint sources throughout the watershed area. CWD estimated that it would be necessary to reduce current phosphorus loading from the watershed by 14% to meet the water-quality target of 15 µg/L.

Elements 8, 9, & 10. ***Monitoring, implementation, and reasonable assurances.*** Although the official "required" TMDL process currently ends when the loading numbers are set, determining load allocations will not improve water quality unless actions are taken to reduce loading. Therefore most TMDLs include implementation and monitoring plans. Only the point sources are subject to regulations at the federal level, mainly through National Pollution Discharge Elimination System (NPDES) permits. Because non-point sources are not subject to federal regulation, control of these sources generally relies on the voluntary use of "best management practices" (BMPs), which range from fencing animals out of streams and sweeping streets to changing agricultural management practices and installing stormwater treatment systems.

For the Cobbossee Lake TMDL, the CWD identified a variety of BMPs, such as fertilizer management plans on hayland, better road maintenance, and shoreline vegetation strips, that could be used to reduce phosphorus loadings by 14%, the amount needed for the lake to eventually meet the water-quality target. Volunteers will continue to play a central role in implementation of water- pollution controls and in monitoring lake water quality, including biweekly monitoring during the open-water months for Secchi disk transparency, dissolved oxygen, temperature, total phosphorus, chlorophyll a, total alkalinity, and pH.

Cobbossee Lake is an excellent example of how volunteers can help make sure that TMDLs aren't just paper exercises. This is particularly important in the case of "nonpoint-source only" TMDLs, where volunteers may be the only source of water

quality data, or of information on activities and pollution sources, after the TMDL is completed.

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Keeping Bugs Alive

Recently Joanna Arciszewski, a Watershed Specialist with the Northern Virginia Soil and Water Conservation District, posted the following query to the volunteer monitoring listserver:

> Hello. I am looking for some advice about how to keep benthic macroinvertebrates alive in tanks for study. If you have experience with such projects, please contact me at jarcisze@gmu.edu.

Joanna received a number of helpful responses and reports that "I was able to keep my macroinvertebrates alive for several days by combining several suggestions. I used a small tank with a bubbler and kept the water cold with ice made by freezing stream water. My bugs survived and were re-released."

One respondent, Arleen Feng of the Alameda County, California, Public Works Agency, provided lots of useful tips for keeping invertebrates for longer than just a few days. For medium-term maintenance, Arleen wrote, "Multiple air stones and bubble curtain attachments for aquarium air compressors work well, particularly if placed beneath a baffle that deflects the bubbles horizontally and sets up a current circulating throughout the tank." Arleen explains that this circular flow mimics conditions in a stream, and says you will be able to observe bugs orienting toward the "current."

For longer-term maintenance, Arleen says, "General rules of aquarium operation begin to apply. Because of evaporation, the dissolved solids content of the water will increase; to offset this, you need to add distilled water or spring water with low conductivity. You should also bring in stones or other substrate from the stream to help jumpstart bacterial

colonization for nitrification and food source. You will need leaves for the shredders but be careful not to overload the system."

Arleen rates the probability of long-term survival as follows:

- collector/detritivore>shredder>grazer>>filterer>>>predator
- tolerant>somewhat tolerant>>>intolerant

For more detailed instructions, consult Merritt, R.W. and Cummins, K.W., An Introduction to the Aquatic Insects of North America, 3rd ed. (Kendall/Hunt, 1996).

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Are You Talking to Me?

Writing for the Public

You may be comfortable with terms like BMP and designated use, but would you want to read an article that begins: "Different spatial and temporal domains of causality combine to produce local community patterns"? Probably not, unless you're a professional ecologist.

In its proper place - for example, an agency technical report - jargon is an appropriate and useful shorthand. But it can turn the untrained reader away after the first sentence. Unfortunately, jargon can be habit-forming; addicts often have trouble remembering any other way to write.

Recently Joan Martin, Adopt-A-Stream Program Director for the Huron River Watershed Council, wanted to raise community awareness about how stormwater runoff damages creeks and to make an appeal for incorporating stormwater BMPs into new developments. She wrote an article that was printed in several local newspapers. A shorter, slightly modified version is printed at right.

What makes Joan's article effective? Basic good writing, for starters - logical organization, use of the active voice - but note especially the following points:

1. **Jargon-free.** First notice what is not there - no mention of nonpoint sources, sedimentation, or BMPs. Instead Joan talks about rain and dirt, building design and landscaping.

2. **Hearts and minds.** The article appeals both to reason (by explaining why stormwater runoff is a problem) and to emotion ("a great gift to our grandchildren"; "recreate what we have lost").

3. **Friendly.** By using the first person plural - "We don't design rain into our lives" - Joan avoids finger-pointing. She is talking with people, not at them.

So, how do you go about writing like this? First, it takes time. Joan says she went through about eight rewrites. As with any skill, whether figure skating or playing the violin, a lot of effort goes into making the product look effortless.

Writing for the public should not be thought of as "dumbing down" your subject. On the contrary, you have to "write smarter" to convey complex ideas in a simple and interesting way. Joan says she imagined she was writing for a colleague in a different field, then "field-tested" her drafts on such people - her librarian, for example.

Note: Joan would like to collect additional examples of good writing about watershed issues for a wide audience. If the authors are willing, the articles will be available for adaptation and use in various communities. Please send examples to jmartin@hrwc.org.

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When Rain Becomes a Problem

by Joan Martin

"What a beautiful day!" I'll bet the image that brings to mind is not a cloudy drizzle or a thunderstorm. We love a beautiful sunny day and usually react to rain as a nuisance that hopefully will soon be gone. Consequently, we don't design rain into our lives.

We especially don't design rain into our built spaces. We design our buildings and landscapes in a fantasy, as if rain didn't exist. Then, when the rain falls, we have a problem that we call "stormwater," which we try to move off the site as efficiently as possible, usually through a system of drains. The typical solution is to run it to the creek.

However, this approach has serious repercussions for the environment around our community. We can have much better designs if we ask for them, and it would be a great gift to our grandchildren if we did. Our guide to a desirable design lies in the natural environment.

We don't talk about stormwater in the woods because very little of the rain leaves the site. On the other hand, when it rains in town, the water cannot soak into the ground so most of the stormwater flows rapidly off the site, washing the impervious pavement and the roofs. You can see the results of washing the streets and other surfaces when you notice the trash that ends up in the river. The chemicals we use on our lawns and the oil and dirt in the streets are also washed into the stream, polluting it. Equally damaging are the physical effects of the stormwater on the creek. When a great surge of stormwater flows rapidly to the creek, it changes a steady gentle stream into a powerful torrent that gouges the channel, tearing away the banks and clogging with dirt the gills of fish and

the homes of streambed creatures.

It is very understandable that our response to the excess water has been to remove it from the city and hasten its trip to the nearest stream. It wasn't part of what we planned in our life. However, a far better way to handle the excess water is to recreate what we have lost in order to keep the water from leaving the site on which it falls.

What would our civilized world be like if we did include rain in the design? We could provide a place for water, both by utilizing the natural systems that hold and cleanse rainwater, such as wetlands and floodplains, and by constructing reservoirs and beautiful "wet gardens" - gardens filled with water-loving plants that absorb excess nutrients and other contaminants from the water.

Let's appreciate and accommodate the rain. Let's ask each developer to design buildings and roads around the natural features that affect the flow of water (such as steep slopes and special soils) and preserve wetlands and floodplains, which have a great capacity to handle stormwater.

The next time you hear that a new development might be built in your community, ask what it will do with the rain.

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Technical: Chlorophyll Methods; Integrated Samplers; Air-Dryer for Chlorophyll Samples; Viewing Tube; Sampling Rake

Spring 2000 - Monitoring Fauna
Macroinvertebrate Data: Volunteers vs. Professionals · Great Herp Search · Animal Tracking · Bugs in Your Face (Cool Facts) · Recent Trends in Macroinvertebrate Monitoring · NatureMapping · Tracking Bird Use of Restoration Sites · Toxic Phytoplankton Update · Bacti Monitoring Success Stories
Technical: Bug Rack

Fall 1999 - Youth Projects
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Technical: Monitoring Optical Brighteners to Trace Bacteria Sources

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Technical: Bacteria Indicators & Methods; Homemade Incubator Update; "Water Tower" Creek Model

Spring 1998 - Monitoring Wetlands
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Fall 1997 - Community Outreach
Moving People from Belief to Action · Outreach Ideas · Crafting Your Message · Working with Native Alaskan Communities · Recruitment & Community Organizing · Media Strategies for Cheapskates
Technical: Tracking Down Fecal Coliform Sources; Automated Flow-Through Sampler; Shallow Water Sampler

Spring 1997 - Methods and Techniques
High Schoolers Identify "Most Wanted" Macroinvertebrates · Test Kit Tips: DO, Nutrients · Waste Disposal · Salinity by Conductivity & Hydrometer · Parallel Testing: Volunteers vs. Professionals · Statistical Analysis

Fall 1996 - Wide World of Monitoring
Health Surveys on U.S.-Mexico Border · Monitoring Stream Morphology & Behavior · Monitoring Wetlands · Bird Banding: Assuring Quality Data · Beach Surveys · Coral Reefs · Sea Turtles · Air Monitoring
Technical: Duckweed Assay for Toxicity Testing

Spring 1996 - Managing a Volunteer Monitoring Program
23 Ways to Say Thank You · Getting Started · Developing Volunteer Leaders · Why Volunteers Leave · Stages of Organizational Development · Strategic Planning · Liability Insurance & Waivers
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Fall 1995 - Monitoring Urban Watersheds
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Spring 1995 - Managing and Presenting Your Data
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Fall 1994 - Monitoring a Watershed
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Spring 1994 - Volunteer Monitoring: Past, Present, & Future
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Technical: Phosphorus Monitoring; Hose for Collecting Integrated Samples; Water Bath Incubator Update

Fall 1993 - Staying Afloat Financially
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Spring 1993 - School-Based Monitoring
How to Work with Schools · Interdisciplinary Monitoring Programs · Action Plans · Getting the Word Out · Computer Networking · Quality Control of Student Data · Student Congresses · Students Against Zebra Mussels · School as Hub of Community
Technical: Toxicity Bioassay with Daphnia; Homemade Water Bath Incubator; Salinity Testing; Correcting Hydrometer Readings

Fall 1992 - Building Credibility
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Spring 1992 - Monitoring for Advocacy
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Technical: Homemade Secchi Disks & Viewscopes; Field-Proofing Hydrometers

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Resources

Online Bug Photos and Key

For beautiful, detailed color photos of macroinvertebrates, along with descriptions, go to http://www.dec.state.ny.us/website/dow/stream/index.htm EXIT EPA. This Macroinvertebrate Pictorial Web Key was developed via a collaboration between Hudson Basin River Watch and the NYS DEC Biomon-itoring Unit and is an ongoing project.

RBP Training on the Web

EPA's Watershed Academy is offering a new Web-based training module, "Rapid Bioassessment Protocols: An Introduction" (M. Barbour et al.). This module reviews methods for assessing the health of streams and watersheds based on fish, invertebrate, and plant communities.

See http://www.epa.gov/owow/watershed/wacademy/acad2000/rbp/index.html .

Update: Periphyton Website

The Website for New Zealand's periphyton monitoring protocol, mentioned in the last issue of The Volunteer Monitor, has been changed to http://www.landcare.org.nz/SHMAK EXIT EPA.

New Coordinator's Manual

Maine's Clean Water Program has produced a new 100-page guide, Environmental Stewardship in the Gulf of Maine: A Coordinator's Manual, covering the information needed to start, build, and sustain an environmental monitoring group. Order from

University of Maine Cooperative Extension, P.O. Box 309, Waldoboro, ME 04572; 208-832-0343; email: esp@umext.maine.edu. $20.

Revised Wetland Manual

A substantially revised edition of New England Freshwater Wetlands Invertebrate Biomonitoring Protocol: A Manual for Volunteers, by Anna L. Hicks and Ethan J. Nedeau, has just been published. The 82-page manual contains new and updated information and over 40 illustrations and black-and-white photographs. Order from UMass Extension Bookstore, Draper Hall, 40 Campus Center Way, Amherst, MA 01003-9244; 413-545-271. $25 + $4 shipping.

Macroinvertebrate Manual and Key

The Illinois RiverWatch Stream Monitoring Manual, 5th edition, describes macroinvertebrate field sampling and identification procedures used by RiverWatch citizen scientists. Single copies of the 61-page manual are free; contact ecowatch@dnrmail.state.il.us ; 888-428-0362.

A companion macroinvertebrate key is available online; go to http://dnr.state.il.us/orep/inrin/ecowatch EXIT EPA and click on "RiverWatch."

Volunteer Monitoring Conference Proceedings

The Proceedings of the 6th National Volunteer Monitoring Conference, "Moving Into the Mainstream" (held in Austin, Texas, April 26-29, 2000) includes papers from 56 presentations, as well as summaries of discussion breakouts and a list of participants. Topics are as varied as monitoring wetlands, state use of volunteer data, and how to organize a regional monitoring "day." Available from the National Service Center for Environmental Publications, 800-490-9198. Use the EPA number, EPA 841-R-01-001, when ordering. Note: People who attended the conference will automatically receive a copy.

Stream "Daylighting"

Daylighting: New Life for Buried Streams provides detailed case studies of 18 projects to restore streams that had been covered or culverted. Download PDF or order hard copy from Rocky Mountain Institute Website (http://www.rmi.org EXIT EPA), or call 970-927-3851. 64 pages; $12 + S&H.

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Beach Cleanup

On Saturday, September 15, 2001, nearly one million people will descend on beaches all over the world to help tackle the problem of marine debris during the 16th Annual International Coastal Cleanup. Last year, cleanup volunteers collected over 13.5 million pounds of trash. For information see http://www.cmc-ocean.org EXIT EPA.

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Short Takes: More TMDL Stories

Rhode Island
Rhode Island volunteer monitors have a longstanding working relationship with the Rhode Island Department of Environmental Management (DEM), which for years has used volunteer monitoring data in the state's 305(b) report and for determining which waters should be on the 303(d) list. So it comes as no surprise that when DEM started developing TMDLs, volunteer monitors were in on the process.

Case in point: The fecal coliform TMDL for the Runnins River. In preparing this TMDL, DEM used long-term fecal coliform data collected by volunteers from the Pokanoket Watershed Alliance (PWA) to help calculate load allocations. In addition, some two dozen volunteer monitors contributed substantially to a study of stormwater loadings of bacteria to the river. These hardy and dedicated folks assembled at 4 a.m. one October morning, only to be sent home when the expected storm did not materialize. A few days later they were called out at 6 a.m., and this time were rewarded with a heavy downpour. The data collected during this study were used in identifying major fecal coliform sources and calculating wet weather loading for the TMDL.

PWA volunteers will continue to collect fecal coliform samples to monitor the effectiveness of source reductions called for in the TMDL.

Massachusetts
The Neponset River fecal coliform TMDL is the first Massachusetts TMDL for which the characterization of the problem was based almost entirely on volunteer-collected data. Volunteers with the Neponset River Watershed Association (NRWA) have been collecting samples for several years under an EPA-approved quality assurance project

plan (QAPP). The samples are analyzed for fecal coliforms at the EPA Region 1 lab.

"The volunteers' dataset was much more extensive than the state's," says Mark Voorhees, an environmental engineer at EPA Region 1 who helped write the TMDL in collaboration with the Massachusetts Department of Environmental Management. "They had been monitoring throughout the watershed, in dry and wet conditions. They also had knowledge about specific problems, which was very helpful."

Voorhees says that the volunteer monitoring data was used to calculate the percent reduction needed to meet water quality standards for the TMDL, and adds, "It's written into the TMDL plan that NRWA will continue to be involved in source identification, as well as post-implementation monitoring to see if control measures are working."

Minnesota

In Minnesota, citizen volunteers assisted the Dakota County Soil and Water Conservation District (SWCD) and the Dakota County Environmental Education Program in gathering data for a fecal coliform TMDL for the Vermillion River. Volunteers collected the samples every week for 5 months and delivered them to a laboratory courier. The citizen-collected samples will be used along with professionally collected samples in calculating the maximum amount of bacteria the river can receive and still meet water quality standards, and for identifying possible sources of bacteria to the river.

In a nearby watershed, volunteers for the SWCD collected weekly water samples from Chub Creek for the purpose of gathering enough data know whether the creek should be listed for fecal coliforms on Minnesota's 303(d) list in 2002.

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